



VCS VERIFICATION / CERTIFICATION REPORT

“ELECTRICITY GENERATION BY UTILIZATION OF WASTE HEAT FROM CALCINED PETROLEUM COKE PRODUCTION PROCESS” IN INDIA

(Verification period: 23 May 2005 to 11 July 2007)

REPORT No. 2007-2077

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DET NORSKE VERITAS



VCS VERIFICATION / CERTIFICATION REPORT

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Summary:
Det Norske Veritas Certification AS has performed a verification of the emission reductions reported for the CDM project “Electricity generation by utilization of waste heat from calcined petroleum coke production process” in Vishakhapatnam, Andhra Pradesh, India’ for the period 23 May 2005 to 11 July 2007 and hence prior to the start date of the CDM crediting period of the project of 12 July 2007.. The CDM project activity is registered under UNFCCC with the Registration Ref. No. being 1002.

In our opinion the GHG emissions reductions reported for the project in the monitoring report dated 4 December 2007 are fairly stated. The GHG emission reductions were calculated correctly on the basis of the baseline and monitoring p provided in the PDD of 04 December 2007.

Det Norske Veritas Certification AS is able to certify that the emission reductions from the “Electricity generation by utilization of waste heat from calcined petroleum coke production process” project in Vishakhapatnam Andhra Pradesh, India, during the period 23 May 2005 to 11 July 2007 amount to 306 158 t CO2 equivalent.

These emission reductions are not eligible as Certified Emission Reductions (CERs) under the CDM.

DNV does not take the responsibility towards the issuance and utilization of the VCU hereby verified and certified. Request for issuance of VCUs shall be made by the project proponent to an approved VCS Program Registry based on the requirements set out under the most recent version of the VCS Program Guidelines clause on VCS Registration.

The verification of reported emission reductions is based on the information made available to us and the engagement conditions detailed in this report. DNV Certification AS can not guarantee the accuracy or correctness of this information. Hence, DNV Certification AS cannot be held liable by any party for decisions made or not made based on this report.

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**Abbreviations**

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction(s)
CH ₄	Methane
CO ₂	Carbon dioxide
CO _{2e}	Carbon dioxide equivalent
CPC	Calcined Petroleum Coke
CFBB	Circulating Fluidized Bed Boiler
DNV	Det Norske Veritas
DNA	Designated National Authority
ERU	Emission Reduction Units(s)
FAR	Forward Action Request
GHG	Greenhouse gas(es)
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MVP	Monitoring and Verification Plan
N ₂ O	Nitrous oxide
NGO	Non-governmental Organisation
ODA	Official Development Assistance
PDD	Project Design Document
UNFCCC	United Nations Framework Convention for Climate Change
GWP	Global Warming Potential
WHRB	Waste Heat Recovery Boiler



1 INTRODUCTION

Rain Calcining Limited has commissioned Det Norske Veritas Certification AS to carry out the verification of emission reductions reported for the “Electricity generation by utilization of waste heat from calcined petroleum coke production process” project in Andhra Pradesh, India for the period of 23 May 2005 to 11 July 2007. This verification and VCU certification statement report summarizes the findings of the verification and VCU certification of the project, performed on the basis of both the IETA criteria for the Voluntary Carbon Standard (VCS) and subsequent decisions by the “Voluntary Carbon Standard Steering Committee”.

The project was registered as a CDM project activity with the crediting period starting on 12 July 2007. This verification has verified emission reductions occurring prior to the start date of the CDM crediting period. These emission reductions are not eligible as Certified Emission Reductions (CERs) under the CDM.

The voluntary GHG emission reductions were calculated correctly on the basis of the baseline and monitoring plan provided in the PDD of 04 December 2007, the formulae given in the VCU monitoring report dated 4 December 2007. The Project Design Document for the related CDM project activity of 4 December 2007 (version 2) was also used as a basis for the verification and VCU certification.

1.1 Objective

Verification of “pre-registration” emission reductions is the independent review and *ex-post* determination by a Verification Entity or Designated Operational Entity (DOE) of the monitored reductions in GHG emissions that have occurred as a result of the implementation of a already registered CDM project activity during the period from the date when the project started to operate until the date when the project was actually registered as a CDM project activity by the CDM Executive Board (EB).

