



Voluntary Carbon Standard 2007.1 Validation Report

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Validation Report:

Name of Validation company:	Date of the issue:
TÜV NORD CERT GmbH	2009-11-18
Report Title:	Approved by:
Natural Gas based Combined Cycle Power Project at Valatharavai Village, Ramanathapuram District, Tamil Nadu by Penna Electricity Limited [Formerly Arkay Energy Limited]	Mr. Winter Rainer
Client:	Project Title:
Penna Electricity Limited	Natural Gas based Combined Cycle Power Project at Valatharavai Village, Ramanathapuram District, Tamil Nadu by Penna Electricity Limited [Formerly Arkay Energy Limited]
Summary:	

Penna Electricity Limited has commissioned the TÜV NORD JI/CDM Certification Program to carry out the validation of the project - "Natural Gas based Combined Cycle Power Project at Valatharavai Village, Ramanathapuram District, Tamil Nadu by Penna Electricity Limited [Formerly Arkay Energy Limited]", with regard to the relevant requirements of VCS 2007.1 Standard.

The Project activity consists of Natural Gas based Combined cycle power plant with a total installed capacity of 58.15 MW to meet the contract capacity i.e. net electricity generation of 52.8 MW. The generated Electricity will be supplied to the southern grid of India and then distributed to connected end users

The review of the VCS PD and additional documents related to baseline and monitoring methodology; the subsequent background investigation, follow-up interviews and review of comments by parties, stakeholders have provided TÜV NORD JI/CDM CP with sufficient evidence to validate the fulfilment of the stated criteria.

A risk based approach has been followed to perform this validation. In the course of the validation, 6 Corrective Action Requests (CAR) and 17 Clarification Requests (CR) were raised and successfully closed out. More over 1 FAR was raised.

The validation is based on the VCS PD, proof of title, additional documents related to baseline and monitoring methodology; the subsequent background investigation, follow-up interviews and supporting documents made available to the validators by project proponent.

As a result of the validation, the validator confirms that:

- The monitoring plan is transparent, adequate and inline with applied baseline and monitoring methodology of AM0029 version 03.
- The calculation of the project emission reductions is carried out in a transparent and conservative manner, so that the calculated emission reductions of 903390 tCO₂e (total) is most likely to be achieved within the chosen 10 years fixed crediting period.

No restrictions or uncertainties were identified related to the validation.

Work carried out by:	Number of pages:
Ma Paa Puratchikkanal K V Sudarshan C. Indumathi Manjari Chandra	39

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1 Introduction

1.1 Objective

The purpose of this validation is to have an independent third party assessment of the project design, in particular the project's baseline, the additionality, the monitoring plan (MP) and the project's compliance with

- The requirements of VCS 2007.1 program guidelines;
- Requirements of the CDM Approved methodology, AM0029. version 03, which is approved by VCSA;
- To assess the project's compliance with other relevant rules, including the project country (India) legislation and
- Other relevant rules, of VCS sustainability criteria are validated in order to confirm that the project design as documented is sound and reasonable and meet the stated requirements and identified criteria. Validation is seen as necessary to provide assurance to stakeholders on the quality of the project and its intended generation of Verified Emission Reductions (VERs/VCUs¹) without double counting.

1.2 Scope and Criteria

The validation scope is given as an independent and objective review of the project design, the project's baseline study and monitoring plan (based on CDM approved baseline methodology AM0029 Ver.03, "Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas" and CDM approved monitoring methodology AM0029 Ver.03, "Grid Connected Electricity Generation Plants using Non-Renewable and Less GHG Intensive Fuel") which are included in the VCS PD and other relevant supporting documents.

The items covered in the validation are described below:

- VCS 2007.1 & Project Country Criteria
 - To meet the requirements of VCS 2007.1 guidelines requirements, in particular,
 - Project country requirements / criteria
- VCS Project Description
 - Project design
 - Project boundaries and Predicted VCS project GHG emissions

¹ As per VCS, Verified Emission Reductions (VERs) are considered to be VCUs only after successful registration in an approved VCU Registry

- Project Baseline
 - Baseline methodology
 - Baseline GHG emissions
- Monitoring Plan
 - Monitoring methodology
 - Indicators/data to be monitored and reported
 - Roles and Responsibilities
- Project Additionality
- Background investigation and follow up interviews
- validation reporting with CARs, CRs & FARs, if any
- Final validation reporting

The information included in the VCS PD^{/PD4/} and the supporting documents were reviewed against the requirements and criteria mentioned above. The TÜV NORD CERT GmbH JI/CDM CP has employed a risk-based approach in the validation, focusing on the identification of significant risks for project implementation and the generation of VERs. The validation is based on the information made available to TÜV NORD JI/CDM CP and on the contract conditions.

The validation is not meant to provide any consulting to the project participant. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the project design.

1.3 VCS project Description

The purpose of the project activity is to set up a Natural Gas based Combined cycle power plant with a total installed capacity of 58.15 MW to meet the contract capacity i.e. net electricity generation of 52.8 MW. The plant consists of one gas turbine of 38.15 MW and one steam turbine of 20 MW. The generated electricity will be sold to the TNEB, which is a part of the southern grid. The power plant is located at Survey Nos. 203 & 204 of Valantharavai Village, Ramanathapuram District, Tamil Nadu State. The latitude and longitude of the sites are 09°19'24" N and 78°54'42"E². At an optimum year, the project would consume around 243042 SCMD of Natural Gas from the Cauvery Asset, Ramanathapuram Zone of Oil and Natural Gas Corporation (ONGC). The project activity is using natural gas, whose emission factor is 54.3 tCO₂/TJ which is less compared to coal/lignite, would result in reducing the carbon intensity of the grid. The computation reveals that the project would reduce Carbon dioxide emissions to the extent of 90339 tonnes per

² <http://www.satsig.net/maps/lat-long-finder.htm>

annum. The estimated GHG emission reduction is 903390 tCO₂e for the chosen ten year crediting period.

1.4 Level of assurance

The validation report is based on VCS PD^{/PD1-PD3/}, financial spreadsheet/^{XLS1-XLS 2/}, supporting documents made available to the validation team and information collected through interviews, and during the on-site assessment. The validation opinion is assured provided the credibility of all above.

2 Methodology

The validation of the project was carried out from November 2008 to November 2009.

Preparations: 10/01/2009-01/10/2009

On-site validation: 05/02/2009

(Draft) Reporting: 30/06/2009

(Final) Reporting: 18/11/2009

The validation consisted of the following three phases:

- a desk review of the project design and the baseline and monitoring methodology
- follow-up interviews
- the resolution of outstanding issues and the issuance of the final validation report and opinion

2.1 Review of Document

The draft PD^{/PD1/} submitted by Penna Electricity Limited in January 2009 and supporting background documents related to the project design and baseline were reviewed on 13/05/2009. Furthermore, the validation team used additional documentation by third parties like host party legislation, technical reports referring to the project design or to the basic conditions and technical data.

The documents that were considered during the validation process are given in chapter 5 of this report. They are listed as follows:

- Documents provided by the project proponent (Table 5-1)
- Background investigation and assessment documents (Table 5-2)
- Websites used (Table 5-3).

2.2 Follow-up Interviews

On 05/02/2009, the TÜV NORD JI/CDM CP performed validation site visit with the project proponent in plant premises located at Valantharavai Village, Ramanathapuram District, Tamil Nadu State.

