



Voluntary Carbon Standard 2007.1 Validation Report Template

19 November 2007

Validation Report:

Name of Verification company:	Date of the issue:
SIRIM QAS International Sdn. Bhd.	07 th March 2011
Report Title:	Approved by:
VCS Validation Report for "Natural Gas based grid connected power project at Peddapuram, A.P. by Gautami Power Limited" (SQAS-VCS-ES12880084)	Parama Iswara Subramaniam Authorised Representative
Client:	Project Title:
Gautami Power Limited	Natural Gas based grid connected power project at Peddapuram, A.P. by Gautami Power Limited. Version: 01 Date: 07/03/2011

Summary:

GVK Gautami Power Ltd (GPL) has engaged SIRIM QAS International Sdn Bhd to undertake the validation of the project “Natural Gas based grid connected power project at Peddapuram, A.P. by Gautami Power Limited” under the Voluntary Carbon Standard (VCS) 2007.1. The purpose of the validation is to perform an independent, third party assessment of whether the project activity confirms to the qualification criteria set in the VCS 2007.1 standard and related requirements to attain real, measurable, additional, and permanent emission reduction. The validation exercise was not meant to provide any consulting to the project participants. However, the stated requests for clarifications and/or corrective actions may provide input for improvement of the project design.

The validation consisted of three phases;

i) a document review of the project documents and preparation of validation protocol, ii) on-site visit to the project activity and interviews with the project developer and the project consultant, and, iii) resolution of outstanding issues and the issuance of final validation report and validation opinion

The project activity is the construction and operation of a new, green field 469 MW natural gas based combined cycle power plant near Peddapuram village, in the East Godavari District of Andhra Pradesh, India for supply to the grid. The main purpose of the project activity is to generate electricity through less GHG intensive fuel, such as natural gas (NG), that displaces electricity from an electricity distribution system (Southern Grid) dominated by fossil fuel fired generating units. The project activity will displace approximately 3387 GWh of power annually (and reduce 1,293,420 tonnes of CO₂) by means of its less carbon intensive power annually to the power deficit, carbon intensive Southern Grid.

The validation process, from contract review to the issuance of validation report and validation opinion was conducted in accordance with SIRIM QAS Intl.'s internal procedures. The first output of the validation process was a list of corrective action requests and clarification requests (CAR and CL) which is presented in Appendix II of this report. As a result of these findings, the PDD was revised by the client.

In summary, it is the opinion of SIRIM QAS Intl. that the proposed VCS project activity has correctly applied the baseline and monitoring methodology (AM0029 version 03) for the project activity and meets the relevant VCS 2007.1 requirements. Total GHG emission by the project is 1,293,422 tCO_{2e} per annum and the estimated GHG reductions from the project would be real, measurable, permanent and additional.

Work carried out by:	Number of pages:
Dr.D.Siddaramu Dr.G.Vishnu Mr. Ravi Shankar	50

Abbreviations

APDISCOM	Andhra Pradesh Distribution Company
APTRANSCO	Andhra Pradesh Transmission Company
BCM	Billion Cubic Meters
CAR	Corrective Action Request
CCPP	Combined Cycle Power Plant
CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CERC	Central Electricity Regulatory Commission.
CL	Clarification Request
CO ₂	Carbon Dioxide
CO ₂ /MU	Carbon dioxide / Million Units
CO _{2e}	Carbon Dioxide Equivalent
DOE	Designated Operational Entity
DPR	Detailed Project Report
EF	Emission Factor
EIA	Environmental Impact Assessment
EPC	Erection Procurement & Commissioning
GAIL	Gas Authority of India Limited
GHG	Greenhouse gas(es)
GOI	Government of India
GPL	GVK Gautami Power Ltd.
GSHR	Gross Station Heat Rate
JMR	Joint Meter Reading
MMCD	Million Meter Cube per Day
MoEF	Ministry of Environment and Forests
MoPNG	Ministry of Petroleum and Natural Gas
MP	Monitoring Plan
NG	Natural Gas
O & M	Operation and Management
PLF	Plant Load Factor
PP	Project Participant
RIL	Reliance Industries Limited
PPA	Power Purchase Agreement
QA/QC	Quality Assurance/Quality Control
SCM/day	Standard Cubic Meter / day
SIRIM QAS Intl.	SIRIM QAS International Sdn Bhd
SPV	Special Purpose Vehicle
tCH ₄ /PJ	Tonnes of Methane/ Peta Joules
UNFCCC	United Nations Framework Convention on Climate Change

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1 Introduction

GVK Gautami Power Ltd (GPL), [hereinafter referred to as the 'Project Proponent'] had contracted SIRIM QAS Intl. to undertake the validation of their project "Natural Gas based grid connected power project at Peddapuram, A.P. by Gautami Power Limited" (hereinafter referred to as the project / project activity) under the Voluntary Carbon Standard (VCS) 2007.1 standard. This report describes the validation work undertaken.

1.1 Objective

The purpose of the validation is to perform an independent, third party assessment of whether the project activity confirms to the qualification criteria set in the VCS 2001.1 standard to attain real, measurable, additional, and permanent emission reduction.

The validation opinion is a written assurance that the project complies with all the applicable VCS requirements and has the ability to generate the emission reductions stated over the projects crediting period.

1.2 Scope and Criteria

The validation scope includes an independent and objective review of the Project VCS project description (PD), the project's baseline study, monitoring plan and other relevant documents. Specifically, the objectives of the validation work are:

- To verify that the project activity meets the requirements of VCS 2007.1 standard including additionality, proof of title and compliance with local laws.
- To assess whether the baseline and monitoring plan are in conformance with the methodology applied from the VCS approved GHG program.
- To certify that the information presented are complete, consistent, transparent and free of material error.

The PD (/1/ and /2/ Appendix 1) was reviewed against VCS 2007.1 standard and the VCS program guidelines (/3/ of Appendix 1) and the applied CDM methodology, AM0029 version 03 (/4/ of Appendix 1). SIRIM QAS Intl. has performed the validation based on a risk based approach focusing mainly on the significant risks to meet the qualification criteria and the ability to generate VCUs.

The work carried out by SIRIM QAS Intl. is free from any conflict of interest.

1.3 VCS project Description

The current VCS project activity of GPL involves the installation of 469 MW Natural Gas fired, gas turbine based combined cycle power plant located at Gautami Power Ltd at Industrial Development Area, Peddapuram, near

Samalkot in East Godavari district, Andhra Pradesh, India, for generation and supply of electricity to Andhra Pradesh state electricity grid (which is part of the Southern Grid), governed by a Power Purchase Agreement with APDISCOM (Andhra Pradesh Distribution Company).

The sold energy displaces an equivalent amount of energy from the fossil fuel dominated Southern Grid contributing significantly in avoidance of greenhouse gases emission. The geographical coordinates of the Samalkot are 17°03'03" N and 82°07'04" E.

1.4 Level of assurance

In line with VCS 2007.1 requirements and as per ISO 14064-3:2006 Para A.2.3.2, a reasonable level of assurance has been followed for the validation of the project. Based on the desired level of accuracy SIRIM QAS Intl. has established an internal quality control process and assures that the information given in the PD is materially correct and is a fair representation of the of the actual project details, and is prepared in accordance with the VCS requirements and the applied CDM methodology for information pertaining to additionality, GHG quantification, monitoring and reporting.

The validation report is carried out as per this requirement and details are presented in the validation statement in section 4 below:

2 Methodology

The SIRIM QAS Intl.'s validation process consists of the following phases:

- A document review of the project description documents and preparation of validation protocol;
- On-site visit to the project activity and interviews with project developer, project consultant; and relevant stakeholders
- Resolution of outstanding issues and the issuance of final validation report and opinion

In order to ensure transparency, a validation protocol was customised for the project according to the VCS 2007.1 guidelines. The protocol describes criteria (requirements), means of verification, results from the validating and how the identified criteria, have been met in a transparent manner. The validation protocol serves the following purposes :

- it organizes, details and clarifies the requirements of a VCS project is expected to meet;
- it ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The validation protocol consists of Appendix II, where findings established during the validation were classified as non-fulfilment of validation protocol criteria or where risks to the fulfilment of project objectives were identified.

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Corrective Action Request (CAR) was issued, where:

- mistakes have been made that directly impact on the project results; or
- validation protocol requirements have not been met; or
- there was a risk that the project would not be accepted as a VCS project or that emission reductions will not be certified.

The validation team has also raised “Clarification” (CL), where additional information is needed to fully clarify an issue.

APPENDIX II: RESOLUTION OF CORRECTIVE ACTION AND CLARIFICATION REQUESTS			
Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
If the conclusions from the draft Validation are either a CAR or CL, these should be listed in this section.	Reference to the Section of the PD where the relevant CAR or CL is raised.	The responses given by the project participants during the communications with the validation team should be summarized in this section.	This section should summarise the validation team's responses and final conclusions.

The following team members from SIRIM QAS Intl. were involved in identifying the following:

Name	Role	Components reviewed
Dr. D. Siddaramu	Validation Team Leader	Completeness check, desk review, onsite inspection, Interview with project representatives & stakeholders, issuance of findings, report preparation.
Dr. G. Vishnu	Auditor	Completeness check, desk review, onsite inspection, Interview with project representatives & stakeholders, issuance of findings, report preparation.
Mr. Ravi Shankar	Auditor	Onsite inspection, Interview with project representatives & stakeholders, issuance of findings.
Mr. S. Sudheendra	Technical Reviewer	Technical issues related to the project.
Mr. CA G.N.Jayaram	Financial Expert	Financial issues related to the project.

2.1 Review of Document

The first PD version 01 (/1/ Appendix 1) submitted by the client and additional background documents related to the project description and baseline were reviewed as an initial step of the validation process.

A desk review was further done to assess the following parameters:

1. Project details as per VCS PD template.
2. Applicability and appropriateness of methodology used.
3. Compliance with relevance laws and regulation
4. Correctness of application of baseline and monitoring methodology
5. Demonstration of additionality
6. Monitoring Plan
7. Stakeholders comment
8. Proof of title
9. Supporting documents mentioned in the PD (Grid emission factor, TNERC guidelines, commissioning certificate etc.)

A complete list of all the documents reviewed is attached in Appendix 1 of this report.

2.2 Follow-up Interviews

After the review of the project description and documents, a site visit was carried out on 28th March 2010. During the site visit, physical inspection of the project components followed by interviews with the on-site personnel was carried out to verify the project details. A follow-up meeting was also conducted with the project representatives. The following persons were interviewed.