According to the VCS, the verification also includes an independent third party assessment of the project design. In particular, the project baseline, monitoring plan and the project compliance with relevant applicable protocols and criteria (i.e. UNFCCC, VCS, host Party and others) are to be validated in order to confirm that the project design, as documented, is sound and reasonable and meets the applicable criteria. This seems as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of voluntary emission reductions.

It is important to note that the project activity has already been assessed by an independent third party in terms of the project design in particular, the project's baseline, the monitoring plan, and the project's compliance with relevant UNFCCC and host Party criteria for CDM (validation was conducted by DNV) and the project was registered as a CDM project activity by the CDM EB with the UNFCCC Registration Ref. No. 1002. This confirms that the project design as documented is sound, reasonable and meets the relevant UNFCCC and host Party criteria. Given the above, in terms of project design, this verification report only addresses VCS specific and unique criteria that have not been so far addressed in the validation report as per CDM requirements.



VCU certification is the written assurance by a Certification Entity that, during a specific period in time, a project activity achieved the emission reductions as verified.

According to the Verification Protocol and Criteria of the IETA's Voluntary Carbon Standard, the Certification Entity is defined as an entity which has been accredited as a Designated Operational Entity (DOE) by the CDM EB; where applicable, been accredited by the CDM Executive Board for the particular scope into which the project falls; or has been accredited as an approved Certification Entity by the VCS Steering Committee. DNV is an accredited DOE for the particular scope into which the project falls.

The objective of this verification was to verify and certify emission reductions reported for the "Electricity generation by utilization of waste heat from calcined petroleum coke production process" project in Andhra Pradesh for the period 23 May 2005 to 11 July 2007.

1.2 Scope

The Verification scope is:

- Verify whether the reductions generated by the project are in line with the Voluntary Carbon Standard Verification Protocol and contains all the necessary information to evidence the project's compliance with the twelve criteria in the Voluntary Carbon Standard Verification Criteria. That may include verifying applicable methodology.
- Verify that the project was implemented as described in the project design document during the whole verification period.
- Confirm that the monitoring system was implemented and fully functional to generate voluntary emission reductions (VER / VCUs*) without any double counting during the whole verification period.
- By checking the monitoring records and the emissions reduction calculation, express a conclusion whether reported data are accurate, complete, consistent, transparent, with a high level of assurance and free of material error or misstatement.

The verification is meant to ensure that reported emission reductions are complete and accurate and is based on generation of renewable energy using waste heat generated in calcined coke production process that replaces fossil-based electricity generation in the grid.

1.3 Description of the Project Activity

The project is located on the premises of Rain Calcining Limited (RCL), Visakhapatnam, Andhra Pradesh, India. The main objective of the CDM project activity is the generation of electricity by utilising the waste heat generated during the production of calcined petroleum coke (CPC) from calcination process of green petroleum coke (GPC).

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



RCL was undertaking a process modification and thereby planned to augment its production capacity from 300 000 MTPA to 480 000 MTPA. In the baseline scenario RCL was generating around 49 MW of electricity through a combination of operating (1) a circulating fluidized bed boiler (CFBB) and (2) a waste heat recovery boiler (WHRB1) with flue gases from the 300,000 MTPA CPC unit. The combined steam was fed through a steam header to the steam turbine with an installed capacity of 52.5 MW electricity generation. After internal consumption, the surplus electricity was supplied to several industrial consumers using the grid infrastructure.

Due to the increase in production capacity, additional quantity of waste heat was expected to be generated from the calcinations process. In the project activity, RCL has commissioned the new waste heat recovery boiler along with a flue gas scrubbing and particulate removal system (WHRB2). The CFBB boiler continues to be on a standby mode. The project activity now generates 48.5 MW power, and after accounting for captive consumptions, the surplus power is supplied to the grid and sold to industrial consumers through a wheeling arrangement. The power generated due to WHRB2, which is equivalent to 25 MW, has only been considered for the CDM activity.