During this visit, as well as earlier and after, interviews with the project proponent, the consultant, project stakeholders and with local authorities were carried out to confirm selected information and to resolve issues identified in the document review.

The key interviewee and main topics of the interviews are summarised in Table 2-1.

Table 2-1 Interviewed persons and interview topics

Interviewed Persons / Entities	Interview topics
Projects & Operations Personnel /IM01/	- General aspects of the project - Project design, Commissioning and implementation - Technical equipment and operation of the project - Performance of the project - Involved personnel and responsibilities - Training and practice of the operational personnel - Implementation of the monitoring plan
Consultants /IM02/	- Monitoring and measurement equipment - QA/QC Testing and calibration procedures - Monitored data management - Data quality, archiving and reporting procedures - Desk review findings - Bundling criteria - Applicability of chosen methodology - Data uncertainty and residual risks - GHG calculation - Procedural aspects of the validation

2.3 Resolution of any material discrepancy

A few discrepancies were found during the validation and the validation report containing a set of CARs & CRs were submitted to the project proponent. The project design

document was revised addressing the CARs & CRs issued by TÜV NORD JI/CDM CP.

After reviewing the revised and resubmitted project documentation^{/PD4/}, resolving the CARs & CRs raised and outstanding concerns, TÜV NORD JI/CDM CP issues this final validation report and opinion.

6 CARs and 17 CRs were found during Validation. More over 1 FAR was also raised. Please refer to Section 3, table 3.

3 Validation Findings

The findings of validation are summarised in table 3:

Table 3: Summary of CAR, CR and FAR issued

Validation topic	No. of CAR	No. of FAR	No. of CR
D- Project Design	2	1	2
B- Baseline and additionality	4	–	8
M- Monitoring plan	–	–	3
C- Calculation of GHG emissions	–	–	3
E- Environmental Impact	–	–	1
L- Local Stakeholder Comments	–	–	–
SUM	6	1	17

For an in depth analysis/evaluation of all CARs and CRs, the sections 3.1 to 3.6 below can be referred:

3.1 Project Design

The project envisages setting up a combined cycle (gas and steam cycle) power plant with an installed capacity of 58.15 MW consisting of one Gas Turbine Generating Unit of 38.15 MW rated capacity, one Heat Recovery Steam Generator Unit of 67 TPH rated capacity coupled to a Steam Turbine Generating Unit of 20 MW rated capacity along with all electrical systems, controls and Instrumentation, Civil, Structural and Architectural

works. The rating of the power plant is 38.15 MW at Plant Factor (PF): 0.8 in Open Cycle and about 58.15 MW at PF: 0.8 in Combined Cycle.

The steam turbine generator would be of the condensing non-reheat type, designed to operate with steam at 65 kg/sq.m at 500°C.

Table 3-1: Technical details of the project activity

Contract Capacity (MW)	52.8
Aux. consumption	4%
Gross electricity generation	55.0
Plant Load Factor (%)	85
Gross energy generation (GWh)	409.53
Auxiliary Consumption (GWh)	16.38
Net electricity generated (GWh)	393.15
Heat rate (kcal/kWh)	1980
Calorific value of fuel (kcal/scm)	8775
Fuel requirement, (standard cubic meters-scm)	92406769
Standard Cubic meters per day (SCMD)	253169

The project duration is: 15 years.

Start date of the project is 2006-07-01

Crediting period for the project activity: Fixed crediting period for the project activity is 10 years i.e., from 2006-07-01 to 2016-06-30

Proof of title was also submitted to DOE. Fresh Certificate of Incorporation consequent upon change of name from Arkay Energy Limited to Penna Electricity Limited from Ministry of Company Affairs, Government of India^{/NAME/} and consent for operation from Tamil Nadu Pollution Control Board^{/CFO/} are considered as the evidence for the proof of title of the project activity. Refer to Table 5-1.

The emission reduction has not been double counted. The project has not applied for other carbon benefits. There is no rejection history for the project activity.

However, 2 CARs and 2 CRs were raised and successfully closed out. More over 1 FAR was raised.

CAR/CR	Reference	Summary of project owner response	Revised sections (as applicable)	Conclusion
CAR D1 In section 1.4, clarification in respect to the capacity of the power plant needs to be stated.	/PD 1/	The PP has an agreement with TNEB to generate electric power of 52.8 MW. The plant has to generate gross power sum of export to the grid (52.8 MW) and plant auxiliary consumption (2.2 MW), which is 4% of gross power (55 MW). For gas based combined cycle power plants, the capacity degradation factor during the life time (15 years) is 1 to 0.965. In view of this PP has chosen nearest ratings of 38.15 MW gas turbine and 20 MW steam turbine to meet the net generating capacity after deducting auxiliary consumption and corrections of capacity degradation factor. Accordingly the equipments were installed with the combined cycle capacity of 58.15 MW to meet the contract capacity. As per TNEB's letter dated 29.07.2006 the capacity test results were arrived for 50.3 MW. It is evident that the installed plant capacity is conservative to	/PD 2/& /PD 3/	The Purchase orders of both gas and steam turbines /PO/ were verified and found that the order placed for the power plant was 58.15 MW. The power purchase agreement /PPA/, Synchronization certificate /SC/, approval letters from State energy Department and no objection clearances for setting up of the power plant /CIA 1-CIA 8/ were all verified and found that the net generation

CAR/CR	Reference	Summary of project owner response	Revised sections (as applicable)	Conclusion
		perform and to meet the PPA requirement of contract capacity. The PP had ordered the plant equipments (Gas Turbine 38.15 MW plus Steam turbine 20 MW total 58.15 MW) to meet the net electricity generation with state utility i.e. 52.8 MW excluding aux. consumption. The PP had obtained all statutory approvals & consents based on NOC for setting up for contract capacity which was issued by TNEB (State Govt. Agency). PP is also obtaining renewals for "Consent for operation" from state PCB. Thus the net generation capacity of the power plant is 52.8 MW. A set of P.O. extracts for Gas turbine & Steam turbine specifications have been provided to DOE for verification		capacity of the power plant which has been contracted with TNEB was 52.8 MW. Including the auxiliary consumption of 4%, it was calculated and verified that gross generation capacity will be around 55 MW. The CERC operational norms for thermal generation /CERC/ was checked and found that the capacity degradation factor for gas based combined cycle power plants are

CAR/CR	Reference	Summary of project owner response	Revised sections (as applicable)	Conclusion
				1 to 0.965. Thus the chosen capacity ratings of 38.15 MW gas turbine and 20 MW steam turbine to meet the net generating capacity after deducting auxiliary consumption and correction of capacity degradation factor is deemed to be acceptable. More over TNEB's letter dated 29.07.2006 was checked in respect to the capacity test results arriving at 50.3 MW and

CAR/CR	Referen ce	Summary of project owner response	Revised section s (as applica ble)	Conclusion
				concluded that the generating capacity is less than the net generation capacity of 52.8 MW. Thus, TUV accepts the contention of the PP that it has installed the 58.15 MW turbines to generate 52.8 MW power and the net generating capacity of the project will not exceed 52.8 MW. However, CAR D1 is closed and in its place FAR D1 is raised.
FAR D1 The	/PD 3/			

CAR/CR	Reference	Summary of project owner response	Revised sections (as applicable)	Conclusion
verifying team should ensure that the working capacity of the turbine has not exceeded the stated capacity of 52.8 MW.				
CAR D2: Project start date as defined by VCS 2007.1 should be mentioned in the VCS PD.	/PD 1/	The PP has considered the date of plant synchronization i.e. 01 July 2006 as the project start date.	/PD 2/ /PD 3/	Synchronization letter /SC/ was checked and thus the project start date has been found to have applied correctly as per the VCS 2007.1 standards. CAR D2 is closed.
CR D1: Write up on risk related to "availability of NG" as stated in section 1.11 of VCS PD and the argument given under section 2.2	/PD 1/	The PP has reviewed and modified the description under section 1.11 of revised VCS PD.	/PD 2/ /PD 3/	Increasing price of the natural gas has been stated as a key risk factor affecting the project GHG emission reductions.