Name & Designation	Company	Details of Interview
Mr. A. Issac George	Director, Gautami Power Ltd.	➤ General information about the project. ➤ Financial analysis, project barrier and additionality.
Mr. G. Madhava Reddy Mr. K.N. Bhavani Shankar Mr. V. Shashidhar Raju	Vice President-Finance Vice President-Finance Manager (F) Gautami Power Ltd.	➤ General information about the project & the PD ➤ Baseline determination ➤ Monitoring and management ➤ Financial analysis, project barrier and additionality ➤ Stakeholder consultation ➤ Operation and maintenance procedures.

Mr. Pravin Jadhav	CDM Consultant General Carbon Advisory Services Pvt. Ltd.	➤ General information about the project & the PD. ➤ Baseline determination ➤ Monitoring and management. ➤ Financial analysis, project barrier and additionality. ➤ Stakeholder consultation
Mr. P. S. Kumar Mr. Zakir Hussain Mr.G. Satyanarayana Mr. N. Srinivasa Rao Mr. P.V. Ravi Ram	GM (Mechanical) DGM (FA&S) Advisor (Technical) GM DGM – Operations Gautami Power Ltd.	➤ Operation and maintenance procedures ➤ Training. ➤ Calibration and maintenance of monitoring & measuring equipment. ➤ Potential risk and the emergency procedures
Mr. Solivewatra Mr. Swami Madhva Mr. M. V. Choudary Mr. K. Bapi raju	<u>Local Stakeholders</u> R. B. Kotturu village R. B. Kotturu village Vetlapalem village Vetlapalem village	➤ Stakeholder meeting agenda ➤ Members present ➤ Issues raised ➤ Replies of the PP

During the site visit, the actual on-site practices adopted and followed for the operation of the project were compared with the description given in the PD. The grid-connectivity, metering practices, calibration and level of accuracy were examined. The archived data of the energy generated was also reviewed.

2.3 Resolution of Corrective Action Requests and Clarifications

The objective of this phase of the validation is to resolve the request for corrective actions and clarification and any other outstanding issues which needed to be clarified prior to SIRIM QAS Intl.'s conclusion on the project description based on the site inspection and review of documents, such that the project activity meets the VCS 2007.1 requirements. Seven (07) Corrective Action Requests and seventeen (17) Clarification Requests raised by validation team were resolved during communication between the client and the validation team. In order to ensure the transparency of the validation process, the concerns raised and responses that have been documented in Appendix II of this report

2.4 Internal Quality Control

SIRIM QAS Intl. has established an internal quality control process. A Technical Reviewer has been appointed to review the final draft validation report and the final validation report. The comments made by the Technical

Reviewer have been taken into consideration and incorporated in the final report.

The final report (after resolution of all findings) is then submitted to the CDM Quality Manager for review and approval.

3 Validation Findings

3.1 Project Design

Project identification, design & development and implementation were evaluated as per the requirements of VCS 2007.1.

The current project activity of GPL involves the installation of a 469 MW natural gas fired, gas turbine based combined cycle power plant located at GVK Gautami Power Ltd. (GPL) at Industrial Development Area-Peddapuram, near Samalkot in East Godavari district, Andhra Pradesh, India, for generation and supply of electricity to Andhra Pradesh state electricity grid (which is part of the Southern Grid), governed by a Power Purchase Agreement with APDISCOM. As per the scopes of the project activity listed in the “List of Sectoral scopes” (Document CDM-ACCR-06 Version 04)’ (/5/ of Appendix 1), the project activity falls under scope number 1, sectoral scope – Energy industries (non-renewable sources) being a grid-connected electricity generating project using non-renewable fuel in energy industries.

The geographical coordinates of the project activity plant are 17°03’03” N and 82°07’04” E. The location of the proposed project activity was physically verified during the on-site visit. The geographical coordinates of the project activity as mentioned in the PD were cross checked with globally accessible satellite based imagery data software and found to be consistent. The site details such as the survey number and village were cross checked with land documents (/6/ of Appendix 1) and found to be correct. The project start date is 05th June 2009; this was confirmed by the review of the Commercial Operation Date (COD) of the project (/7/ of Appendix 1) during the site visit.

The present project activity has chosen a fixed crediting period of 10 years, starting from 05th June 2009. The VCS crediting period will be terminated in between if the project activity achieves CDM registration. This was verified during the discussion with the PP and, compared with the expected operational life time of 15 years as mentioned in “The Gazette of India, Extraordinary” [Part II-SEC. 3(ii), Ministry of Power Notification, Dt. 29th March 1994] (/8/ of Appendix 1) is considered reasonable.

In order to validate the technical specifications of the project activity as mentioned in the PD, the technical specifications of the equipment were cross verified with the details provided in the notice to proceed to EPC contractor (/9/ of Appendix 1), and were found to be correct and consistent.

The project design is sound and reflects good engineering practices and the geographical (Industrial Development Area, Peddapuram, Samalkot, East Godavari District, Andhra Pradesh, India) and temporal (15 years) boundaries of the project are clearly defined. The project boundary consists of the equipment viz., gas turbine generator, steam turbine generator, auxiliary equipment of gas turbine and generator, heat recovery steam generator and steam turbine and generator meters, pipelines and all power plants connected physically to the baseline grid, which is the southern grid of India.

The project activity plant is operating at the peak design PLF presently. As per the PPA, the entire electricity generated would be sold to the grid based on the tariff rate specified in the PPA. The project is expected to displace 3,387 GWh of fossil fuel dominated energy from Southern Grid, which is equivalent to 1,293,422 tonnes of CO₂e per annum.

The CO₂ emissions due to extraction, processing and transportation of fuel outside the project boundary are being accounted for as leakage emissions to calculate the net emissions reduction. Leakage emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system has been conservatively calculated as 97,909 tonnes of CO₂ based on the applicable methodology ACM0029.

The validation team has verified that the project has not received any public funding and/or Official Development Assistance (ODA). The project is a unilateral project and has considered 70:30 debt to equity ratio as evidenced from "Project Information Memorandum – November 2003" by lender PFCL (page no. 4 and 33) (/10/ of Appendix 1).

In line with the VCS requirements, proof of title of the project proponent was verified with the EPC contract and PPA (/9/ and /11/ of Appendix 1). In both the documents PPs name (i.e., GVK Gautami Power Ltd) was found to be consistent and will own the VERs generated by the project.

To ensure that the environmental credits generated by the project are not double counted under VCS, an undertaking letter was provided by GVK Gautami Power Ltd mentioning that the project activity is under CDM validation where the crediting period starts from the date of registration and that the present verification term for VCS does not overlap with the expected date of CDM activity registration and has not been rejected under other GHG programme and is under validation as a CDM project (/12/ of Appendix 1).

The project meets the general requirements of VCS 2007.1 with respect to project start date, project scope and crediting period according to clause 5.1, 5.2 and 5.3.

The validation team hereby confirms that the project descriptions and project design in PD were accurate and complete based on the document review, on-site inspection, physical verification and Interviews conducted.

Six corrective action requests (CAR 1, 2, 3, 4, 6 and 7) were raised for issues related to

- Discrepancy in PP's name in title and other sections of the PD (CAR 1).
- Evidence for the indicated timelines in section 1.10 of the PD (CAR 2).
- The PP not submitting the commitment letter for verification (CAR 3).
- Section 1.15 of the PD not as per the VCS project description template (CAR 4).
- Section 2.5 not included in the PD (CAR 6) and
- Schedule section of the PD not as per the VCS project description template (CAR 7).

Eight clarification requests (CL 3, 4, 5, 6, 7, 11, 16 and 17) were raised for issues related to

- Justification for the assumption of 15 years as project lifetime for NG power plant (CL 3).
- Justification for the claim i.e., that best available technology was used at the time of EPC mentioned in section 1.9 of the PD (CL 4).
- Section 1.9 of the PD has not clarified the start-up power covered under auxiliary power (CL 5).
- Clarity on wheeling or sell of electricity to TNEB (CL 6).
- 2% of CER allocation for sustainable development including society/community development with a monitorable action plan is not evident from the PD (CL 7).
- Clarification on considering the awarding of EPC Contract as starting date of the project activity as indicated in section 2.4 of the PD (CL 11).
- Clarification on the project start date mentioned in Appendix 1 (CL 16) and
- The links provided for some references are not reproducible for the natural gas availability in the project activity region mentioned in Appendix 1 (CL 17).

These CARs and CLs were adequately addressed, resolved and closed in revised PD version 02. The resolution of each CAR and CL is represented in Appendix II: Resolution of Corrective Action and Clarification Requests.

3.2 Baseline

The 469 MW natural gas based combined cycle power project at Peddapuram uses the latest approved baseline methodology AM0029 ("Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas", version 3). The applicability of the methodology has been discussed in section 2.4 of PD and the project fulfills the applicability conditions as below:

The project activity of GPL involves utilization of natural gas as the only fuel source to generate power. No other start up fuel is to be used for the project activity. Electricity generated from the proposed project activity will be supplied to the Andhra Pradesh state grid, which in turn forms a part of the Southern Grid whose boundaries are clearly identified and its information is publicly available from Central Electricity Authority, Government of India.

For the project activity, GPL has made agreements with M/s Gas Authority of India Limited (GAIL) (/13/ of Appendix 1) for the gas supply quantity of 1.96 MCMD natural gas till 31st December 2010 (Gas Supply Contract with GAIL; page 5).

Apart from this, GPL has also entered into an agreement with Reliance Industries Limited (RIL) (/14/ of Appendix 1), for which the Term sheet has been signed on 09th June 2007. The project proponent is now using the natural gas supplied by RIL. The agreement with RIL is for 70699 MMBtu which is equivalent to approximately 2.23 MCMD. This supply is assured until 31st March 2012 which can be extended further.

Natural gas reserves are sufficiently available in the country and at the time of real action of the project activity, the reserves were to the order of 751 Billion Cubic Meter (2002-2003, <http://petroleum.nic.in/petstat.pdf>) in comparison to the supply commitment by GAIL towards the project activity of 1.96 MCMD (which is equivalent to 715.4 MCM considering an operation of 365 days in a year). This means that the commitment of natural gas quantity to the project activity by GAIL is only 0.095% of the total reserves of natural gas during the period of 2002-2003 and the available reserves are capable of firing more than 1000 times the installed capacity of the project activity. The gas availability in the country after 3 years of the date of award of the EPC Contract (generally the time required to construct the infrastructure facility) of the project activity is 1101 BCM which is capable of firing more than 1500 times the installed capacity of the project activity.