Project Parties: India
 Title of project activity: Electricity generation by utilization of waste heat from calcined petroleum coke production process
 Project Entity: Rain Calcining Limited
 Location of the project activity: Visakhapatnam, Andhra Pradesh state, India

2 METHODOLOGY

The verification of the emission reductions has assessed all factors and issues that constitute the basis for emission reductions from the project. A risk-based verification approach has been employed, implying that emphasis should be on the significant contributors to emission reduction. The team has during its preparations identified the key reporting risks and used the assessment to determine to which extent the project operator's control systems were adequate for mitigation of these key reporting risks. In addition, other areas that can have an impact on reported emission reductions have also undergone detailed audit testing.

Verification team

K. Venkata Raman	DNV India	Team Leader, CDM Verifier,
Astakala Vidyacharan	DNV India	GHG Auditor
C. Kumaraswamy	DNV India	Technical Reviewer

Duration of verification

Preparations: From 01 November 2007 to 05 November 2007
 On-site verification: From 07 & 08 November 2007
 Reporting: From 27 November 2007 to 22 January 2008



2.1 Review of Documentation

The monitoring reports / 1// and the emission reduction calculations, provided in the form of spreadsheets submitted by Rain Calcining Limited, were assessed as a part of the verification. In addition, the Project Design Document / 2/, in particular the baseline estimations and the monitoring plan contained in the PDD were also assessed. Moreover, other documents / 3/ -/ 6/] were also assessed as evidence.

2.2 Site Visits

Detailed verification of all data contained in the monitoring report was performed during a site visit at Rain Calcining Limited on 07 and 08 November 2007. During the site visit, the following personnel were interviewed or assisted the verification team:

Rain Calcining Limited		Agenda
Mr. M. Satyanarayana Mr. S.V. Ramarao Mr. A. Papa Rao	General Manager (Operations) Manager (Co-Gen) Manager (Electrical)	<ul style="list-style-type: none"> • Detailed checking of the daily monitoring records and spreadsheets, as per monitoring plan and report • Assessment of calibration records • Environmental permits

2.3 Assessment

The data presented in the monitoring report were assessed in detail through a review of the detailed project documentation and production records, interviews with personnel at Rain Calcining Limited, collection of measurements, observation of established monitoring and reporting practices and assessment of the reliability of monitoring equipment. This has enabled the verification team to assess the accuracy and completeness of the reported monitoring results and verify the correct application of the approved monitoring methodology. Data from other sources include the grid emission factor, which is based on CEA data, was calculated ex-ante and fixed for the period, have been verified and assessed.

2.4 Reporting of Findings

Findings established during the verification may be that:

- i) the verification is not able to obtain sufficient evidence for the reported emission reductions or part of the reported emission reductions. In this case these emission reductions shall not be verified and certified;
- ii) the verification has identified material misstatements in the reported emission reductions. Emission reductions with material misstatements shall be discounted based on the verifiers ex-post determination of the achieved emission reductions.



A Forward Action Requests (FAR) should be issued, where: the actual project monitoring and reporting practices requires attention and /or adjustment for the next consecutive verification period, or an adjustment of the MP is recommended.

In the context of FARs, risks have been identified, which may endanger the delivery of high quality CERs in the future, i.e. by deviations from standard procedures as defined by the MP. As a consequence, such aspects should receive a special focus during the next consecutive verification. A FAR may originate from lack of data sustaining claimed emission reductions.

3 VERIFICATION FINDINGS

3.1 Project Implementation

The project has been implemented as planned. The project boundaries and key equipment for the project activity are in line with the PDD. The project boundary covers the following:

- Waste gas sources (CPC production unit) from where the waste gases are generated, collected, and then transferred to the project site. CFBB is on standby.
- Two WHRB units and power generation unit
- Southern regional electricity grid

The commissioning date of the project is 23 May 2005 and the generation details have been considered for the reporting from 23 May 2005 to 11 July 2007. These data have been verified by DNV with the generation details from daily generation reports, monthly power export/import certificates from APTRANSCO and production log sheets. The calibration certificates of the main meter and check meter have also been verified and found to be in order.

3.2 Project Baseline

The project's baseline has been assessed as part of the CDM validation of the project.

The approved baseline methodology ACM0004, version 02 – “Consolidated baseline methodology for waste gas and/or heat for power generation” has been applied to the project activity. In accordance with ACM0004, the baseline scenario selected for the project activity has been determined and validated as:

The project meets the following applicability criteria as stipulated in the methodology.