CAR/CR	Referen ce	Summary of project owner response	Revised section s (as applica ble)	Conclusion
of the VCS PD, related to availability of NG are contradictory to each other.				IOC Website was checked in respect to dismantling of APM and corresponding price hike in fuel prices. Thus the price hike of natural gas, which affects the GHG emissions, is deemed to be acceptable as a key risk factor. CR D1 is closed.
CR D2 Documents required: 1. Provide certificate of incorporation consequent upon change of name from M/s Arkay Energy Private Limited to Penna Electricity	/PD 2/	A scanned copy of change of name certificate from M/s Arkay Energy Private Limited to Penna Electricity Limited has been provided to DOE for verification.	PD 3/	Fresh Certificate of Incorporation consequent upon change of name from Arkay Energy Limited to Penna Electricity Limited from Ministry

CAR/CR	Reference	Summary of project owner response	Revised sections (as applicable)	Conclusion
Limited.				of Company Affairs, Government of India dated 8/09/2006 ^{/N} AME/ was verified and found to be OK. Hence representing the name of the Company as Penna Electricity Limited is acceptable.

3.2 Baseline

The proposed project uses CDM approved methodology AM0029 /Version 03: "Grid Connected Electricity Generation Plants using Natural Gas", which is approved under VCS 2007.1.

The project satisfies all criteria for AM0029. The application of baseline methodology is assessed in following manner

Methodology Reference	Applicability	Y/N	Evidence in PD and reference	Assessment
Applicability	Is the project	Y	Section 2.2,	The project activity is construction and operation of a

1	activity is the construction and operation of a new natural gas electricity generation plant?		Site visit, /SC/ /CIA 1/-/CIA 8/	Natural Gas fired which has been verified from site visit. The statutory clearances /CIA 1/-/CIA 8/ were verified and the ssynchronization certificate from TNEB dated 2006-07-01 was verified in this regard and concluded that the project activity is the construction and operation of a new natural gas electricity generation plant.
	Is the electricity generation plant grid connected?	Y	Section 2.2, /PPA/	Power purchase agreement has been verified and found that the electricity generation is grid connected.
	Is NG the primary fuel?	Y	Section 2.2 /GAIL 1/, /GAIL 2/	Natural Gas agreement with GAIL was verified and found that the Natural gas is the primary fuel.
	Is Start up / Auxiliary fuel used not more than 1% of total fuel used?	Y	Section 2.2	Based on the project design and from the site visit it has been verified that other fuel is not at all envisaged in the project design
Applicability 2	Is the geographical /Physical boundary of the baseline grid can be	Y	Section 2.2	The geographical and physical boundaries of both the TNEB as well as the Southern Regional Load Dispatch Centre are clearly identified and managed by independent entities, viz., TNEB and the Southern Regional Electricity Board (SREB) which was verified to be correct from the site visit.

	clearly identified?			
	Is the information pertaining to estimation of baseline emission is publicly available?	Y	http://cea.nic.in	The Central Electricity Authority of India, which is a statutory technical authority under the Ministry of Power, Government of India, has published the Operating Margin and Build Margin data of all regional power grids, which were verified from the website ^{/CEA/} and thus concluded that the estimation of baseline emission is publically available.
Applicability 3	Is the NG is sufficiently available in the region or country?	Y	(Source : www.petroleum.nic.in/petstat.pdf) Page no:15 of :Statistics at a Glance 2006-07 published by TNEB	From the table showing the production of natural gas in Tamil Nadu, it is observed that natural gas productions are steadily increasing. More over, from the list of natural gas based power plant already commissioned during 2006-07, it can be understood that the Natural gas is sufficiently available

	Will future natural gas power capacity addition, comparable in size to the project activity not be constrained by the use of NG in the project activity?	Y	www.hindu.com/2006/09/05/stories/2006090507230500.htm www.thehindubusinessline.com/2006/12/04/stories/2006120403200300.htm	It is observed that Tamil Nadu Electricity Board is setting up another natural gas based power project in Valuthur with an installed capacity of 75 MW for which GAIL has agreed to supply required natural gas. From the website ^{/hindu 1/} it has been verified that the ONGC has found more potential zones of natural gas reserves in Ramanathapuram district. More over, from the web site ^{/hindu 2/} it has been verified that the Reliance Industries have planned to lay a pipeline to bring the gas to Tamil Nadu from KG basin and the supply should start sometime. Thus it has been verified and concluded that Natural Gas is available in sufficient quantities in Tamil Nadu for setting up more projects of comparable size
	Has PP document ed that supply limitation will not result in significant leakage as indicated in Note 2? i.e. there is no price	Y	Section 2.2	Liquefied Natural Gas (LNG) can also be imported through the ports of Chennai, Tuticorin etc. Therefore, stating that this project activity will not deprive any other economic activity of the supply of Natural Gas is verified to be acceptable.

	- inelastic supply constraints.			
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Thus all the applicability conditions of baseline methodology are assessed to be correct. There is no methodology deviation or revision.

The project boundary and the GHG emission sources applicable to this project activity were verified to be in line with the methodology.

Identification of baseline scenario has been done in accordance with the methodology AM0029.

1. Plausible baseline scenario alternatives were identified. The clear description of each baseline scenario alternatives were verified and found to be OK.
2. Economically most attractive baseline scenario alternative has been identified using investment analysis. Levelised cost of electricity generation was identified as suitable financial indicator and found that the coal based option has the most attractive indicator among the alternatives. Assumptions and input data and the calculations of levelised cost were verified and found to be OK.
3. Sensitivity analysis was also carried out for all the alternatives which were verified to be OK.

All the above analyses were verified and thus the identified baseline scenario "Coal based power generation" has been assessed to be appropriate.

Baseline emissions are calculated by multiplying the electricity generated in the project plant (EGPJ, y) with a baseline CO₂ emission factor (EFBL, CO₂, y). Baseline emission factor has been selected in accordance with the methodology.

Build Margin emission factor of current generation mix (713.3 tCO₂/ GWh) (option 1) is lower than the other two options and was selected as baseline emission factor based on "Tool to calculate emission factor for an electricity system" which has been verified to be OK.

The calculation of EF_y is current and publicly available and published by the Central Electricity Authority on its web-site^{/cea/}. The validation team is convinced of the result of the emission coefficient calculation. It is deemed to be adequate, transparent and conservative.

The additionality has been assessed using project test. The implementation barrier: investment barrier and common practice approach have been established to demonstrate the additionality.

The additionality is assessed using project test-1.