In the state of Andhra Pradesh, the demand from consumers having firm commitments for supply in the year 2001-2002 was 6.12 MCMD. Against this demand, the availability from GAIL for the year 2001-2002 was 7.50 MCMD. Further, the announcement of consideration of Lanco's Kondapalli (<http://petroleum.nic.in/clip4151206.pdf>) and ongoing 768 MW expansion (<http://asian-power.com/regulation/more-news/ge-supply-parts-and-services-vemagiri-plant>; http://www.gmrgroup.in/corporate/pdf/GIL_Q3-FY_11_-_Press_Release_Ver3_0_Final.pdf) at Vemagiri power projects by Ministry of Petroleum (Government of India) as well as 800 MW GVK Gautami Power Ltd., prove that the project in question is not depriving any other future users. Hence, it is without doubt that this project activity will not constrain future natural gas based power capacity additions, comparable in size to the project activity.

The above information was checked and verified to be correct from the note on gas availability (/15/ of Appendix 1).

The demand supply data of India available from Ministry of Petroleum and Natural Gas shows that the country's natural gas consumption has been less than the gross production (/16/ of Appendix 1).

The spirit of emphasizing "sufficient availability" of NG in the methodology as an applicability criterion is:

- to ensure that NG from other users are not diverted and
- to ensure future power generation facilities of comparable size are not deprived due to NG being taken up by the project activity

The above are emphasized in the clarification provided by CDM EB [Ref: F-CDM-AM-Clar_Resp_ver 01.1 – AM_CLA_0091]. The clarification was requested for applicability of the above criterion to a project activity which was constructing a power plant using LNG imported from Australia. Clarification was requested on how to define sufficient availability of natural gas in this situation.

The EB response clearly stated that this condition is required to ensure the project activity does not displace natural gas that would otherwise be used elsewhere in an economy of the country or region, thus leading to possible leakage. Notwithstanding where the natural gas is imported from, this applicability condition is to be implemented by demonstrating, through monitoring, that the full demand of natural gas by the project activity is dedicatedly met with imported gas, and where dedicated imports is not the case, the monitoring should show that satisfying the project activity's demand for natural gas will not lead to a shortages in supplies of the gas to other projects within the country.

The above clarification clearly indicates that gas availability in region actually means that consumption of NG by the project activity would not lead to shortage of supplies to other projects within the country. Such conditions would be met, when:

1. There is enough gas reserves in the country
2. There are provisions and plans to make the gas available in the country (gas supply infrastructure).

If the above two conditions do not satisfy the demand, then there are enough infrastructure capacity to import and distribute this fuel in the country

The validation team verified the information provided and concluded, therefore, that future natural gas based power capacity additions would not be constrained as a result of the use of gas in the project activity and hence the applicability condition of the methodology pertaining to the availability of natural gas is met by the project activity.

Consideration of alternatives

The project participant identified all the plausible and credible alternatives to the project activity and the reasons for their exclusion / inclusion are explained below:

The various possible alternatives available with the PP at the investment decision time (August 2003) include the following:

SI No	Alternative to project activity	Justification of feasibility / non-feasibility
1	The project activity i.e. 469 MW NG based combined cycle power plant with an efficiency of 50%-55% and with a lifetime of 15 years not taken as a CDM project activity.	The purpose of the project activity is to generate electricity from the natural gas and deliver it to the Southern Grid to meet the base load power requirement of the grid. This alternative is in compliance with all the applicable legal and regulatory guidelines. Hence this <u>option is taken as a baseline scenario.</u>
2	Power generation using natural gas as the fuel but with different alternative technologies such as open cycle and cogeneration mode.	The purpose of the project activity is to deliver the power to the grid, whereas, this option does not deliver the similar output/ services comparable to the project activity. Hence, this is not a credible and realistic alternative for the PP. Therefore this alternative is not taken as a baseline scenario.
3	Power generation using energy sources other than natural gas	The various alternative energy sources that can generate power other than natural gas include: 3a) Power generation using coal as the energy source with an efficiency of 34%-36% (/17/ of Appendix 1) and a lifetime of 25-30 years (/18/ of Appendix 1). This is a realistic and credible alternative to the PP, which delivers base load power to the grid. Hence, <u>this is a plausible baseline scenario.</u> 3b) Power generation using wind as the energy source with an average PLF of 20% with a life of 20 years (/19/ of Appendix 1). Power generation from wind does not meet the base load requirement for the grid on a continuous basis as wind is seasonal in nature and the capacity utilization factor is very low. Due to the high uncertainty of wind,

		it is not a credible and realistic option for the project proponent for such high capacity comparable to the project activity. 3c) Power generation using hydroelectric power plant with an average PLF of 60% (/20/ of Appendix 1) (http://www.sandrp.in/hydropower/crtlenv_issue_wcd.pdf pg. 5, 2nd last line). The different types of hydro power projects available with the project proponent include: 3c.i) Reservoir storage based hydro power plants (/21/ of Appendix 1). This is not a plausible baseline scenario as it delivers peak-load power to the grid and not the base load power. 3c.ii) Run-of-river based hydro power projects Power generation from hydro is not a feasible alternative to the project activity as it involves high gestation periods and also cannot meet the base load power requirement for the grid on a continuous basis due to the uncertainty of monsoons (http://www.brighthub.com/environment/renewable-energy/articles/7826.aspx). Moreover, the hydro power projects are not credible and realistic alternative to the PP due to the following reasons. • Hydro power projects are comparatively capital intensive. In the context of resource shortages and continuing power shortages, thermal projects (coal, liquid fuel and gas), which need a relatively short gestation period, have been getting priority in fund allotments. • The existing tariff formulation norms for hydro projects (based on a cost plus approach) with no premium for peaking services and the provision for 12% free power to distressed states from the initial years are also proving to be deterrents. Hence, the alternative is not taken as a baseline scenario.
4	Power generation using cluster of diesel engine based power plants with an efficiency of 42%	Diesel engine based power plants were installed before 2001 (/23/ of Appendix 1) and lately the independent power producers (IPP) are not going for the liquid fuel based generation due to the increase in the fuel costs. The State Electricity Boards are also

	and a lifetime of 15 years (/22/ of Appendix 1).	discouraging the IPPs to go for liquid fuel based power plants for the same reason. The prices of petroleum products have long since been controlled by the Government of India (GoI) under the Administered Pricing Mechanism (APM) to reduce the burden on the consumers. However, in April 2002 the GoI dismantled the APM on the oil derived fuels (petrol, diesel etc.) after which there has been sharp increase in their prices to match international parity prices. Hence the option is not an economically viable alternative to any individual IPP with such a large capacity as it was mandated by the Central Government that sanction of IPPs should be through the competitive bidding mechanism. Moreover, the rupee dominated tariffs also fail to attract investors as observed in the Indian power sector particularly relating to the short gestation liquid fuel projects. As per AP Government order, it was not a legal option to take up liquid fuel power plant. GVK was also developing a 200 MW diesel based power plant from 1994 and it could never achieve financial closure, thus stalled in 2002. Thus, PP would not consider diesel option in 2003 at investment decision making for project activity (http://www.processregister.com/Ratlam_Power/Project/pid4013.htm). Therefore this alternative is not taken as a baseline scenario.
5	Power generation using nuclear fuel	This scenario is available only to Nuclear Power Corporation of India Limited, a 100% Government of India owned company, whose capacity additions are driven by the Government of India's initiatives based on its long term strategic programmes and not by the project activity. Hence, this option is not available for any of the stakeholders including the project activity (Page 17, clause 22 of the Atomic Energy Act 1962) (/24/ of Appendix 1). Therefore this alternative is not taken as a baseline scenario.
6	Electricity imports from other grids:	This is not a realistic alternative as all the other grids are themselves facing shortages in meeting the energy demands and especially at the peak demand (www.cea.nic.in). This alternative also does not deliver the same output comparable to the project activity due to the high transmission losses.

		Hence, this alternative is not considered as a feasible and credible alternative under the existing scenario.
7	Coal fired supercritical power plant:	The coal fired supercritical power plant is new advanced technology. However, the technology was not available in India in 2003 (at the time of project activity decision was made). The first supercritical power plant in India was being built in 2006. (http://www.esi.iitb.ac.in/aer2006_files/papers/031.pdf, http://goliath.ecnnext.com/coms2/summary_0198-211733_ITM) Hence, this alternative is not taken as a baseline scenario.

From the above discussion it is evident that the plausible baseline scenarios identified by the PP include:

- a) The project activity i.e. 469 MW NG based combined cycle power plant with an efficiency of 50%-55% in combined cycle mode of operation and with a lifetime of 15 years not taken as a CDM project activity.
- b) Power generation using coal as the energy source with an efficiency of 35%-38% with a life of 25-30 years

As recommended in the methodology, the levelised cost of electricity production in Rs/kWh is used as financial indicator for investment analysis.

The levelised tariff was calculated (/25/ and /26/ of Appendix 1) for the plausible baseline options to the proposed project activity, as mentioned below:

1. New power plant (s) based on natural gas and
2. New power plant (s) based on coal

From the levelised cost analysis (detailed in additionality section) it is observed that, using coal as fuel with sub-critical technology is the economically most attractive alternative for producing power in Andhra Pradesh and thus forms the baseline scenario. With this option, the GHG emissions will be more than the CDM project activity, while it is also observed that the project activity is not the most economical option for power production. As per this, the fossil fuel (Coal using Sub-critical technology) based power plant, was found to be economically more attractive alternative and thus forms the baseline scenario. The same was also confirmed by performing sensitivity analysis on the critical parameters (fuel price, PLF and heat rate) as defined under the guidance for investment analysis.

The project participant has calculated and used the baseline emission factor as the lowest among the option required by the methodology. The value of the emission factor corresponds to the build margin calculated according to the

'Tool to calculate the emission factor for an electricity system (/27/ of Appendix 1).

Options	Emission Factor (tCO ₂ e/MWh)
Build Margin	0.8179
Operating Margin	0.9876
Combined Margin	0.9028
Emission factor of coal based power plant	0.9580

The emission factors such as operating margin (OM), and build margin (BM) have been evaluated according to the procedures prescribed in 'Tool to calculate the emission factor for an electricity system Version 02 (EB 50)'. Data from the CO₂ Baseline Database for the Indian Power Sector-Central Electricity Authority, version 5.0 (/28/ of Appendix 1), applicable at the time of validation has been used in the revised PDD. The emission factor of coal (sub-bituminous) has also been derived from the CEA database Version 5.0 which was checked and verified to be appropriate and conservative.

