VALIDATION REPORT

ENERGY EFFICIENCY AND FUEL SWITCHING MEASURES IN CAUSTIC SODA AND SODIUM CYANIDE PLANT AT VADODARA COMPLEX OF GACL, INDIA

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DET NORSKE VERITAS

VALIDATION REPORT

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Approved by: Einar Telnes Director	Organisational unit: DNV Certification, International Climate Change Services
Client: Gujarat Alkalies and Chemicals Limited.	Client ref.: V.K.Gulati

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Summary

Det Norske Veritas Certification Ltd. (DNV) is currently validating the "Energy efficiency and fuel switching measures in Caustic Soda and Sodium Cyanide plant at Vadodara complex of GACL" project, on the basis of UNFCCC criteria for the CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures, the simplified modalities and procedures for small-scale CDM project activities and the subsequent decisions by the CDM Executive Board. This validation report summarizes the findings of the validation.

The validation consisted of the following three phases: i) a desk review of the project design and the baseline and monitoring plan, ii) follow-up interviews with project stakeholders and iii) the resolution of outstanding issues and the issuance of the final validation report and opinion.

In summary, it is DNV's opinion that the "Energy efficiency and fuel switching measures in Caustic Soda and Sodium Cyanide plant at Vadodara complex of GACL" project, as described in the project design document of December 2006, meets all relevant UNFCCC requirements for the CDM and correctly applies the approved simplified baseline and monitoring methodology AMS-II.C (version 7), II.D (version 7) and III.B (version 9). DNV Certification thus requests the registration of the project as a CDM project.

Report No.: 2005-9023-1	Subject Group: Environment	
Report title: Energy efficiency and fuel switching measures in Caustic Soda and Sodium Cyanide plant in Vadodara (Gujarat in India) managed by Gujarat Alkalies and Chemicals Limited.		
Work carried out by: Vinod Richharia, K V Raman, Michael Lehmann		
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Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CH_4	Methane
CL	Clarification request
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
GACL	Gujarat Alkalies and Chemicals Limited
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MVP	Monitoring and Verification Plan
N_2O	Nitrous oxide
NGO	Non-governmental Organisation
ODA	Official Development Assistance
PDD	Project Design Document
UNFCCC	United Nations Framework Convention on Climate Change

1 INTRODUCTION

GACL has commissioned Det Norske Veritas Certification Ltd. (DNV) to validate the Energy efficiency and fuel switching measures in Caustic Soda and Sodium Cyanide plant at Vadodara complex of GACL, in Vadodara, Gujarat, India (hereafter called "the project"). This report summarises the findings of the validation of the project, performed on the basis of UNFCCC criteria for small-scale CDM projects, as well as criteria given to provide for consistent project operations, monitoring and reporting

The validation team consists of the following personnel:

Mr Vinod Richharia	DNV Certification Bangalore	Team Leader, GHG auditor
Mr K V Raman	DNV Certification Bangalore	CDM Validator
Mr C Kumaraswamy	DNV Certification Bangalore	Technical Reviewer
Mr Michael Lehmann	DNV Certification Oslo	Energy sector expert

1.1 Validation Objective

The purpose of a validation is to have an independent third party assess the project design. In particular, the project's baseline, monitoring plan, and the project's compliance with relevant UNFCCC and host Party criteria are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

1.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD). The PDD is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords and the relevant decisions by the CDM Executive Board. The validation team has, based on the recommendations in the Validation and Verification Manual /3/, and employed a risk-based approach, focusing on the identification of significant risks for project implementation and the generation of CERs.

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

1.3 Description of Proposed CDM Project

Gujarat Alkalies and Chemicals Limited, located at Vadodara in the state of Gujarat, India, has taken voluntary initiatives to identify and implement energy efficiency programmes, primarily power conservation, at their Vadodara complex.

The measures adopted under the energy efficiency programme can be broadly classified into:
The project activity consists of following measures:

1. Energy efficiency measures-
    a. Replacement of tray dryer system with paddle dryer system to enable reduction in steam and electricity consumption for drying sodium cyanide.

   b. Replacement of less efficient brine pumps with higher efficiency pumps
   c. Replacement of first generation electrolyser cells with IV generation electrolyser cells in cell house 1 and 2 and up-gradation of distributed control software system for monitoring and controlling electrolysis process in caustic soda plant and thus, reducing energy consumption.
2. Switching from furnace oil to natural gas in the boiler house of sodium cyanide plant for process steam generation.
3. Switching from natural gas to hydrogen in the firing system of the caustic concentration unit II (CCU-II) for concentration of caustic soda flakes (CSF).

The total anticipated energy savings due to the project is around 10.26 GWh per annum. The project is estimated to reduce on an average of 13 157 tonnes of CO_2e per annum.

2 METHODOLOGY

The validation consists of the following three phases:

I a desk review of the project design and the baseline and monitoring methodology
II follow-up interviews with project stakeholders
III the resolution of outstanding issues and the issuance of the final validation report and opinion.