Step as per VCS 2007.1	Argument	Assessment
Step1: Regulatory Surplus	There is no National Legislation that requires the production of power generation through Gas resources. Additionally, the Government regulation has not imposed any target for Gas power plants. The implementation of the gas based power project activity is a voluntary step undertaken by the project proponents with no direct or indirect mandate by law. Project Proponents have been issued with all required regulatory clearances before commissioning.	Validation team has checked all the National Regulations and Local legal requirements. It was found that there is no legal requisite in India and at the local level which restricts the implementation of power generation through gas resources. Hence the argument is appropriate for this project activity. Required regulatory clearances and no objection clearances /CIA1-CIA8/ were verified and found to be OK. ☒ Step passed ☐ Step not

		passed ☐ Not applicable
Step 2: Implementation Barriers: Investment Barrier	The project faces capital or investment return constraints that can be overcome by the additional revenues associated with the generation of VCU. So the PP has chosen Benchmark Analysis to demonstrate the additionality of the projects in the bundle. Weighted average cost of capital (WACC) has been considered as the benchmark for the project activity. While estimating WACC, the cost of debt has been taken from average prime RBI prime lending rate and thus the post tax debt has been arrived at 10.27% at the time of investment and average return on equity is considered based on the return earned by Central sector undertakings (CSUs) as estimated by CRISIL Advisory Services CAS (A division of Credit Rating and Information Services of India Ltd (CRISIL)). Accordingly the WACC	Various elements have been checked during the additionality assessment. Validation team has checked the identified financial indicator (Project IRR), which is most suitable for the project type and decision context. In order to verify the relevant benchmark value of WACC, validation team has referred all necessary supportive data and found OK. Project proponents have demonstrated through the investment analysis that the financial returns of the project activity are below the requisite benchmark. TUV-Nord considers the benchmark chosen is conservative and appropriate for the project. Using the investment analysis, the project proponents have demonstrated that the Project IRR of 9.05% from the project

	has been calculated based on a 70:30 debt to equity ratio and arrived to be 13.75%. Since the Project IRR is chosen as the financial indicator to demonstrate the additionality, WACC is one of the appropriate benchmarks as per the Guidance on Investment Analysis EB 41, Annex 45, version 2. Investment analysis was carried out with assumptions based on the Detailed Project Report (DPR), Central Electricity Regulatory Commission (CERC) norms, prevailing fuel prices & interest on term loan at the time of project implementation and the Power Purchase Agreement (PPA). The PLF of 85% has been considered based on the Power Purchase Agreement. Thus the IRR works out to be 9.05% and is less than the benchmark of 13.75%. Thus, it is evident that the project faces investment constraint and it is not financially	activity is lower than benchmark WACC of 13.75%. The bench mark WACC calculations were verified and found to be appropriated considering the project plant. ROE earned by Central sector undertakings (CSUs) which have been calculated based on proxy Beta Indian method was verified from CERC website³ and hence average ROE of 18.86% used in bench mark (WACC) calculations are deemed to be acceptable. The cost of debt calculations is found to be correct. The average prime lending rate used in cost of debt calculations were verified from the website⁴ and found to have applied correctly. Thus the overall WACC calculations are deemed to be acceptable and the obtained bench mark value of 13.75% was found to be appropriate. More over, the established investment barrier
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³ <http://cercind.gov.in/rep1304.pdf>

⁴ <http://rbidocs.rbi.org.in/rdocs/Wss/DOCs/36275.doc>

	feasible. Sensitivity Analysis was carried on with variation of critical parameters like power generation, project cost, fuel cost, tariff and O& M expenses. <table><tr><th>Factor</th><th colspan="3">Variation</th></tr><tr><th></th><th>-10%</th><th>0%</th><th>+10%</th></tr><tr><td>Generation</td><td>7.03%</td><td>9.05 %</td><td>11.00 %</td></tr><tr><td>Project cost</td><td>11.11 %</td><td>9.05 %</td><td>7.33%</td></tr><tr><td>Tariff</td><td>5.24%</td><td>9.05 %</td><td>12.68 %</td></tr><tr><td>Fuel cost</td><td>10.75 %</td><td>9.05 %</td><td>7.29%</td></tr><tr><td>Benchmark*</td><td colspan="3">13.75%</td></tr></table>	Factor	Variation				-10%	0%	+10%	Generation	7.03%	9.05 %	11.00 %	Project cost	11.11 %	9.05 %	7.33%	Tariff	5.24%	9.05 %	12.68 %	Fuel cost	10.75 %	9.05 %	7.29%	Benchmark*	13.75%			has been assessed to be appropriate and sufficient. The arguments with supporting spreadsheets^{/XLS2/} provide proof for the non-viability of the project. The input data and assumptions for calculation of IRR like (profit after tax, project cost, net cash flow, additional depreciation, interest on term loan) were verified with references provided by PP and found to be OK. The estimated annual electricity is based on the PLF of 85% which has been considered as per the Power Purchase Agreement contract with Tamil Nadu Electricity Board. The Power purchase agreement/^{PPA}/ was verified and found that the project shall be deemed to have achieved into commercial operation only if capacity test of the Project has to be atleast 47.52 MW and not more than 55.44 MW. Thus with gross generation capacity of 55.44 MW and minimum generation capacity
Factor	Variation																													
	-10%	0%	+10%																											
Generation	7.03%	9.05 %	11.00 %																											
Project cost	11.11 %	9.05 %	7.33%																											
Tariff	5.24%	9.05 %	12.68 %																											
Fuel cost	10.75 %	9.05 %	7.29%																											
Benchmark*	13.75%																													

		of 47.52 MW the calculated PLF of 85% is found to be acceptable. Moreover as the capacity degradation factor is varied year to year operation; the PP has considered the PLF based on net generation capacity and not on gross generation capacity which is deemed to be acceptable. The project revenue is sensitive to the electricity generation, project cost, fuel cost, tariff and O& M expenses. Hence the sensitivity analysis has been carried out by the PP for the above variables to the tune of -10% to +10%. The calculation has been reviewed and concluded that that the project activity has IRR less than the benchmark value, clearly indicating that the project is financially not feasible without carbon benefits. ☒ Step passed ☐ Step not passed ☐ Not applicable
Step 3: Common	Power Generation statistics as on 31st	The region wise installed

Practice	March 2004, reveals that natural gas, as fuel in power generation accounted only 15.2% of the total thermal power generated in the country. More over, in the Southern region, natural gas based power generation accounted for 15.5% of the total power generation. The thermal power plants (consisting of coal and lignite) account for more than 58% of the total power generated in the country. Power generated through multi fuel and diesel account for a little over 1%. Thus, CO2 emitting power plants account for almost 60% of the power generated in the country. The less pollutant hydropower and liquid fuel/natural gas account for only about one third of the power generated. Thus, it is evident that gas based power Project is not a common practice in the country.	electricity generation capacity utilities have been checked from the web site CEA website ⁵ and the given statistical data showing natural gas based power generation accounted only 15.2% of total power generation in country wise and 15.5 % in southern region were verified to be correct. More over the CEA reference web site ⁶ was verified and thus the statistics showing CO2 emitting power plants account for almost 60% and the less pollutant hydropower and liquid fuel/natural gas account for only 1/3 rd of the power generation in the country are found to be OK. By the analysis done on the Common Practice it has been found that the scope of existing and upcoming natural gas based power generation projects of similar or higher scale is low. As a result of existence of the
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⁵ http://www.cea.nic.in/power_sec_reports/general_review/0304/chap-2.pdf

⁶ http://www.cea.nic.in/power_sec_reports/general_review/0405/ch0.pdf

		analysis of the barriers, the project activity has been concluded as not a common practice scenario in the region. OK ☒ Step passed ☐ Step not passed ☐ Not applicable
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However, CARs and CRs were raised and successfully closed out.