Accordingly, the baseline emission factor value applicable to the project activity is 0.8179 tCO₂e/ MWh.

As per the applicable methodology, the project boundary includes the project site and all power plants connected physically to the baseline grid as defined in "Tool to calculate emission factor for an electricity system". In accordance to this, the project boundary comprises of the project site and all power plants connected physically to the Southern Grid. The specific components and facilities included in the project boundary are the gas turbine, heat recovery steam generator, steam turbine generator, station transformers, auxiliary equipments of gas turbine and generator, heat recovery steam generator and steam turbine and generator; meters (gas, electricity) and gas supply pipelines.

Based on the project boundary, CO₂ is indicated as the main source of the baseline and project emissions, which is correct as per the project activity and the applicable methodology.

It is the opinion of the validation team that the methodology is correctly quoted and applied by comparing it with the actual text of the applicable version of the methodology available on the UNFCCC CDM website and the selected methodology is applicable to the project activity. Also, the credible baseline alternatives have been chosen and exclusion of the alternatives has been appropriately justified to arrive at the applicable baseline and the project boundary along with the sources of GHG emissions and activities (baseline and project activity) has been clearly explained. The emission reductions have been correctly calculated based on the applicable formulae and applicable emission factor, which are detailed in the GHG calculations section.

The validation team therefore confirms that the selected baseline scenario reasonably represents what would happen in the absence of the project

activity. Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and deemed reasonable. The validation team confirms that the identified baseline scenario is the most reasonable baseline scenario for the proposed VCS project activity.

Additionality

As specified in the approved methodology AM0029 version 03, the assessment and demonstration of additionality has been carried out based on sub-step 2b- option II- Investment comparison analysis. The levelized tariff for all the plausible options to the proposed project activity has been calculated and presented. The key assumptions in validating the appropriateness and justification for each of the parameter are given below:

Techno economic parameters of the project activity (Installed Capacity 469 MW)		
Parameter	Value / Reference	Justification
Total Investment	14,500 Million [DPR, May 2001 specifies D/E ratio (DPR for power plant was made by earlier owners in 2001, and an annual project cost 13237.6 million. An annual escalation of 5% for two years till decision making is assumed)].	Reflects realistic values as compared to CEA expert committee, the project has also later achieved financial closure and taking in to account escalation costs, hence conservative. The actual project cost is Rs.14,500.04 million (page no. 151) as per the “Common Agreement (for loan) – 29/04/2004” (/29/ of Appendix 1), which is less than the project cost for financial closure of Rs.14,500 million (page no. 4) (/10/ of Appendix 1) and to substantiate the conservativeness, a sensitivity analysis has been done as per EB guidelines (para 17 of EB 51, Annex 58).
Debt: Equity	70: 30% D/E is the standard for any power financing in India even now. GPL is SPV (Special Purpose Vehicle) so no earlier loan record.	As per the “Project Information Memorandum – Nov 2003” (/10/ of Appendix 1) by lender (PFCL), D/E ratio is 70:30 (page no. 33). Hence the D/E ratio considered for the project activity is appropriate and standard practice for power projects.

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O & M costs	3.76% of the capital Cost based on the experience of PP from operating NG CCPP	Jegurupadu phase I project and conservative compared to 3.8% considered by Project Information Memorandum for GPL by PFCL in Nov. 2003 [Pg. No. 36, 39 of pdf file] (/10/ of Appendix 1). (Jegurupadu phase I project was operating from 1997 with the same Parent Company (GVK Group under same management). Thus, the O & M cost is used from ready reference is appropriate).
Plant Load Factor	85% based on DPR (Appendix 13) (/30/ of Appendix 1)	As per detailed project report based on the PPA signed with APTRANSCO. Also sensitivity analysis for PLF to an extent of $\pm 10\%$ is conducted in line with the guidance on investment analysis. Comparing with CERC 2004 guidelines (/31/ of Appendix 1), page no.10, the assumed PLF is conservative.
Auxiliary consumption	3% (CERC (Terms & Conditions of tariff) Regulations, 2001; pg. 8) (/32/ of Appendix 1)	Based on the CERC guidelines 2001 available at the time of investment decision and hence appropriate and correct.
Gross calorific value	9308 kcal/SCM DPR, Appendix 13 (/30/ of Appendix 1)	The calorific value applied is found to be in line with the value in the gas invoices.
Station heat rate	1850 kcal/ kWh PPA of GPL 1997, Clause 57 (/11/ of Appendix 1)	Conservative, compared to the combined cycle station heat rate recommended for gas based power plant according to CERC 2001 guidelines (pg. 8 is 2000 kcal/kWh) (/32/ of Appendix 1)
Fuel charges	4205/ 1000 SCM	The assumed value is conservative comparing with the NG pricing trend available on http://www.oilnergy.com/1gnymex.htm#since30 . [Matches with the third party value from Project Information Memorandum for GPL by PFCL, dated: Nov. 2003 (Pg. No. 100,
Transmission charges (for using gas pipelines of GAIL)	481.44	
Escalation on transmission	3%, (Fuel supply agreement with GAIL dated 09/10/2000 and	

Charges	applicable taxes pg.7	104 of pdf file)].
Book Depreciation Rate (Straight Line Method basis)		
Civil Works	8.24%	Based on the Depreciation Norms for Generating Companies by the Notification from Ministry of Power dated. 29/03/1994 available at the time of investment decision.
Plant and Machinery	8.24%	
Book Depreciation up to (% of asset value)	90%	
Income Tax		
Income Tax rate	35%	As per Companies Act & Income Tax Act and hence accepted.
Minimum Alternate Tax	7.5%	
Surcharge	2.5%	
Dividend Distribution Tax	12.5%	
Working capital		
Working capital interest rate	11%	Conservative based on CERC guidelines 2001(Pg. 30) and the PLR existing at the time of investment decision.

The assumptions considered for calculating the levelized cost of generation for the alternative (b) i.e. power generation using coal as the energy source are described in the table below. For coal based power plant, the nearest capacity in the standard available turbine generator set i.e. 500 MW which is used for comparison. This 500 MW plant at 85% PLF and 9.5% auxiliary consumption will generate 3,369,315MWh electricity. Whereas, a 469 MW gas based unit at 85% PLF and 3% auxiliary consumption will generate 3,387,409MWh electricity.

Techno Economic parameters for power generation using coal as the energy source			
Parameter	Value	Reference	Justification
Installed Capacity	500 MW	CERC (Terms & Conditions of tariff) Regulations, 2001 (/32/ of Appendix 1)	Nearest block size for coal, considering its higher auxiliary consumption than NG CCPP.
Total Investment (INR Rs.)	19,974.41	Million – Estimated from TEC available to other thermal projects (/33/ of Appendix 1)	Conservative compared to State/Central Sector Thermal Schemes Appraised by CEA.
Debt : Equity (INR Rs.)	70:30 (Total Debt-	CERC (Terms & Conditions of tariff)	At standard 70:30 debt/ equity based on CERC

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	13,982.08 Total Equity -5,992.32)	Regulations, 2004; pg. 38 (/31/ of Appendix 1)	guidelines.
O & M Costs	2.5% of the capital Cost	CERC (Terms & Conditions of tariff) Regulations, 2000	Based on the CERC (Terms & Conditions of tariff) Regulations, 2000; pg.92 (/34/ of Appendix 1) available at the time of investment decision and hence appropriate and correct.
Plant Load Factor	85%	Kept same as that of the project activity to get same electricity supply as project activity as discussed above this table.	Sensitivity analysis for PLF to an extent of ±10% conducted is in line with the guidance on investment analysis. Comparing with CERC guidelines 2004, pg23, the assumed PLF is conservative. CERC assumes 80%, conservatively 85% is considered & same as NG option to get same output as per AM0029.
Auxiliary Consumption	9.5%	CERC (Terms & Conditions of tariff) Regulations, 2001; pg. 8	Based on the CERC guidelines 2001 available at the time of investment decision and hence appropriate and correct.
Return on Equity	16%	CERC (Terms & Conditions of tariff) Regulations, 2001; pg. 27 (For NG, ROE is not considered. The NG power plant was based on a bid that did not include guaranteed ROE by Government).	The value is in line for thermal power plants installed in year 2001- 2004 according to Central Electricity Regulatory Commission (CERC) 2001.
Gross Calorific Value	4760.50 kcal/kg	Price Notification No. 7/2001-2002 dated 9 th April, 2001 from the	The price notification dated 09/04/2001 was verified and found that

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Fuel Charges	1357/ 1000 kg	Singareni Collieries Co. Ltd (/35/ of Appendix 1)	the values applied are appropriate i.e., existing at the time of investment decision.
Station Heat Rate-Stabilization	2600 kcal/ kWh	CERC (Terms & Conditions of tariff) Regulations, 2001; pg. 7	Based on the CERC guidelines 2001 available at the time of investment decision. For calculations 2500 kcal/ kWh is used, which is conservative.
Station Heat Post Rate-Stabilization	2500 kcal/ kWh		
Depreciation rate for revenue calculation (Straight Line Method basis)			
Civil Works	7.84%	Electricity Supply Act (/36/ of Appendix 1)	Depreciation Norms for Generating Companies by the Notification from Ministry of Power dated 29/03/1994.
Plant and Machinery	7.84%		
Book Depreciation up to (% of asset value)	90%		
Book Depreciation Rate (Straight Line Method basis)			
Civil Works	3.34%	Company's Act (/37/ of Appendix 1)	As per companies Act & Income Tax Act and hence accepted.
Plant and Machinery	5.28%		
Book Depreciation up to (% of asset value)	95%		
Surcharge	2.5%		
Dividend Distribution Tax	12.5%		
Working capital			
Working capital interest rate	11%		Conservative based on CERC guidelines 2001 (Pg. 30) and the PLR existing at the time of investment decision.

The validation team has confirmed that the values assumed / applied have been sourced from authentic documents / references, which were cross checked and found to be appropriate, conservative and correct.

Based on the values assumed, a levelised cost of Rs.2.10/kWh and Rs.1.93/kWh has been calculated for the natural gas and coal for power generation which is conservative and correct and in accordance with para 6 of EB 51, annex 58 (i.e., Guidelines on investment analysis). The below table summarizes the levelized cost of electricity generation for various alternatives.