In order to ensure transparency, a validation protocol was customised for the project, according to the Validation and Verification Manual /3/. The protocol shows in a transparent manner criterion (requirements), means of verification and the results from validating the identified criteria. The validation protocol serves the following purposes:

- It organises, details and clarifies the requirements a CDM 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 three tables. The different columns in these tables are described in Figure 1.

The completed validation protocol is enclosed in Appendix A to this report.

Findings established during the validation can either be seen as a non-fulfilment of validation protocol criteria or where a risk to the fulfilment of project objectives is identified. Corrective action requests (CAR) are issued, where:

i) mistakes have been made with a direct influence on project results;
ii) validation protocol requirements have not been met; or
iii) there is a risk that the project would not be accepted as a CDM project or that emission reductions will not be certified.

The term Clarification may be used where additional information is needed to fully clarify an issue

Validation Protocol Table 1: Mandatory Requirements for CDM Project Activities			
Requirement	***Reference***	***Conclusion***	***Cross reference***
The requirements the project must meet.	*Gives reference to the legislation or agreement where the requirement is found.*	*This is either acceptable based on evidence provided (**OK**), a **Corrective Action Request (CAR)** of risk or non-compliance with stated requirements or a request for **Clarification (CL)** where further clarifications are needed.*	*Used to refer to the relevant checklist questions in Table 2 to show how the specific requirement is validated. This is to ensure a transparent Validation process.*

Validation Protocol Table 2: Requirement Checklist				
Checklist Question	***Reference***	***Means of verification (MoV)***	***Comment***	***Draft and/or Final Conclusion***
The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organised in seven different sections. Each section is then further sub-divided. The lowest level constitutes a checklist question.	*Gives reference to documents where the answer to the checklist question or item is found.*	*Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable.*	*The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached.*	*This is either acceptable based on evidence provided (**OK**), or a **Corrective Action Request (CAR)** due to non-compliance with the checklist question (See below).A request for **Clarification (CL)** is used when the validation team has identified a need for further clarification.*

Validation Protocol Table 3: Resolution of Corrective Action Requests and Requests for Clarification			
Draft report corrective action requests and requests for clarifications	***Ref. to Table 2***	***Summary of project participants' response***	***Final conclusion***
If the conclusions from the draft Validation are either a Corrective Action Request or a Clarification Request, these should be listed in this section.	*Reference to the checklist question number in Table 2 where the Corrective Action Request or Clarification Request is explained.*	*The responses given by the project participants during the communications with the validation team should be summarised in this section.*	*This section should summarise the validation team's responses and final conclusions. The conclusions should also be included in Table 2, under "Final Conclusion".*

Figure 1 Validation protocol tables

2.1 Review of Documents

The PDD /1/ submitted by GACL (final version dated of December 2006 and the earlier version) and additional background documents related to the project design and baseline were reviewed as a part of the validation.

2.2 Follow-up Interviews

On 11 November 2005, DNV Certification performed interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. Representatives of GACL and local stakeholders were interviewed. The main topics of the interviews are summarised in Table 1.

Table 1 Interview topics

Interviewed organisation	Interview topics
GACL Mr.V.K.Gulati – Sr. General Manager (Materials Management, Export & Resource mobilisation) Mr.R.K.Gupta – Dy.General Manager Mr. A.K.Tatte Mr. R. B. Shah	➢ Clarifications of the comments identified in the document review ➢ Clarifications of the stakeholders comments process ➢ Understanding of the material issues that may impact the CER generation ➢ Systems in place to ensure the proper implementation of the project
Mr.Chandrakant G Patel – Sarpanch, Gram Panchayat, Ranoli Village	➢ Stakeholder views on the projects

2.3 Resolution of Clarification and Corrective Action Requests

The objective of this phase of the validation was to resolve any outstanding issues which needed to be clarified for DNV's positive conclusion on the project design. The corrective action requests and requests for clarification raised by DNV Certification Ltd., presented to the project participants in DNV's draft validation report of 17 November 2005 (rev. 0) were resolved during communications between the client and DNV. To guarantee the transparency of the validation process, the concerns raised and responses given are documented in the validation protocol in Appendix A.

Since modifications to the Project design were necessary to resolve DNV's concerns, the client decided to revise the PDD and resubmitted the PDD, last on 30 December 2006. After reviewing the revised PDD, DNV issued this final validation report and opinion.

2.4 Internal Quality Control

The draft validation report including the initial validation findings underwent a technical review before being submitted to the project participants. The final validation report underwent another technical review before requesting registration of the project activity. The technical review was performed by a technical reviewer qualified in accordance with DNV's qualification scheme for CDM validation and verification

3 VALIDATION FINDINGS

The findings of the validation are stated in the following sections. The validation criteria (requirements), the means of verification and the results from validating the identified criteria are documented in more detail in the validation protocol in Appendix A.

The final validation findings relate to the project design as documented and described in the revised and resubmitted project design documentation of December 2006.

3.1 Participation Requirements

The proposed project is being proposed as a unilateral project by Gujarat Alkalies and Chemicals Limited located at Vadodara in India. India has ratified the protocol and established the DNA as per participation requirements under the Kyoto Protocol. The DNA of India approved the project on 21 November 2005 /2/. No public funding has been used for the project activity.