Draft report clarification & corrective action requests	Ref. to section of PD	Summary of Project owner's response	Reference to revised section of the PD	Validation team opinion
CAR B1: In section 2.3, Project boundary as specified on page 21 of VCS PD has not shown the southern grid where the net electricity is exported within project boundary.	/PD 1/	The power generating stations, which are connected to Southern grid, have been incorporated in the project boundary under section 2.3 of revised VCS PD.	/PD 2/ /PD 3/	Necessary changes in the Project boundary have been made which are in accordance with the requirement of the methodology AM0029 and found to be OK. CAR B1 is closed.
CAR B2 Under section 2.5, The investment analysis has to be done based on step 1: Benchmark investment	/PD1 / /XLS 1/	Investment analysis calculations have been revised with benchmark investment analysis method.	/PD 2/ /PD 3/ /XLS 2/	The revised benchmark analysis calculations were verified and found to be in line with tools for

analysis, mentioned in the methodology AM0029 (p.3).				demonstration of additionality and with the methodology AM0029. Thus the investment analysis was verified and found to be OK. CAR B2 is closed.
CAR B3 The computation of benchmark should conform to the Additionality Tool. While the computation of WACC over the life time of the project appears logical, the parameters used in the computation of WACC should be 'standard' in the market and not pertaining to project.	/PD 2/ /XLS 1/	Computation of WACC & IRR analysis have been revised for the life time of the project i.e. 15 years and made necessary changes in the revised VCS PD. The return on equity and cost of debt calculations have been done based on the standards available in the market. Soft copy of these calculations is provided to DOE for verification.	/PD 3/ /XLS 2/	Required changes in investment analysis have been made by modifying the calculations for life time of 15 years. These calculations were verified and found to be OK. More over ROE earned by Central sector undertakings (CSUs) have been calculated based on proxy Beta Indian method which has been verified

				from CERC website ⁷ and hence average ROE of 18.86% used in bench mark (WACC) calculations are deemed to be acceptable. The average prime lending rate used in cost of debt calculations were verified from the RBI website ⁸ and found to have applied correctly. Thus the calculations of WACC which have been done based on market available data were verified and found be OK. CAR B3 is closed.
CAR B4 The term loan amount has been taken as percent of project cost and the rate of interest considered is	/XLS 1/	The company has taken term loans from four financial institutions and the weighted average of	/XLS 2/	The Loan sanction letters from Power Finance Corporation Ltd ^{/LSC 1/}, Punjab

⁷ <http://cercind.gov.in/repl304.pdf>

⁸ <http://rbidocs.rbi.org.in/rdocs/Wss/DOCs/36275.doc>

stated to be the rate prevailing at the time of decision making. VCS PD states that the loan had already been sanctioned. If the loan has been sanctioned, it is appropriate to take the loan amount and terms of loan as per sanction letter.		interest considered for IRR analysis. <table><thead><tr><th>Bank / Institution</th><th>Loan Amount, Rs Crores</th><th>Rate of Interest</th></tr></thead><tbody><tr><td>PNB</td><td>20.00</td><td>13.0%</td></tr><tr><td>Uco Bank</td><td>10.00</td><td>13.0%</td></tr><tr><td>UBI</td><td>58.00</td><td>10.75%</td></tr><tr><td>PFC</td><td>39.00</td><td>12.0%</td></tr><tr><td>REC</td><td>38.00</td><td>9.0%</td></tr><tr><td>Total</td><td>165.00</td><td></td></tr><tr><td>Weighted Avg.</td><td></td><td>11.1%</td></tr></tbody></table> Copies of loan sanction letters have been provided to DOE for verification.	Bank / Institution	Loan Amount, Rs Crores	Rate of Interest	PNB	20.00	13.0%	Uco Bank	10.00	13.0%	UBI	58.00	10.75%	PFC	39.00	12.0%	REC	38.00	9.0%	Total	165.00		Weighted Avg.		11.1%		National Bank /LSC 2/, UCO Bank /LSC 3/, Rural electrification Corporation Ltd /LSC 4/, Union bank of India /LSC 5/ were verified and thus the interest rates of each bank used in calculating weighted average interest rates were found to have applied correctly. CAR B4 is closed.
Bank / Institution	Loan Amount, Rs Crores	Rate of Interest																										
PNB	20.00	13.0%																										
Uco Bank	10.00	13.0%																										
UBI	58.00	10.75%																										
PFC	39.00	12.0%																										
REC	38.00	9.0%																										
Total	165.00																											
Weighted Avg.		11.1%																										
CR B1 As per Expert Committee Report, auxiliary consumption for NG based power plant is 3%. Hence, the auxiliary consumption of 4% appears to be high.	/XLS 1/	The plant auxiliary power has been computed as follows: <table><thead><tr><th></th><th>Gas Turbine (MW)</th><th>Steam Turbine (MW)</th><th>Total</th></tr></thead><tbody><tr><td>Capacity</td><td>38.15</td><td>20.00</td><td>58.15</td></tr><tr><td>Aux. CO</td><td>3%</td><td>7%</td><td>4.4%</td></tr></tbody></table>		Gas Turbine (MW)	Steam Turbine (MW)	Total	Capacity	38.15	20.00	58.15	Aux. CO	3%	7%	4.4%	/XLS 2/	The derived auxiliary power consumption is deemed to be acceptable. The DPR has been verified in respect to 4% auxiliary consumption and found to have applied correctly. It is found to be conservative.												
	Gas Turbine (MW)	Steam Turbine (MW)	Total																									
Capacity	38.15	20.00	58.15																									
Aux. CO	3%	7%	4.4%																									

		um pt io n 14 40 54		CR B1 is closed.
		The derived overall plant aux. power is 4.4%. The PP has taken 4% as mentioned in DPR for IRR analysis, which is reasonable & conservative. Extract copy of DPR has been provided to DOE for verification.		
CR B2 O&M cost should be on installed capacity. It appears to have been taken on Gross electricity generation. This may be checked and corrections carried out, if need be. Also clarify whether there are no warranties given by the machinery supplier.	/XLS 1/	O&M cost considered on installed capacity in the revised IRR analysis. No warranties given by the machinery supplier.	/XLS 2/	Required changes in O& M cost computations have been made which were verified and found to be OK. CR B2 is closed.
CR B3 1. Electricity tax is normally payable on self consumption or third party sale. Since this project activity is selling power	/XLS 1/	1. Evidence has been provided.	/XLS 2/	The following web site http://www.tn.gov.in/gorders/energy/energy-e-51-2003.htm was verified in respect to

to the grid, electricity tax may not be applicable. Evidence should be submitted, in case the electricity tax is applicable to this project activity. 2. The project seems to have been conceived in 2003-04. The tax rate taken in the calculation does not seem to be the prevailing rate at that time. This may be checked and corrections made, if necessary		2. Checked & necessary changes have been made in the revised IRR analysis with income tax rate of 35.88%		the electricity tax of 5% on tariff and found to have applied correctly. 2. Necessary changes have been made. KPMG's Corporate tax rate survey - annual report⁹ was verified in respect to the tax rates and thus the applied tax rate is found to be correct. CR B3 is closed.
CR B4 Value of PLF stated under section, 2.4 (PLF 80% on page 23 and PLF 85% on page 28) and value of 85% PLF used in ER calculation. Consistency in the value for the same should be maintained	/PD 1/	Necessary changes have been made under section 2.4 of the revised VCS PD. The PLF of 85% has been consistently used.	/PD 2/ /PD 3/	Required changes in the PLF have been made. The power purchase agreement was verified and the applied PLF of 85% is found to be OK. CR B4 is closed.