Scenario	Levelized Cost of generation (₹/kWh) at 85% PLF
Project activity implemented as a project without the CDM revenue	2.10
Power generation using coal as the energy source	1.93

Thus, the economically attractive baseline scenario as identified by the investment analysis using the levelized cost of electricity generation (in Rs./kWh) as the financial indicator is the alternative (b) which is power generation using coal as the energy source.

Based on the calculations it has been established that the credible options available at the time of investment decision are financially more attractive, compared to the least polluting but more expensive option which is the project activity. The project activity is concluded to be additional and the revenues from CERs will help in making the project viable.

Sensitivity analysis:

A sensitivity analysis is performed for all alternatives; to confirm that the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions i.e. the capital cost, fuel price, plant load factor and SHR. Project cost is varied as it is taken as per investment decision date. Actual project cost is higher due to delay in commissioning and increase in IDC component.

In accordance with para 17 of the investment guidance in EB 51, the project proponent has conducted a sensitivity analysis on the financials by varying the parameters which have a bearing of 20% or more on either the project costs or the project revenues and has tabulated the results

Sensitivity analysis considering variation in fuel price		
Price of fuel change	-10%	+10%
Levelized cost of electricity generation for power generation using natural gas as energy source (Project activity not implemented as CDM Project)	1.97	2.23
Levelized cost of electricity generation for power generation using coal as energy source	1.82	2.05

Sensitivity analysis considering variation in Plant Load Factor (PLF)		
PLF change	-10%	+10%
Levelized cost of electricity generation for power generation using natural gas as energy source (Project activity not	2.15	1.95

implemented as CDM Project)		
Levelized cost of electricity generation for power generation using coal as energy source	2.01	1.87

Sensitivity analysis considering variation in capital cost		
Capital cost change	-10%	+10%
Levelized cost of electricity generation for power generation using natural gas as energy source (Project activity not implemented as CDM Project)	2.07	2.13
Levelized cost of electricity generation for power generation using coal as energy source	1.90	1.97

Sensitivity analysis considering variation in heat rate		
Station Heat Rate (SHR)	-10%	+10%
Levelized cost of electricity generation for power generation using natural gas as energy source (Project activity not implemented as CDM Project)	2.09	2.11
Levelized cost of electricity generation for power generation using coal as energy source	1.81	2.05

The sensitivity analysis confirms that the economically most attractive baseline scenario identified in the sub-step 1 is robust to reasonable variations in all the critical assumptions.

The validation team, based on the assessment result by the financial expert engaged, hereby confirms that the assumptions are appropriate, financial calculations are correct and PP has applied all the statutory levies and taxes correctly corresponding to the investment decision date.

Common Practice:

The common practice analysis has been analyzed based on requirements of the additionality tool- sub-step 4a where the analysis of other activities similar to the proposed project activity is done.

In this step, an analysis of any other activities that are similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc has been done.

As per CEA version 3 (/38/ of Appendix 1) the share of the gas based power generation in India is 16% of the total installed thermal power capacity and that of coal based power plants is 82%. The total percentage of installed capacity of the gas based power plants in Southern Region is only 17.2% of the total installed capacity. This corroborates the fact that Natural Gas based power generation is not commonly carried out practice in India.

According to the 'Tool for the demonstration and assessment of additionality', analysis of any other activities implemented previously or currently underway

that are similar to the proposed project activity needs to be performed to describe whether and to which extent similar activities have already diffused in the relevant region. Similar project activities include Natural Gas based Grid Connected Power Plant of similar scale that takes place in a comparable environment with respect to regulatory framework, investment climate, and access to technology etc., in the state of Andhra Pradesh with the tariff determined through the International Competitive Bidding Process (ICB) those activities that are implemented previously or currently underway.

To arrive at the power plants that fall under the above said criteria, an analysis is conducted including all the power plants connected to grid that are operational having similar or comparable capacity (200- 500 MW) at the time of investment decision. They include

No.	Power generation units	Unit No.	Capacity	Fuel used
1	K_gudem new	1	250	Coal
2	K_gudem new	2	250	Coal
3	Vijaywada	1	210	Coal
4	Vijaywada	2	210	Coal
5	Vijaywada	3	210	Coal
6	Vijaywada	4	210	Coal
7	Vijaywada	5	210	Coal
8	Vijaywada	6	210	Coal
9	Royal seema	1	210	Coal
10	Royal seema	2	210	Coal
11	R_gudem stps	1	200	Coal
12	R_gudem stps	2	200	Coal
13	R_gudem stps	3	200	Coal
14	R_gudem stps	4	500	Coal
15	R_gudem stps	5	500	Coal
16	R_gudem stps	6	500	Coal
17	Simhadri	1	500	Coal
18	Simhadri	2	500	Coal
19	Peddapuram ccgt	1	220	Natural gas
20	Jegurupadul	1	235.4	Natural gas
21	Spectrum Godavari	1	208	Natural gas

Among the above mentioned power plants No 19, 20 and 21 are NG based power plants. Although this may use a similar fuel as compared to the project activity, the tariff structure of GPL is different as compared to that of the NG based power plant mentioned above. These power plants were commissioned before 2000 and have a two part tariff system in which the capital cost was approved by CEA and they are entitled for a fixed return of equity [http://www.ercap.org/TariffOrders/TO_2001-02.pdf page 45]. Another important feature is 'fuel pass through' nature of PPA i.e. whatever the cost of fuel actually incurred by these plants, is reimbursed by the power purchaser. Thus, independent of the fuel used (naphtha, SD or the natural gas), these plants get complete expense reimbursed and 16% ROE in tariff. Thus, the

multifuel power plants came up in a different investment scenario and have fuel pass through PPA i.e. cost of fuel is paid to the plant under the PPA signed. Thus, that is not included in the analysis.

In contrast to that, the PPA for the project activity was signed with APTRANSCO with the tariff that was fixed for the short gestation projects (Natural Gas Based Power Generation Projects) selected under the International Competitive Bid Process (ICB).

The tariff fixed for the project activity was to match the tariff fixed for the Natural Gas based Power Projects which have participated in the International Competitive Bid Process. The Natural Gas based power plants that have participated in the process and won the bid for the similar tariff include

- 370 MW Vemagiri Power Project promoted by GMR Group.
<http://cdm.unfccc.int/Projects/Validation/DB/5PJHBSBR7NOR16EJM699U5OT91W5A3/view.html>
- 445 MW Konaseema Power Project promoted by Konaseema Gas Power Limited.
<http://cdm.unfccc.int/Projects/Validation/DB/YVZZAK437I4UGWTRQTDD0KO1MDE98N/view.html>
- 228 MW Combined Cycle Natural Gas based grid connected power plant promoted by GVK Industries Ltd., Hyderabad
<http://cdm.unfccc.int/Projects/Validation/DB/82ORS4DFFAE3F7JI64VMOSYQ EYXGCB/view.html>

The third project has GVK Power and Infrastructure Ltd. as one of the promoters and the plant is also under the CDM registration process (it was web hosted for global stakeholders' comments in June 2008 (http://cdm.unfccc.int/filestorage/3/F/A/3FA6BMC8TZ4UXNGD7ORVLIW1EH2K0S/PDD%20Gautami.pdf?t=RmN8MTMwNjQ5MDgwMS4wOQ==|eb7OPNaWrFclyHvOi4lhErvZxL8=))).

The plants that existed from earlier days in the vicinity namely Spectrum Power Generation and another project from the same project promoters is based on a different tariff structure to include a guaranteed 16% return on equity [http://www.scribd.com/doc/20623495/GVK-Power-Infrastructure-Initiating-Coverage-11Aug09 (Page 4)].

Thus, all the projects with similar tariff structures are in different stages of CDM registration Process.

From the above discussions it can be concluded that the project is not a common practice in the region.

As per additionality tool - only 'similar activities' (one condition for similar being those that take place in a similar environment) need to be considered. It

should also be noted that there has been no other natural gas based power project that has been commissioned in Andhra Pradesh with the similar tariff structure. The above discussed power projects are already in the CDM pipeline. Hence, it can be concluded that no similar activities have diffused in the relevant region without the consideration of CDM revenue.

Thus in line with the additionality tool, the PP has demonstrated additionality by investment analysis and common practice analysis. Based on the above, the validation team is of the opinion that the project is additional and faces significant barriers. Hence additional support through VCS registration is required for the project to overcome the barriers.

A Corrective Action Request (CAR 5) and Seven Clarification requests (CL 1, 8, 9, 10, 12, 13 and 14) were raised with regard to

- Common practice analysis conducted and indicated in section 2.4 of the PD is not conclusive (CAR 5)
- Mentioning of naphtha based power plants in the baseline scenario in section 1.4 of the PD (CL 1)
- In section 2.4 of the PD (page no.21), for the various possible alternatives illustrated, links provided for some alternatives are not reproducible and for some are after the investment decision date (CL 8)
- Justification for exclusion of project cost and SHR for Sensitivity analysis based on EB guidelines (CL 9).
- Justify with appropriate evidences that supercritical power plant was not available in India in 2003 (at the time of project activity decision was made) CL 10
- Clarification on assumptions for the techno economic parameters of the project activity and the baseline with respect to EB guidelines on investment analysis and justification on their conservativeness (CL 12).
- In section 2.4 of the PD, under techno economic parameters of the project activity for fuel charge it is indicated a 4205/1000 SCM, but in the financial sheet fuel cost is shown as 4174 (CL 13).
- Clarification on PLF, useful life of project activity and depreciation and to provide the authentic evidence for the assumed parameters for calculations (CL 14).

The issues were adequately addressed, resolved and closed in revised PD version 02. The resolution of each CAR and CL is represented in Appendix II: Resolution of Corrective Action and Clarification Requests.

3.3 Monitoring Plan

The project uses approved monitoring methodology "Grid Connected Electricity Generation Plants using Non-Renewable and Less GHG Intensive

Fuel”, AM0029, version 3, which is applicable to the project. According to the methodology the following parameters should be monitored

- Metering of the electricity exported by power plant to the Southern Grid (ex-post)
- Total volume of natural gas combusted in the project plant in year y (ex-post)
- The net calorific value (energy content) per volume unit of natural gas in year ‘y’ (ex-post)
- Quantity of LNG or NG consumed in the project activity (for leakage, if any)
- The BM emission factor in accordance with tools to calculate emission factor for electricity system (ex-ante)

It was confirmed from the site visit and the invoices raised (/39/ of Appendix 1) to the state electricity board that the project design has got provisions to monitor the fuel (NG) from both the supplier (GAIL and RIL) and the consumer (GPL) which acts as a system of cross –verification to arrive at the correct value on a conservative basis. The qualitative monitoring of the fuel is also done periodically using Gas Chromatography.