This methodology has been applied on the existing industrial facility of RCL that has under-gone an expansion programme. The project utilises the waste heat of the exhaust gases, from the calcination of green petroleum coke for generating electricity that displaces import of electricity from the southern regional grid (through APTRANSCO), and also displaces/ avoids captive electricity generation using fossil fuel.

No fuel switch is envisaged in the calcining operation where the waste heat is produced after the implementation of the project.

As the baseline scenario has been established to be grid power imports, option 2 of the methodology has been applied in determining the emission factor for the displaced electricity. In other words, by supplying electricity generated through waste heat recovery to industrial consumers, the project activity displaces electricity from the APTRANSCO grid, which forms a



part of southern regional grid. The estimation of the baseline emission factor is as per option 2 of the approved baseline methodology ACM0004 version 02, as the baseline scenario includes grid power. This has been estimated using the combined margin approach as stipulated in the approved methodology ACM0002.

The weighted average of the “operating margin” and the “build margin” emission coefficient for southern regional grid of India has been estimated to be 0.941 t CO₂/MWh. The “operating margin” emission factor has been estimated based on the “simple OM” approach as low cost / must run plants constitute less than 50% of the generation of southern regional grid. For OM calculation, the vintage data for the years 2002~2003, 2003~2004 and 2004~2005 is used and operating margin emission factor is evaluated to be 1.150 t CO₂/MWh. For the build margin, 20% of the most recently installed plants have been accounted for, in terms of electricity generation. The build margin emission factor has been evaluated to be 0.733 t CO₂/MWh. The completeness of the set of power plants as well as the correctness of the reported fuel consumption and electricity generation data has been verified. All data has been sourced from data published by the central electricity authority (CEA).

3.3 Project Additionality

The project’s additionality has been assessed as part of the CDM validation of the project.

The additionality of the project has been established using the “Tools for the demonstration and assessment of additionality” version 02 dated 28 November 2005. The project activity demonstrates the additionality through investment analysis and the barriers of prevailing practice and technology as per option B of VCS standard version 1. While the details on the validation of additionality are available in DNV’s validation report 2 July 2007, the same is summarized as follows:

Identification of alternatives to the project activity consistent with current laws and regulations:

The following alternatives have been identified:

- a) The proposed project is not undertaken as a CDM project activity.
- b) Continuation of the existing CFBB and supplying power to industrial consumers
- c) Captive power generation at RCL with renewable resources
- d) Industrial consumers generate captive power and not buy power from RCL
- e) Industrial consumers buy all power from grid

All identified alternatives comply with the requirements of applicable statutory/regulatory laws of India.

Investment analysis

It is demonstrated that RCL was generating power and selling to the grid in the baseline scenario and continues to do so in the project scenario. Hence, there are no additional revenues **because of** the project activity as compared to the baseline scenario. The project has only one source of revenue i.e. from sale of CERs from the project. Hence simple cost analysis has been accepted during validation for demonstrating investment barrier. The investment in the project activity was evidenced at INR 589 million. It has been demonstrated that the IRR of the project activity (at a plant load factor of 95%) without considering CDM revenue is 3.58%. As the project



activity has availed loans, without infusion of any equity, the prevailing rupee interest rate at 8% has been considered for comparison of the project IRR. It has been demonstrated that with CDM revenues the project IRR improves to 15.95%.

Barrier analysis

Investment barrier: RCL has demonstrated that there is continued loss of revenue due to the decreasing electricity tariff (Rs.3.95/ kWh in 2000-01 to Rs.3.25/ kWh in 2005-06) with anticipated further reductions. The anticipated CDM revenue is expected to alleviate the following risks to the project activity as well:

- compulsion to sell power at a much reduced price to the grid in case the industrial consumers refuse to buy from RCL at any time during the crediting period, due to the falling tariff
- Any downtime on the WHRB2 would lead to CPC production being temporarily suspended, leading to lower CPC production.

Prevailing practice: In India RCL is the first and only project proponent to implement waste heat recovery based power generation, out of four similar units producing CPC. Thus it is confirmed that the implementation of the project activity does not represent a common practice in the sector.