⁹ KPMG s International tax center's annual survey of Corporate tax rates

in all the relevant section of VCS PD and calculations and supported by evidences.				
CR B5 Sensitivity analysis calculations need to be done as per EB 41 annex 45.	/XLS 1/	Necessary changes in sensitivity analysis calculations have been made.	/XLS 2 /	Necessary modifications in sensitivity analysis calculations have been made. Thus the sensitivity analysis calculations are in accordance with EB 41 of annex 45 and found to be OK. CR B5 is closed.
CR B6 Reference is required for the details shown in table " List of gas based power plant in Tamil Nadu" on page 18 of VCS PD	/PD 2/	A scanned copy of reference List of gas based power plants in TN: Page no: 15 of: Statistics at a Glance 2006-07 published by TNEB has been provided to DOE for verification.	/PD 3/	The list of gas based power plants in Tamil nadu were verified from Statistics at a Glance 2006-07 published by TNEB and found to have referred correctly. CR B6 is closed.
CR B7	/PD 2/	Considered PPA	/PD	The tariff

Clarify whether the tariff is Rs.2.279/kWh or Rs. 2.27/kWh. While in the VCS PD it is stated as Rs.2.279, in the worksheet it is taken as Rs.2.27. Reconcile the difference		tariff (2.2798 Rs/KWh) for IRR analysis and the same indicated in revised VCS PD.	3 /	rate of 2.2798 has been verified from PPA and found to have applied correctly. CR B7 is closed.
CR B8 The basis for assuming book depreciation rate of 7.66% may be furnished.	/XLS 1/	Reviewed & considered Companies Act Depreciation rates in revised IRR analysis.	/XLS 2/	The depreciation rates mentioned as 5.28% for plant and equipment and 3.34 % for civil works are in accordance with companies Act and verified to be correct. CR B8 is closed.

3.3 Monitoring Plan

The proposed project uses CDM approved monitoring methodology AM0029 (Version 03, 16th May 2008) – “Grid Connected Electricity Generation Plants using Non-Renewable and Less GHG Intensive Fuel”, which is approved under VCS 2007.1.

The project satisfies all criteria for AM0029. The application of monitoring methodology is assessed as correct.

The monitoring plan provides detailed information related to the collection and archiving of all relevant data needed to:

- Estimate or measure emissions occurring from GHG sources, sinks and reservoirs
- Determine the baseline emissions
- Estimate changes in emissions from the site

The following parameters are monitored

- Amount of Gas Consumption during the power generation (scm).
- Net calorific value of Natural gas used for generation of power (kcal/scm or GJ/scm)
- Gross electricity generation (kWh) by the project activity.
- Electricity Import from the grid system (kWh).
- Net quantity of Electricity generated (exported) to the grid by the project activity (kWh).
- Emission factor for Natural gas (tCO₂/GJ).
- Oxidation factor of the fuel
- Emission factor for upstream fugitive methane emissions of natural gas from production, transportation and distribution (tCH₄/GJ)
- Emission factor of the plants included in the build margin (tCO₂/GWh)
- Periodical calibration of monitoring equipments.

The above parameters which are monitored are in line with the monitoring methodology AM0029 and found to be OK.

Main Meter and Check meters are used for metering the exported electricity to the grid & imported electricity from grid system. The meters are of accuracy 0.2 % and calibrated as per Industry standards. Thus the meters are calibrated annually.

Energy meters are used for metering Gross electricity generation and Auxiliary power consumption.

Flow meters are used for measuring consumption of natural gas in the project. The meter would be subject to regular (in accordance with stipulation of the meter supplier) maintenance and testing at least once in year to ensure accuracy. The readings will be double checked by the gas supply company.

Thus the above monitoring equipments and monitoring procedures have been clearly defined and found to be OK.

Responsibilities related to monitoring are clearly defined in the monitoring plan.

The recorded parameters would be documented every day in the standard log books maintained at the plant.

The day to day records would be verified by Plant Manager, compiled and documented for preparation of internal audit reports.

All the data items monitored under the monitoring plan would be kept for 2 years after the end of crediting period.

The on-site visit was carried out on 13/5/2009. One member of the Validation team attended the site visit.

Before and during the on-site visit, the Validation team performed interviews with the project participants to confirm selected information and to resolve issues identified in the document review.

During the onsite-visit the information above was verified by the joint meter reading reports which have been duly signed by the representatives of TNEB submitted by the PP. This was found to be in line with the monitoring plan ^{/PD3/} & the PPA signed for the project and deemed to be ok.

However, following CRs were raised and successfully closed out.

CAR/CR	Ref	Summary of project owner response	Revised sections (as applicable)	Conclusion
CR M1 In section 3.2 Gross Calorific value is reported as parameter while in section 3.3, Net Calorific Value (NCV) is taken as a monitored parameter.	/PD 1/	The project considered NCV of gas is one of the monitoring parameters and corrected accordingly in respective sections.	/PD 2/ /PD 3/	Necessary corrections in monitoring parameters have been made and found to be OK. CR M1 is closed.
CR M2 Unit of measurement for Gross electricity generation is mentioned wrongly as kWh / MWh in section 3.2 page 33 of the VCS PD.	/PD 1/	Necessary changes have been made in section 3.2	/PD 2/ /PD 3/	Modifications in respect to unit representing Gross electricity generation have been made which were

CAR/CR	Ref	Summary of project owner response	Revised sections (as applicable)	Conclusion
				verified to be correct. CR M2 is closed.
CR M3 Table showing monitored parameter should need to include parameters: OXIDf, EF BL, U/s CH4 and EFBL, CO2, y.	/PD 1/	Tables have been incorporated for the three indicated monitoring parameters under section 3.3 of revised VCS PD.	/PD 2/ /PD 3/	The required parameters and their QA/QC procedures have been included correctly which were verified to be OK. CR M3 is closed.

3.4 Calculation of GHG Emissions

GHG emission reduction achieved by the project activity is calculated as the difference between the baseline emission and the project emission as well as the leakage emission.

Baseline emissions are calculated by multiplying the electricity generated in the project plant (EGPJ, y) with a baseline CO2 emission factor (EFBL, CO2, y).

The baseline emission factor is selected as per the methodology AM0029. Out of the three options available for selecting baseline emission factor, the Build margin factor of current generation mix (713.3 tCO2/ GWh) is lower than the other two options; hence it has been selected as baseline emission factor.

The project proponent has used the published data of CEA, Version 4 October 2008 to select build margin emission factor.

The calculation of EFy is current and publicly available and published by the Central Electricity Authority on its web-site^{/cea/}. The validation team is convinced of the

result of the emission coefficient calculation. It is deemed to be adequate, transparent and conservative.