Section 3.4 of PD describes in detail the responsibility, authority, monitoring, measurement, reporting, archiving, the QA / QC procedures related to calibration, meter testing, internal audits, maintenance of monitoring equipment and monitoring plan implementation which are found to comply with the requirements of the applicable methodology. The O & M is undertaken by the plant personnel appointed by the project proponent (/40/ of Appendix 1).

The grid emission factor was calculated from the Operating Margin (OM) CO₂ emission factor, Build Margin (BM) CO₂ emission factor and emission factor of coal (sub-bituminous) have been evaluated according to the procedures prescribed in ‘Tool to calculate the emission factor for an electricity system Version 02’. Data from the CO₂ Baseline Database for the Indian Power Sector-Central Electricity Authority, version 5.0 (/28/ of Appendix 1), applicable at the time of validation has been used in the PD.

The value of the following parameters were checked and verified from CEA version 5 and found to be appropriate and conservative

- $EF_{grid,OM,y}$ of 0.9876 tCO₂e/MWh and $EF_{grid,BM,y}$ of 0.8179 tCO₂e/MWh considered for the project activity.
- The estimated figure of 0.9028 tCO₂e/MWh for grid emission factor and
- 0.9580 tCO₂e/MWh emission factor of coal based power plant derived from the CEA database.

PP has used the official published data on OM and BM emission factors. The version of the data used is as available on the date of validation. This data is published by CEA, the sole authority for the publication of such data in India. This data is based on the emission factor tool approved by UNFCCC. Validation team agrees to this emission factor, since it is based on the official background data published by CEA.

Leakages occurring due to upstream fugitive methane emissions have been considered on a conservative basis based on the methodology AM0029. Leakages have been taken into account considering:

1. Fugitive methane emissions of natural gas envisaged from production, transportation, distribution, and, in the case of LNG, liquefaction, transportation, re-gasification and compression into a transmission or distribution system, in tCH₄ per GJ fuel supplied to final consumers
2. Upstream fugitive methane emissions occurring in the absence of the project activity in terms of ton of methane per MWh

The validation team is of the opinion that the project participant is able to implement the monitoring plan as

- The monitoring plan is in line with the requirements of the methodology;
- Monitoring arrangements described in the monitoring plan are feasible within the project design;

A clarification request (CL 2) was raised with regard to the identification of procedures for dealing with possible monitoring data adjustments to handle exigency situations. The issues were adequately addressed, resolved and closed in revised PD version 02. The resolution of each CL is represented in Appendix II: Resolution of Corrective Action and Clarification Requests.

3.4 Calculation of GHG Emissions

As per AM0029, the baseline emission sources considered are the power plants connected to the Southern Grid that contribute to its build margin. The project activity uses a lesser GHG intensive fuel and thus proposes to reduce the GHG intensity of the grid to which it supplies. The baseline emission is obtained by multiplying net electricity generated by the project power plant with the build margin baseline emission factor of Southern regional grid as per the data of CO₂ baseline database published by CEA.

The measurement of net electricity generated is according to the applied methodology, established in monitoring section, while the BM applied emission factor has been taken based on comparison of the different options, among which the lowest value has been applied based on CEA version 5 (/28/ of Appendix 1), applicable at the time of validation. Oxidation factor for NG was taken as 1 based on IPCC 2006 "IPCC Guidelines for National Greenhouse Gas Inventories". The energy efficiency of technology in the most

likely baseline scenario and is taken as 36.3%, calculated based on CEA Version 5 based on 'Tool to calculate the emission factor for an electricity system'.

The leakage emissions (due to utilization of natural gas as fuel) have been calculated conservatively. Default emission factor for fugitive CH₄ upstream emissions was taken as 296 tCH₄/PJ as this is the value recommended by the methodology and applicable to the operational facilities in most of the developing countries. The emission factor for upstream fugitive methane emissions occurring in the absence of the project activity in terms of tonnes of methane per MWh is calculated as 16.01 CO₂/MU based on CEA Version 5. The net calorific value of 9308 kcal/SCM (energy content) per volume unit of natural gas in year is provided by supplier and recorded by GPL for verification, which will be cross verified on a continuous basis using a Gas Chromatograph and averaged in the invoice for the metered period.

The estimated emissions reduction E_{Ry} by the project activity during a given year y is:

Emission Reductions = Baseline Emissions – Project Emissions – Leakage

E_{Ry} = 2,770,562 – 1,379,231 – 97,909 = 1,293,422 tCO₂e

E_{Ry} = 1,293,422 tCO₂e

These have been described adequately in section 4 of the PD and in VER calculation sheet (/41/ of Appendix 1) as per the methodology AM0029, Version 3. Hence it is the opinion of the validation team that

- All assumptions and data used by the project participants were listed in the PD, including their references and sources;
- All documentation used by project participants as the basis for assumptions and source of data was correctly quoted and interpreted in the PD;
- The baseline methodology has been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions;
- All estimates of the baseline emissions can be replicated using the data and parameter values provided in the PD.

The validation team confirms that the estimates of baseline emissions can be replicated using the information provided and the formulas are correctly applied and the calculations done in a transparent way.

A clarification request (CL 2) was raised with regard to the VER's calculation in the PD not consistent with VER calculation sheet submitted. The issue was adequately addressed, resolved and closed in revised PD version 02. The resolution of the relevant CL is represented in Appendix II: Resolution of Corrective Action and Clarification Requests.

3.5 Environmental Impact

An Environmental Impact Assessment (EIA) for the project activity had been conducted by SGS India Ltd., Environmental Services Secunderabad in the month of November 2000 (/42/ of Appendix I). The project got environmental clearance from Ministry of Environment and Forests (MoEF), Government of India (Host Party) on 09th January 2001(/43/ of Appendix I). The project had also received consent to operate from local regulatory authority (Andhra Pradesh Pollution Control Board) on 04th January 2009 (/44/ of Appendix I).

The plant has been granted the environmental clearances and consents as per the requirements of the regulatory authority of the host country. Also the NCDMA of India through its approval letter has confirmed that the project contributes to sustainable development in India.

The significant environmental impacts of the project activity along with the measures taken to mitigate the impacts and the conclusions are enumerated in section 5 of the PD. As the plant is located in a notified industrial area and the proposed plant will run on natural gas (a clean fuel), it is ensured that there are no major negative impacts envisaged on the air quality, water environment and land environment of the surrounding region. Moreover the plant authorities have taken necessary care to see that all statutory regulations existing in the country are met. The validation team considered that the project will not have adverse environmental impact.

3.6 Comments by stakeholders

A formal consultation process with the local stakeholders was held on 30th November 2007 at project activity premises (i.e., GVK Gautami Power Ltd. (GPL) at Industrial Development Area, Peddapuram, Samalkot, East Godavari district, Andhra Pradesh, India). PP had communicated by written invitation in local language (/45/ of Appendix I) 15 days in advance before the meeting to the identified stakeholders. The meeting was attended by 25 participants (/46/ of Appendix I) including locals residing in the neighboring villages, local health officer, staff of neighboring college, officials of state electricity board and pollution control board.

The project activity was explained to the gathering and a brief presentation on climate change was made. The role of the project activity in the mitigation of climate change and local sociological benefits were explained. Then queries were invited from the local stakeholders. The stakeholders were given further 15 days' time to contact project proponents for any further queries.

The main concerns of the stakeholders were with regard to health and skin problems, any danger due to the leakage of natural gas/liquid fuel, the safety arrangements that are maintained to face any accidents, whether necessary employment opportunities created to the people of surrounding villages and any community facilities will be provided to the residents of nearby villages. The stakeholders were given clarification on the issues raised to their satisfaction by providing relevant evidence of the project claims. There were

no specific comments that required follow up action from the proposed project activity as evident from the minutes of the stakeholder meeting (/47/ of Appendix I) and the description provided in section 6 of the PD.

The information regarding the stakeholders meeting was verified during the site visit by interviewing the relevant members who had participated and were present at the meeting. The interviewed persons confirmed the information provided in the PD and the documents / record of the local stakeholder consultation process.

The validation team hereby confirms that the process of local stakeholder consultation is observed to be adequate.

4 Validation Conclusion

SIRIM QAS Intl. performed a validation of the proposed VCS project “Natural Gas based grid connected power project at Peddapuram, A.P. by Gautami Power Limited”. The validation was carried out to independently assess whether the project confirms to the qualification criteria and requirements of the Voluntary Carbon Standard (VCS) 2007.1, including the baseline and monitoring methodology applied. The VCS program provides the standard and framework for independent validation based on ISO 14064-2:2006 and ISO14064-3:2006 standards.

The validation was performed using a risk based approach, the review of the project design documentation and the subsequent follow-up interviews provided SIRIM QAS Intl. with sufficient evidence to determine the fulfilment of the stated criteria.

The project participant is GVK Gautami Power Limited. The project applies the approved baseline and monitoring methodology “Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas”, AM0029 version 03.

The project activity is a singled VCS project activity by GVK Gautami Power Limited which involves the commissioning and operation of a new Greenfield 469 MW natural gas fired combined cycle power plant at Industrial Development Area, Peddapuram, near Samalkot in East Godavari district, Andhra Pradesh, India. The main purpose of the project activity is to generate electricity through less GHG intensive fuel, such as natural gas (NG), that displaces electricity from an electricity distribution system (Southern Grid) dominated by more GHG intensive fossil fuel fired generating units. The project activity will displace approximately 1,293,422 tCO₂e of less carbon intensive CO₂ of power annually to the power deficit, more carbon intensive Southern Grid.

The project will result in the reduction of greenhouse gas emissions that are real, measurable and give long term benefits to the mitigation of climate change. It is demonstrated that the project faces an investment barrier that would prevent its implementation without the VCU revenue. Without the VER revenue, the levelised cost is calculated to be 2.10 INR/ kWh which is more costly compared with the credible and feasible baseline alternative of energy generation using coal. Emission reductions from the project are hence additional to any that would occur in the absence of the project activity.