Common practice analysis

As indicated in step 3, the generation of electricity using waste heat is not a common practice in India in the Calcined petroleum coke manufacturing sector. There are four units manufacturing CPC from GPC in India and none of them have activity similar to that of the project activity. This has been demonstrated and confirmed through annual reports and official web sites of those organisations, where electricity generation and sales have been included.

In conclusion it is deemed likely that the project would not have been possible to implement without the support of the expected CDM revenues.

3.4 Completeness of Monitoring

As indicated in the PDD version 02 dated 04 December 2007, the following parameters are monitored.

- Total electricity generated by the power plant – measured using calibrated meter.
- Total auxiliary energy consumed by project - estimated as per formulae given in PDD.
- Electricity exported to the grid – measured using calibrated APTRANSCO meter.
- Net electricity supplied to the facility (EGy) – measured using various calibrated meters in facility.
- Quantity of steam generated by WHRB1 and WHRB2- measured using flow meters. CFBB was not operational as a standby.
- Emission factor for southern grid power mix – fixed ex-ante at 0.941 t CO₂/MWh.

Necessary management system procedures including responsibility and authority of monitoring activities have been verified to be as per established and documented quality management system procedures. Knowledge of personnel associated with the project activity was also found to be satisfactory.



3.5 Accuracy of Emission Reduction Calculations

No significant reporting risks have been identified for the data reported. The parameters reported, including source, frequency and review criteria as indicated in the revised monitoring plan were verified to be correct and in line with the monitoring plan of the PDD. The same has been archived in the project monitoring excel worksheet. The worksheet contains all the calculations for the period 23 May 2005 to 11 July 2007.

Net electricity generation from WHRB2 when fully or partially operating is calculated as follows:

- (1) Total gross electricity generated from WHRB1 + WHRB2 + CFBB (standby) = GEN-EM-01
- (1.1) Total electricity generated from WHRB2, based on the WHRB2 steam fraction to the total steam generated by WHRB1, WHRB2 and CFBB = $EG_{GEN} = [FTS2090/(FTS1020+FTS2090+FTS722)] * (1)$
- (2) Auxiliary consumption in power plant = (GEN-EM-01 - TVEM-01) - (CAL1-IDF-1 + CAL1-EM-1 + CAL1-EM-2 + CAL1-EM-3 + CAL2-IDF-2 + CAL2-EM-1 + CAL2-EM-2)
- (2.1) Auxiliary consumption in power plant for converting steam from WHRB2 to electricity = $EG_{AUX} = [FTS2090/(FTS1020+FTS2090+FTS722)] * (2)$
- (3) Total net electricity generated from WHRB2 = $EG_y = (1.1) - (2.1)$.

It is confirmed CFBB was not operational during the period. It has been verified, that the diversion of waste heat from WHRB1 to WHRB2 is not carried out, as each boiler is directly attached to independent streams of Calcined petroleum Coke kilns and only steam headers get combined before entering Turbine block.

Total electricity generated minus the auxiliary electricity consumption for the power plant is considered as net electricity generated by power plant. The Steam generated by both WHRB1 and WHRB2 is monitored and weighted average of steam is used to estimate the net electricity generated by the project activity. These have been determined as follows:

Net electricity supplied by the power plant, $EG_y = EG_{GEN} - EGAUX$ (Electricity generated by Power plant –Auxiliary power consumed by power plant)

The auxiliary power EG_{AUX} is estimated as per the equation mentioned in the monitoring report and PDD (and as stated above)

Steam generated by WHRB1, WHRB2 and CFBB boilers is monitored separately using calibrated flow meters. The weighted average of steam is used to account net generated power equivalent to the project activity i.e. WHRB2 using the formulae mentioned in PDD.

All the aforementioned formulae are confirmed to be as per the PDD, and have been applied correctly in the revised monitoring report of version 03 dated 04 December 2007. The project does not have any leakage issues to be considered and is in line with the monitoring plan



contained in the PDD. The emission reductions are the difference of the baseline emissions and the project emissions. The calculations have been verified and conform to the submitted PDD. The project utilizes various process control systems and its components like distributed control system (DCS). The electrical generation readings are read directly from the 0.2 class energy meters and logged in the daily log book and also maintained as a soft copy. The steam flows are monitored using calibrated flow meters. The verification team has assessed all continuous and daily data and the aggregated numbers are found to be correct.