Project emission calculations are done as per the methodology AM0029 and found to be OK.

Leakage calculations have been done and all the formulae used in leakage calculations are in line with the methodology and the calculations were verified to be OK.

The validation team has checked the underlying input values as well as the computation in the emission reduction spreadsheet^{/ER 2/}. The estimation of the emission reduction was realized in a transparent and conservative manner and is well documented under section 4.2 - 4.4 of the PD.

As per the final PD/^{PD 4/} this project is expected to reduce emissions of 903390 tCO₂e over a 10 year fixed crediting period. Following CR issues were raised and subsequently closed out in view of the satisfactory response received from the project promoters:

VCS 2007.1 Validation Report of the Natural Gas based Combined Cycle Power Project at Valatharavai Village, Ramanathapuram District, Tamil Nadu by Penna Electricity Limited [Formerly Arkay Energy Limited].

CAR/CR	Refer ence	<i>Summary of project owner response</i>	<i>Revis ed secti ons (as appli cable)</i>	Conclusion

CR C 1 Justification for using default value for EF NG, Upstream CH4 as 160 (USA and Canada) as per table 2 of AM 0029 has to be provided in VCS PD. Moreover the justification given as a part of comment under cell D22 of ER _CLC is also not adequate and convincing.	/PD 1/, /XLS 1/	Necessary supporting information has been incorporated under section 4.1 of VCS PD as well as in excel spread sheet.	/PD 2/ /XLS 2/	The reference websites /blonnet/¹⁰ and /emt/¹¹ were verified and concluded that GAIL infrastructure standards are inline with the "American Petroleum Institute and European Standards". More over GAIL has received ISO 9002, ISO 14001 and OHSAS 18001 quality and environmental management certificates for its gas infrastructures and it has won Five Star Safety Awards by British Safety Council. Hence using default value for EF NG, Upstream CH4 as 160 (USA and Canada) are deemed to be acceptable as the gas distribution unit is built and operated to international standard units. The above clarification for using the default value is in
¹⁰ http://www.blonnet.comz/2005/04/23/stories/2005042301550200.htm		40		accordance with the methodology requirements and found to be OK. CR C1 is

VCS 2007.1 Validation Report of the Natural Gas based Combined Cycle Power Project at Valatharavai Village, Ramanathapuram District, Tamil Nadu by Penna Electricity Limited [Formerly Arkay Energy Limited].

CR C2 Formulae specified for Project emission in VCS PD on page no 44 section 4.1 should be as per approved methodology AM 0029. COEFF,y is not defined in PD.	/PD 1/	Formula for COEFF,y has been incorporated under head of Project Emissions in section 4.1	/PD 2/ /PD 3/	The incorporated Formulae for COEFF, y under project emissions were in line with the methodology and verified to be correct. CR C2 is closed.
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CR C3 Value for EF CO₂, f, y is wrongly stated as 54.3 t CO₂/TJ in section 4.2 VCS PD and also the same value has been used for calculating project emission. Also the reference has been given to IPCC 2006, whereas, as per page 5/14 of the methodology AM 0029 Version 03, only values as determined by fuel supplier, or otherwise from local or national data can be used. Use of IPCC value is permitted only for the start up fuel.	/PD 1/	Value for EF CO₂, f, y has been taken from Appendix B- Assumptions for CO₂ Emission Calculations of CEA latest data i.e. Version 4 sep2008. Web link also provided in the revised VCS PD	/PD 2/ /PD 3/	CEA website ¹² has been checked in respect to the EF value used and found to have correctly applied. CR C3 is closed.
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3.5 Environmental Impact

¹²

<http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm>

A comprehensive environmental impact assessment study has been conducted for the project and Environmental impact assessment report prepared by M/s Enviro Care Engineers were verified and found that the impact of the project activity on the environment is not significant. More over, "No Objection Certificate" from Energy Department of Tamilnadu and other clearances from forest department, Town and Country planning, public work development Departments ^{/CIA1-CIA8/} were verified and found to be OK.

More over

CAR/CR	Reference	Summary of project owner response	Revised sections (as applicable)	Conclusion
CR E1 Provide all statutory clearances for the project activity on Environmental Grounds.	/PD 1/	Copies of all statutory clearances related to Environment have been provided to the DOE for verification	/PD 2/ /PD 3/	Necessary documents like no objection certificates from Tamil Nadu Forest Department and environmental clearances ^{/CIA2-CIA3/} were verified and found to be OK. CR E1 is closed.

3.6 Comments by stakeholders

A stakeholders meeting was called through a news paper advertisement (Indian Express dated 13/07/2002) at District Collector's office, Ramanathapuram. Copy of the public notice along with minutes of the stake holder's meeting ^{/SHC 1-SHC2/} has been submitted. The stakeholders for the project include

- District Collector
- District Environmental Engineer
- Member of Legislative Assembly from the constituency
- Local Municipal councillor
- Department of Environment(State Pollution Control Board)
- Local people

As could be seen from the above, the composition includes state government representatives, local government representatives, and local population.

Invitation notice and minutes of SHC invitation notice and invitation notice were verified and found to be OK.

4 Validation conclusion

Penna Electricity Limited has commissioned the TÜV NORD JI/CDM Certification Program to carry out the validation of the project – “Natural Gas based Combined Cycle Power Project at Valatharavai Village, Ramanathapuram District, Tamil Nadu by Penna Electricity Limited [Formerly Arkay Energy Limited]”, with regard to the relevant requirements of VCS 2007.1 Standard.

The review of the VCS PD and additional documents related to baseline and monitoring methodology; the subsequent background investigation, follow-up interviews and review of comments by parties, stakeholders have provided TÜV NORD JI/CDM CP with sufficient evidence to validate the fulfilment of the stated criteria.

A risk based approach has been followed to perform this validation. In the course of the validation 6 Corrective Action Requests (CAR) and 17 Clarification Requests (CR) were raised and successfully closed out. More over 1 FAR was raised.

The validation is based on the VCS PD, proof of title, additional documents related to baseline and monitoring methodology; the subsequent background investigation, follow-up interviews and supporting documents made available to the validators by project proponent.

As a result of the validation, the validators confirm that:

- The project additionality is sufficiently justified in the PD.
- The monitoring plan is transparent, adequate and inline with applied baseline and monitoring methodology of AM0029 Version 03
- The calculation of the project emission reductions is carried out in a transparent and conservative manner, so that the calculated emission reductions of 903390 t CO₂e (total) is most likely to be achieved within the 10 years fixed crediting period.

No restrictions or uncertainties were identified related to the validation.