The GHG emission calculations are documented in a complete and transparent manner. The formulae and methodologies for accounting GHG emissions are appropriate and emission factors are deemed to be of sufficient accuracy. The total emission reductions from the project if implemented as envisaged in the PD version 02 dated 15th May 2010 are 12, 934, 220 tCO₂e over the 10-year crediting period. The emission reductions forecast has been

checked and it is deemed likely that the stated amount is achievable on the basis that the underlying assumptions do not change.

The monitoring plan is line with the approved monitoring methodology of AM0029 version 03. The plan adequately addresses all necessary information for monitoring and reporting of emissions reductions due to the project activity. Responsibilities and authorities for project management, monitoring and reporting, and the data quality control and quality assurance procedures have been described in the PD.

An Environmental Impact assessment (EIA) for the project activity has been conducted. The plant has been granted with the environmental clearances and consents as per the requirements of the regulatory authority of the host country. The project is not likely to create any significant adverse environmental impacts. The project complies with all environmental regulations of India. Also the NCDMA of India through its approval letter has confirmed that the project contributes to sustainable development in India.

In summary, it is SIRIM QAS Intl.'s opinion that the "Natural Gas based grid connected power project at Peddapuram, A.P. by Gautami Power Limited" as described in the PD version 02, dated 15th May 2010, meets all relevant VCS 2007.1 requirements, is eligible as category I under scope I of the large-scale project activities and correctly applies the baseline and monitoring methodology specified in AM0029 (version 3).

As such, SIRIM QAS Intl. recommends the registration of the project as a VCS project activity.

Prepared by :

Approved by :



Dr. D. Siddaramu
(Validation Team Leader)



Parama Iswara Subramaniam
(DOE Representative)

Appendix I

References

Ref. No.	Document or Type of Information
/1/	VCS Project Description (PD) Version 01 dated 7 th March 2010.
/2/	VCS Project Description (PD) Version 01 dated 15 th May 2010.
/3/	VCS 2007.1 Standard, Program guidelines, Registration and Issuance guidance document dated 18/11/2008.
/4/	CDM approved consolidated baseline methodology AM0029 Version03
/5/	List of Sectoral scopes
/6/	land documents
/7/	Commercial Operation Date - 05 th June 2009
/8/	The Gazette of India, Extraordinary Dt. 29 th March 1994 (http://www.powermin.nic.in/acts_notification/generating_companies.htm)
/9/	Notice to proceed to EPC contractor
/10/	Project Information Memorandum – November 2003 by lender PFCL (refer pg. 4 and 33)
/11/	PPA
/12/	Undertaking from GPL dated 25 th March 2010 that no other form of environmental credits is generated from project and there is no transfer of any equipment.
/13/	Gas Supply Contract with GAIL
/14/	Gas Supply Contract with RIL
/15/	Note on gas availability
/16/	Demand supply data of India -Ministry of Petroleum and Natural Gas
/17/	Power generation using coal
/18/	Life of coal power plant (www.cercind.gov.in/160502/comp_bidding.pdf)
/19/	Maharashtra Electricity Regulatory Commission, Wind Project Tariff Order, 18 th September 2003 (http://www.mercindia.org.in/pdf/Annexures.pdf)
/20/	Hydroelectric power plant -average PLF of 60%

(http://www.sandrp.in/hydropower/crtlenv_issue_wcd.pdf pg. 5, 2nd last line).

- /21/ The Base Load Fallacy, Author: Mark Diesendorf
- /22/ Power generation using cluster of Diesel Engine
- /23/ Diesel Engine based power plants were installed before 2001
- /24/ Atomic energy ACT 1962 (<http://www.dae.gov.in/rules/aeact.pdf>)
- /25/ Levelised tariff calculations for Natural Gas
- /26/ Levelised tariff calculations for Coal
- /27/ Tool to calculate the emission factor for an electricity system Version 02.1
- /28/ Central Electricity Authority: CO2 Baseline Database for the Indian Power Sector. Version 05
- /29/ Common Agreement (for loan) – 29th April 2004
- /30/ PLF of 85% as per DPR (Appendix 13) available at investment decision
- /31/ CERC Terms & Conditions of Tariff 2004
(http://www.cercind.gov.in/28032004/finalregulations_terms&condition.pdf)
- /32/ CERC (Terms & Conditions of tariff) Regulations, 2001
- /33/ Estimated from TEC available to other thermal projects
- /34/ CERC (Terms & Conditions of tariff) Regulations, 2000
- /35/ Price Notification No. 7/2001-2002 dated 9th April, 2001 from the Singareni Collieries Co.
- /36/ Electricity Supply Act
- /37/ Depreciation Rates- Company act
- /38/ CO₂ baseline database for the Indian power sector, User guide, Version 3.0, December 2007, Central Electricity Authority, Government of India
- /39/ Invoices raised to the state electricity board from June 2009 to Feb 2010
- /40/ O & M -PIL- 15th September 2005
- /41/ VER calculation spread sheet
- /42/ EIA conducted by SGS India Ltd -November 2000
- /43/ Environmental Clearance from Ministry of Environment and Forests (MoEF) -09th January 2001

- /44/ Consent to operate from Andhra Pradesh Pollution Control Board -04th January 2009
- /45/ Invitation to Stakeholders
- /46/ Stakeholders meeting Attendance list
- /47/ Minutes of the stakeholder meeting

Appendix II: Resolution of Corrective Action and Clarification Requests

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
<u>CAR 1</u> As GVK Gautami Power Ltd (GPL) is the new name of PP as per order dated.08/09/2009 (letter from 'Registrar of Companies, Andhra Pradesh'), but in the project title it is mentioned/indicated as Gautami Power Ltd.	Section 1.1	The VCS project title is kept same as the CDM project activity that was webhosted on 17/09/2008 and 30/12/2009 and also host country approval is in the same name. Thus, PP requests to accommodate this title (though differs from the new name of PP.	The clarification by PP is acceptable, hence this CAR is resolved. <u>Conclusion</u> CAR 1 Closed
<u>CAR 2</u> Evidence for the indicated timelines in section 1.10 of the PD is not submitted for validation.	Section 1.10	All the evidences for this section 1.10 of the PD are now provided to DOE.	Now evidence for the indicated timelines in section 1.10 of the PD is submitted by PP. <u>Conclusion</u> CAR 2 Closed
<u>CAR 3</u> The project proponent has not submitted the commitment letter for verification as indicated in section 1.13 of the PD.	Section 1.13	The commitment letter on not claiming VCS credits after the CDM registration of the project activity is attached.	The commitment letter on not claiming VCS credits after the CDM registration of the project activity is submitted by PP. <u>Conclusion</u> CAR 3 Closed

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
<u>CAR 4</u> Section 1.15 of the PD is not as per the VCS Project Description Template i.e., Roles and responsibilities of the PP mentioned in this section.	Section 1.15	The section 1.15 is updated to give the roles and responsibilities of PP.	The roles and responsibilities of PP are now updated in section 1.15 of the revised PD version02. <u>Conclusion</u> CAR 4 Closed
<u>CAR 5</u> Common practice analysis conducted and indicated in section 2.4 of the PD is not conclusive.	Section 2.4	The comment is section is addressed and the analysis is concluded now.	The section 2.4 of the PD on Common practice analysis conducted is revised and is now conclusive. <u>Conclusion</u> CAR 5 Closed
<u>CAR 6</u> The PD submitted for validation is not as per the VCS Project Description Template (19 November 2007) i.e., section 2.5 is missing.	Section 2.5	Section 2.5: Description of how the emissions of GHG by source in baseline scenario are reduced below those that would have occurred in the absence of the project activity (assessment and demonstration of additionality) is now included in the PD.	Section 2.5 has now been included in the revised PD version02. <u>Conclusion</u> CAR 6 Closed
<u>CAR 7</u> The Schedule section of the PD is not as	Section 7	Section 7: Schedule is updated to include the information gaps on frequency of monitoring	In the revised PD version02, Section 7 i.e., Schedule is updated to include the frequency of monitoring and reporting.

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
per the VCS project description template i.e., frequency of monitoring and reporting are not mentioned.		and reporting.	<u>Conclusion</u> CAR 7 Closed
<u>CL 1</u> In describing the baseline scenario, it mentioned that “In the absence of the project activity, the equivalent amount of electricity would have been generated in the coal based power plants or naphtha based power plants (existing and future additions) connected to the southern grid of India”. Please clarify	Section 1.4	The total amount of electricity produced by this 449 MW project is expected to be 3492 GWh per year. In the absence of this project, the same amount of electricity would have been produced by the existing coal based power plants connected to the southern grid and from planned future capacity additions which is more carbon intensive than natural gas based power plant.	The clarification by PP is acceptable and same have been included in section 1.4 of the revised PD, version 02. Hence this CL is resolved <u>Conclusion</u> CL 1 Closed
<u>CL 2</u> Please clarify Section 1.6 indicates the expected starting date of crediting period as the date of as the date on which the project began reducing GHG emissions. Whereas the JMR is taken on a fixed date, It is most likely that the date of registration may not coincide with the date of JMR. PD does not identify procedures for dealing with possible monitoring data adjustments to	Section 1.6 and Section 3.4	The following line is included for this situation in the VCS PD, Section 3.2. ‘As the project activity registration may not coincide with the JMR date (both monitoring period start and the end), (1) the net electricity export for this period will be monitored from the check meter/ DCS readings from the PP’s monitoring system. OR (2) the crediting period will be taken from the subsequent JMR date after the registration	In the revised PD version02, Section 3.2 is updated to include the procedures for dealing with possible monitoring data adjustments to handle such exigency <u>Conclusion</u> CL 2 Closed

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
handle such exigency. Identical situation is anticipated in the last month of crediting period.		date'.	
<u>CL 3</u> Justify the assumptions on project lifetime for NG power plant considered as 15 years in section 1.9 of the PD.	Section 1.9	Evidence for the project lifetime is included in the footnote and also it is submitted to the DOE (Footnote 2).	The footnote 2 included in the revised PD version02 for the project lifetime of 15 years for Diesel and NG power plant is acceptable as it is evident from The Gazette of India, Extraordinary, [Part II-Sec. 3(ii)], Ministry of Power, Notification, Dt. 29/03/1994. Hence this CL is resolved. <u>Conclusion</u> CL 3 Closed
<u>CL 4</u> Section 1.9 of the PD claims that “The project technology was the best available at the time of EPC”. Please justify.	Section 1.9	The combined cycle natural gas based power plant of the heat rate is still the best available and supplied by reputed OEM Alstom. The heat rate of the project activity plant still meets the latest CEA requirements and the discharge norms including the pollution control, specifically NOx. The GT specification sheet describes it as 'Constantly updated, today's GT13E2	The justification provided by PP is acceptable. As per the link provided and CEA, version05 it is evident that supercritical technology was not available in India in 2003 (i.e., during Investment decision). <u>Conclusion</u> CL 4 Closed