3.6 Quality of Evidence to Determine Emission Reductions

The emission reductions reported during the period starting from 23 May 2005 to 11 July 2007 was verified to be 306 158 tCO_{2e}.

3.7 Management System and Quality Assurance

Rain Calcining Limited has developed GHG emission reduction management system for management of the project in line with its existing ISO 9001 quality management system. The governing procedures under the same cover the calibration and quality assurance of the monitoring and metering systems for the project activities. External/internal calibrations of the electricity meters are carried out annually and the calibration certificates of the instruments used for data monitoring and recording were also verified during the site visit.



4 CERTIFICATION STATEMENT

Det Norske Veritas Certification AS has performed a verification of the emission reductions reported for the “Electricity generation by utilization of waste heat from Calcined petroleum coke production process” managed by Rain Calcining Limited for the period 23 May 2005 to 11 July 2007 and thus prior to the project’s CDM crediting period starting on 12 July 2007. These emission reductions are not eligible as Certified Emission Reductions (CERs) under the CDM, and the emission reductions are thus claimed as Voluntary Carbon Units (VCU) under the Voluntary Carbon Standard (VCS).

Rain Calcining Ltd is responsible for the collection of data in accordance with the validated monitoring plan (with applicable deviations) the reporting of GHG emissions reductions from the project.

It is DNV’s responsibility to express an independent verification statement on the reported GHG emission reductions from the project.

In our opinion the GHG emissions reductions reported for the project in the revised monitoring report of version 03 dated 04 December 2007 are fairly stated.

The GHG emission reductions were calculated correctly on the basis of the \monitoring plan provided in the PDD of 04 December 2007.

Det Norske Veritas Certification AS is able to certify that the emission reductions from the “Electricity generation by utilization of waste heat from Calcined petroleum coke production process” in Vishakhapatnam, Andhra Pradesh in India managed by Rain Calcining Limited during the period 23 May 2005 to 11 July 2007 amount to 306 158 tCO₂ equivalent.

DNV does not assume any responsibility towards the issuance and utilization of the VCUs hereby verified and certified. Request for issuance of VCUs shall be made by the project proponent to an approved VCS Program Registry based on the requirements set out under the most recent version of the VCS Program Guidelines clause on VCS Registration.

The verification of reported emission reductions is based on the information made available to us and the engagement conditions detailed in this report. DNV Certification AS cannot guarantee the accuracy or correctness of this information. Hence, DNV Certification AS cannot be held liable by any party for decisions made or not made based on this report.

Bangalore and Oslo, 22 January 2008.

Kumaraswamy Chandrashekhara
Manager (South Asia)

Michael Lehmann
Technical Director
International Climate Change Services



5 REFERENCES

Documents provided by the Project Participants that relate directly to the GHG components of the project. These have been used as direct sources of evidence for the periodic verification conclusions, and are usually further checked through interviews with key personnel.

- / 1/ Rain Calcining Limited: “Electricity generation by utilization of waste heat from Calcined petroleum coke production process” project Monitoring report for the period 23 May 2005 to 11 July 2007 of version 01 dated 17 October 2007 and version 03 dated 04 December 2007.
- / 2/ Rain Calcining Limited : PDD for” Electricity generation by utilization of waste heat from Calcined petroleum coke production process” project dated 04 December 2007
- / 3/ The Voluntary Carbon standard Version 1, March 2006.

Background documents related to the design and/or methodologies employed in the design or other reference documents.

- / 4/ CDM Executive Board: ACM0004 - Consolidated baseline (and monitoring) methodology for waste gas and/or heat and/or pressure for power generation. Version 02 of 3 March 2006.
- / 5/ International Emission Trading Association (IETA) & the World Bank’s Prototype Carbon Fund (PCF): *Validation and Verification Manual*. <http://www.vvmanual.info>
- / 6/ CDM Executive Board: Tool for the demonstration and assessment of additionality. Version 02 of 28 November 2005.

Persons interviewed during the initial verification, or persons who contributed with other information that are not included in the documents listed above.

- | | | |
|------|----------------------|------------------------|
| / 7/ | Mr. M. Satyanarayana | Rain Calcining Limited |
| | Mr. S.V. Rama Rao | Rain Calcining Limited |
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