Mr. Ma. Paa. Puratchikkanal

Team Leader

Bangalore, 2009-10-01



Rainer Winter

Final approval

Essen, 2009-11-18

TÜV NORD II/CDM Certification Program

Table 5-1: List of Documents submitted

Reference	Document
/GAIL1/	Gas Agreement with GAIL dated 27-12-2005
/GAIL 2/	Additional supply of gas letter from Gas India Limited (GAIL) dated 16-05--2006
/SHC 1/	Invitation notice to stake holders dated 13-07-2002
/SHC 2/	Minutes of Stakeholders Meeting conducted on 19-08-2002
/SC/	Synchronisation certificate of 52.8 MW capacity Power Plant from Tamil Nadu Electricity Board dated 01-07-2006
/ClA 1/	In-Principle approval Letter from Energy Department of TamilNadu for setting up Natural Gas based power project at Valantharavai Village, Ramanathapuram Dist., Tamil Nadu dated 21-05-2002
/ClA 2/	No Objection Clearance certificate for setting up of power plant from Tamil Nadu Forest Department dated 16-08-2002
/ClA 3/	Environmental clearance from Tamil Nadu Forest

Reference	Document
	Department dated 10-07-2003.
/ClA 4/	Project site approval from TNEB dated 11-03-2002
/ClA 5/	Issue of land use classification certificate from Town and Country planning Department , Sivagange, Tamil Nadu dated 18-03-2002
/CIA 6/	Permission from Gram Panchayat Department 20-06-2006
/CIA 7/	Permission from Public work Department to draw ground water 25-04-2003
/CIA 8/	No objection certificate from Airport Authority of India for condtruction of chimney dated 17-10-2002
/STAT1/	Natural gas power generation in Tamil Nadu 2006-07 given by TNEB
/STAT2/	List of gas based power plants in Tamil Nadu: :Statistics at a Glance 2006-07 published by TNEB
/ HRCV/	Plant Station Heat Rate & Calorific value for Natural gas.
/ CV/	Invoice raised by GAIL stating the calorific vale of natural gas dated 31-12-2007
/REP 1/	Performance Report published by Ministry of Petroleum & Natural gas for Natural gas price
/PC 1/	Document showing Project cost
/PC 2/	Chartered Accountant. Certificate for Project Cost
/CAL 1/	Calibration certificates for energy meters - Main meter (Feeder 1)
/CAL 2/	Calibration certificates for energy meters - Check meter (Feeder 1)
/CAL 3/	Calibration certificates for energy meters - Main meter (Feeder II)

Reference	Document
/CAL 4/	Calibration certificates for energy meters - Main meter (Feeder III)
/CAL 5/	Calibration certificates for gas flow meters
/CERC/	Operational Norms for Thermal Generation
/EIA/	Environmental Impact Assessment Report prepared by M/s Enviro Care Engineers
/STD/	Documentary Evidence for the Standards being maintained by GAIL
/REP 2/	Extracts from Report of the Expert Committee on Fuels for Power Generation (Feb 2004)
/PFR/	Performance review of thermal power stations 2005-2006 published by CEA
/NAME/	Fresh Certificate of Incorporation consequent upon change of name from Arkay Energy Limited to Penna Electricity Limited from Ministry of Company Affairs , Government of India dated 8-09- 2006
/PO/	Purchase orders for gas turbine and steam turbine dated 5-08-2004
/DPR/	Extracts of DPR for plant capacity & project cost
/ER1/	Emission reduction calculation sheet corresponding to VCS/PD2/
/ER2/	Emission reduction calculation sheet corresponding to VCS /PD 3/
/PD 1/ /PD 2/ /PD 3/ /PD 4/	VCS PD by Penna Electricity Limited version 1 dated 24/05/2009 VCS PD by Penna Electricity Limited version 2 dated 20/08/2009 VCS PD by Penna Electricity Limited version 3 dated 09/09/2009 VCS PD by Penna Electricity Limited version 4 dated

Reference	Document
	17/11/2009
/XLS1/ /XLS 2/	Financial calculation sheet corresponding to VCS /PD2/ Financial calculation sheet corresponding to VCS /PD3/
/LSC 1/ /LSC 2/ /LSC 3/ /LSC 4/ /LSC 5/	Loan sanction letter from Power Finance Corporation Ltd Loan sanction letter from Punjab National Bank Loan sanction letter from UCO Bank Loan sanction letter from Rural electrification Corporation Ltd Loan sanction letter from Union bank of India
/CFO/	Consent for Operation from Tamil Nadu Pollution Control Board

Table 5-2: Background investigation and assessment documents

Reference	Document
/AM0029/	Methodology for Grid Connected Electricity Generation Plants using Natural Gas --- (Version 3)
/EB 41 Annex45/	Guidance on the Assessment of Investment Analysis
/ EF Tool/	Tool to calculate the emission factor for an electricity system
/Tool A/	Tool for demonstration and assessment of additionality

Table 5-3: Websites used

Reference	Link	Organisation
/vcs/	www.v-c-s.org	VCS website

Reference	Link	Organisation
/unfccc/	www.unfccc.int	UNFCCC website
/cea /	http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm	Central Electricity Authority
/ceal /	http://www.cea.nic.in/power_sec_reports/general_review/0304/chap-2.pdf	Central Electricity Authority
/cea 2/	http://www.cea.nic.in/power_sec_reports/general_review/0405/ch0.pdf	Central Electricity Authority
/MoEF/	http://envfor.nic.in/legis/eia/sol533.pdf	Ministry of Environment and forestry
/IPCC/	http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf	Inter governmental panel on climate change
/infra/	http://www.infraline.com/power/default.asp?URL1=power/demand/RepPerCapitalDemSuppPow.asp#2	Infraline
/teda 1/	www.tn.gov.in/departments/energy.htm	Tamil Nadu Energy Development Agency
/teda 2/	http://www.teda.gov.in/page/Wind.htm	Tamil Nadu Energy Development Agency
/teda 3/	http://www.teda.gov	Tamil Nadu Energy Development

Reference	Link	Organisation
	in/page/biomass.pdf	Agency
/tneb/	www.tneb.in	Tamil Nadu State Electricity board
/tnpcb/	www.tnpcb.gov.in	Tamil Nadu State Pollution Control Board (TNPCB)
/petrol/	www.petroleum.nic.in /petstat.pdf	Petroleum Ltd
/bgindia/	www.bg-india.com/presentations/20feb_06/Fourth_Asia_Gas_Partnership_Summit.pdf	BG India
/hindu 1/	www.hindu.com/2006/09/05/stories/2006090507230500.htm	The Hindu
/hindu 2/	www.thehindubusinessline.com/2006/12/04/stories/2006120403200300.htm	The Hindu
/iea/	http://www.iea.org/textbase/work/2004/zets/apec/presentations/sharma.pdf	International Energy Agency
/ercap/	http://www.ercap.org/OtherOrders/Order_RP_84_2003.doc	Ercap
/cerc/	http://cercind.gov.in/rep1304.pdf)	Central Electricity Regulatory Commission, Government of India

Reference	Link	Organisation
/blonnet/	http://www.blonnet.com/2005/04/23/stories/2005042301550200.htm	Blonnet
/gail/	http://gail.nic.in/gailnewsite/investorzone/investorzone_annualreports.html	Gas Authority of India Limited
/emt/	http://www.energymanagertraining.com/eca2005/Award2005CD/AwardBook/Petroleum%20Pipeline.pdf	Energy Manager Training
/rbi/	http://rbidocs.rbi.org.in/rdocs/Wss/DOCs/36275.doc	Reserve Bank of India

Table 5-4: Interviewed Persons

Reference		Name	Organisation / Function
/IM01/	☒ Mr. ☐ Ms.	Mr. Reddy	M/s. Pionner Genco Limited
/IM01/	☒ Mr. ☐ Ms.	Mr. Kurukrishnan	M/s. Penna Electricity Limited
/IM02/	☐ Mr. ☒ Ms.	Mr. Narasimhan	M/s. Penna Electricity Limited