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
		<i>incorporates a number of further technical enhancements as the result of a careful continuous product improvement process. With the latest rating, the engine has now the highest simple cycle efficiency in it's class - 180 MW gross output with 36.9% gross efficiency' (Attachment 1).</i>	
<u>CL 5</u> It is not clear from section 1.9 of the PD that the start up power (it is indicated that the combustion turbine is started by operating the generator as a variable speed motor. The variable frequency power required for this purpose is supplied by the static frequency convertor system) is covered under Auxiliary power.	Section 1.9	The electricity used in start up is covered under the total auxiliary power requirement. The sentence in VCS PD is revised as below. 'The variable frequency power required for this purpose is generated by the static frequency converter system from station auxiliary power systems (only during start up). This electricity usage is accounted in the total auxiliary consumption for calculation of net export.'	Section 1.2 of the revised PD, version02, was checked and the PP has now modified the earlier sentence. Hence this CL is resolved. <u>Conclusion</u> CL 5 Closed
<u>CL 6</u> Please clarify; In section 1.13 of the PD (page no.13), it is mentioned that "Energy Wheeling Agreement (EWA) and Power Purchase Agreement (PPA) with TNEB that provides preferential tariff for the exported energy".	Section 1.13	The sentence was a mistake as it is not applicable for this project activity and it is removed now.	The sentence in the revised PD version02, Section 1.13 has now been removed. <u>Conclusion</u> CL 6 Closed

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
<u>CL 7</u> As per DNA requirement a minimum of 2% of CER allocation for Sustainable Development including society/community development is not evidenced and also monitorable action plan for the same is missing in the PD. Please clarify	Section 1.16	The same is now included in the PD page no. 12 and also the monitorable plan is included in the Appendix II of the PD.	The 2% revenue commitment for socio-economic development has been included/ updated in the revised PD, version02. And a brief monitorable action plan for utilization of 2% CER revenue for socio-economic development is included in Appendix II of PDD. <u>Conclusion</u> CL 7 Closed
<u>CL 8</u> Please clarify; In section 2.4 of the PD (page no.21), for the various possible alternatives illustrated, • links provided for some alternatives are not reproducible and • for some are after the investment decision date (i.e., September 2003).	Section 2.4	The links for the section 2.4 of the PD is now submitted to the DOE.	The links included in the section 2.4 revised PD version02 are now reproducible and before investment decision date for the various possible alternatives. <u>Conclusion</u> CL 8 Closed
<u>CL 9</u>	Section 2.4	Sensitivity Analysis for Capital cost (project	The revised PD, version02 financial

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
Sensitivity analysis on • Project Cost and • Station Heat Rate (SHR) has not been done based on EB guidelines		cost) and station Heat rate is now included in the PD as well as financial models.	sheets were checked and found that a sensitivity analysis on project cost and SHR has now been done based on EB guidelines. <u>Conclusion</u> CL 9 Closed
<u>CL 10</u> Justify with appropriate evidences that supercritical power plant was not available in India in 2003 (at the time of project activity decision was made).	Section 2.4	According to the evidences provided to the DOE (Footnote 30) till Dec 2010 there was no supercritical plant in India. Two companies i.e NTPCL and Adani Power Limited were in final stage to get their plant commissioned, country's first supercritical units of 660 MW each at Sipat (Chhattishgarh) and Mundra (Gujarat) respectively in the early year 2011.	The justification provided by PP is acceptable. As per the link provided revised PD version02 it is evident that supercritical technology was not available in India in 2003 (i.e., during Investment decision). <u>Conclusion</u> CL 10 Closed
<u>CL 11</u> In section 2.4 of the PD (page no.21), it is mentioned that “the starting date of the project activity, which is considered as the awarding of EPC Contract (September 2003)”. Please clarify	Section 2.4	This is not applicable from the context of VCS project and is modified now as ‘...at the time of the starting date investment decision of the project activity, which is considered as the awarding of EPC Contract (September 2003)...’	The necessary corrections have been made in section 2.4 of the revised PD, version02. Hence this CL is resolved. <u>Conclusion</u> CL 11 Closed

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
<u>CL 12</u> Please clarify on the assumptions for the techno economic parameters for the project activity and the baseline with respect to EB guidelines on investment analysis and justify their conservativeness.	Section 2.4	The VCS PD, Section 2.5 is now updated to give evidences for each of these parameters in each alternative baseline scenario.	Evidences for each of these parameters in each alternative baseline scenario given in section 2.5 of the revised PD, version02 is now in line with EB guidelines on investment analysis. <u>Conclusion</u> CL 12 Closed
<u>CL 13</u> Please clarify; In section 2.4 of the PD, under techno economic parameters of the project activity for fuel charge it is indicated a 4205/1000 SCM, but in the financial sheet fuel cost is shown as 4174.	Section 2.4	The financial model is not updated to show the value consistent with the section 2.5 of the VCS PD.	The fuel charge value (4205/1000 SCM) is now made consistent in financial model calculation excel sheet and revised PD, version02. Hence this CL is resolved. <u>Conclusion</u> CL 13 Closed
<u>CL 14</u> Please clarify; 1. Board Resolution: Please furnish certified copy of the Board resolution in which the decision to invest was finalized.	Section 2.5	1. The certified copy of the Board resolution where investment decision in the project activity was taken is submitted.	1. The certified copy of the Board resolution in which the decision to invest in the project activity was taken is been submitted now.

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
2. The useful life of the project is assumed to be 15 years whereas the guidance in EB 51 para 3 envisages a maximum of 20 years. Credible evidence for this factor to be provided. 3. PLF: Has been assumed @ 85%. PI provide authentic evidences for the same which should also be in line with the guidance in EB 48. 4. Depreciation: Accelerated depreciation (80%) which is allowable under the IT Act has not been taken for the income tax depreciation calculations. Kindly clarify 5. Kindly provide the authentic evidence / URLs for the following:		2. As per the Guidance '<i>calculations shall as a preference reflect the period of expected operation of the underlying project activity (technical lifetime)</i>'. The technical lifetime is 15 years as per the Notification from Ministry of Power Dt. 29/03/1994. 3. The PLF Guidance referred is applicable for '<i>methodologies related to renewable energy generation</i>'. The PLF used here is from the DPR, Appendix 13 and also studied for $\pm 10\%$ sensitivity to cover all realistic range of variation in the parameter. 4. Accelerated depreciation is not applicable to the project activity plant (being a large scale fossil fuel fired power plant). As per understanding of the PP, accelerated depreciation is allowed to renewable energy generating units and high efficiency boilers (including the oil and gas fired boilers). Project activity plant does not involve boilers but uses gas turbine and HRSG (heat recovery steam generator) and steam turbine. 5. the evidences for each of these parameters are as below	2. The evidence submitted for the useful life of the project was verified and found appropriate. 3. The justification provided by the PP is acceptable. Hence this query is closed. 4. The justification provided by the PP for not Accelerated depreciation for the income tax depreciation calculations is acceptable. Hence this query is closed. 5. The evidences submitted for each of the following parameters were verified

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
• Rate of Depreciation • Per MW Cost • Debt : Equity ratio • Auxiliary consumption • GSHR (kcal/kWh) • Price of Fuel • Escalation rate • GCV (Kcal/ BTU) • O&M Expenses		a) Rate of depreciation is taken from Depreciation Norms for Generating Companies by the Notification from Ministry of Power dt. 29/03/1994 b) Cost is taken from the DPR, 2001 and escalation is in line with Project appraisal by Power Finance Corporation (Nov. 2003). c) DPR (Appendix 13) has taken same D/E (Refer 2.33) d) Auxiliary consumption- CERC (Terms & Conditions of tariff) Regulations, 2001; pg. 8 e) Gross station heat rate (GSHR) - PPA of GPL 1997, Clause 57 f) Price of fuel - DPR (Appendix 13) has taken Rs. 4,316/1000 SCM g) Escalation rate – 5%. This is conservative compared to 7% from 10 year historic price index [New York	and found appropriate. • Rate of Depreciation • Per MW Cost • Debt : Equity ratio • Auxiliary consumption • GSHR (kcal/kWh) • Price of Fuel • Escalation rate • GCV (Kcal/ BTU) and • O&M Expenses Hence this CL is resolved. <u>Conclusion</u> CL 14 Closed

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
		Mercantile Exchange (from Feb. 1994) shows 7% annual escalation - copy of data provided to DOE] h) GCV = 9382 kcal/ SCM from i) O&M expense – is taken as 3.76% of the capital cost and is sourced from Detailed Project Appraisal, Pg. 36	
<u>CL 15</u> The VER's calculated in section 4.3 of the PD is not consistent with VER calculation sheet submitted.	Section 4.3	The values are changed as per the VER sheet submitted to the DOE. It is now consistent throughout the PD.	The VERs is now made consistent in VER calculation sheet and the revised PD, version02. Hence this CL is resolved. <u>Conclusion</u> CL 15 Closed
<u>CL 16</u> Please clarify; In appendix 1 of the PD (page no.46) it is mentioned that "The agreement for the supply of 1.1 million SCM/ day (MCMD)	Appendix 1	There was a typographical error. The sentence is now modified to '1.96 million SCM/ day'. The calculation is shown in VER calculation excel sheet 'BE & PE" and as per, at 85% PLF, the daily average gas requirement is 1.88 MSCMD. This is lower than the gas supply agreement for project i.e. 1.96 MSCMD	Appendix 1 has now been modified in the revised PD, version02. Hence this CL is resolved. <u>Conclusion</u> CL 16 Closed

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
gas (more than that required for the operation) is signed before the financial closure".			
<u>CL 17</u> In appendix 1 of the PD (page no.62) for the natural gas availability in the project activity region the links provided for some references are not reproducible. Please clarify	Appendix 1	All the links are being submitted in separate pdf files now.	The referenced documents of the links provided in Appendix 1 are now submitted as separate PDF files. Hence this CL is resolved. <u>Conclusion</u> CL 17 Closed

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