The project is expected to contribute to sustainable development through increased energy efficiency and resource conservation.

3.2 Project Design

The project involves implementation of the following measures to reduce energy consumption in the Vadodara complex of GACL:

1. Energy efficiency measures-
    a. Replacement of tray dryer system with paddle dryer system to enable reduction in steam and electricity consumption for drying sodium cyanide.
    b. Replacement of less efficient brine pumps with higher efficiency pumps
    c. Replacement of first generation electrolyser cells with IV generation electrolyser cells in cell house 1 and 2 and up-gradation of distributed control software system for monitoring and controlling electrolysis process in caustic soda plant and thus, reducing energy consumption.
2. Switching from furnace oil to natural gas in the boiler house of sodium cyanide plant for process steam generation.
3. Switching from natural gas to hydrogen in the firing system of the caustic concentration unit II (CCU-II) for concentration of caustic soda flakes (CSF).

In the absence of the project the inefficient equipment and drives and use of higher GHG intensive fuels would have continued operation resulting in excess power and resource consumption.

All equipment affected by the project is identified in the PDD/1/. The project was started in July 2002 and completed in a phased manner by June 2005. The project proponent has chosen a fixed crediting period of 10 years with the starting date of the crediting period as 2003-01-01.

DNV has not come across any diverted ODA being used for this project.

3.3 Project Baseline

The most likely baseline scenario of the project is the continuation of the existing setup with emissions due to the additional consumption of electricity and furnace oil/natural gas.

The project applies the approved baseline methodology AMS II. C – Demand side energy efficiency programmes for specific technologies (version 7), Type II D – Energy efficiency and fuel switching measures for the industrial facilities (version 7) and Type III B – Switching of fossil fuels (version-09) for small scale CDM projects.

AMS II. C has been applied to the project activity of replacement of less efficient brine pumps with higher efficiency pumps (project 1.b as listed under 3.2). These are specific technologies installed at various locations in the plant and confirmed by DNV to lead to a reduction in annual electricity consumption to 0.25GWh. This is less than the stipulated 60GWh for the project category. As per the baseline methodology, the energy displaced is electricity and the energy baseline is calculated as sum of devices replaced, it's related of power multiplied by the average annual operation hours. The energy baseline is also multiplied by an emission coefficient (measured in kg CO_2equ/kWh) for the electricity displaced

For project 1.a and 1.c (as listed under 3.2), the energy baseline of the replaced equipment is the differential of the amount of power drawn by the equipment in the baseline scenario and the power drawn by the replaced equipment after implementation of the project. Thus the energy baseline is the additional amount of electricity that would have been consumed by the existing equipment in absence of the project. All the equipment replaced under the project is included within the project boundary. No equipment is likely to be substituted or replaced within the crediting period. The energy saving measures results in a total saving of around 10.01 GWh per annum.

For projects 2 and 3 (as listed under 3.2), the emission baseline is the current emissions of the facility expressed as emissions per unit of output. AMS-III.B is justified as it is apparent that in the absence of the project activity, the baseline would be the consumption of natural gas for firing at the furnace of CCU II and furnace oil in the boiler house at the sodium cyanide plant. Therefore the baseline emissions are represented by the emissions that would have occurred due to the burning of natural gas and furnace oil at the Vadodara complex. The two measures reduce anthropogenic emissions by sources and directly emit 4 507 tCO_2 annually.

3.4 Additionality

The project additionality has been demonstrated by assessing the investment barrier, technological barrier, barriers due to prevailing practice and other barriers relevant to the project.

The managing directors note dated 22 January 2003 was presented to demonstrate that GACL was keen on identifying project activities for their economic viability and thereby utilize the benefits of CDM.

Investment barrier:

GACL has made a total investment of INR 91 million in these project activities (for those involving Type II methodologies) and the payback for the same has been determined to 4.9 years. The investment and efforts are initiated only with the aim to reduce GHG emissions. Records pertaining to investment and purchases for the measures initiated were presented and justify that energy savings and emission reductions were the sole driver for the projects. As it is a more attractive venture to invest in modern technologies either at the design phase of a plant or during a total revamp of the unit, this partial investment does not bring in sufficient returns to make it financially attractive.

It has been demonstrated that by switching from natural gas to hydrogen, GACL is likely to incur losses on revenue which will partly be recovered from CDM benefits, for the following reasons:

- GACL had the option of selling hydrogen to third parties
- Natural gas was available at a lower price and hence a more economical option for GACL compared to hydrogen
- There was a steady market for hydrogen and demand for hydrogen is evidenced by enquiry letters from process industries such as *Deepak Nitrite, Nishal Enterprises and Dragon Drugs*
- It has also been demonstrated and verified by DNV that the quantity of natural gas required in CCU-II was otherwise available with GACL at the time of switch over to hydrogen and also the infrastructure for selling hydrogen was available with GACL

Common practice barrier:

The barrier for common practice demonstrates that there is no law in India that mandates adoption of energy efficiency programmes. The energy conservation initiative taken by GACL is not a common practice in this segment of process industries. GACL is also the first industry in India to use paddle drier technology for sodium cyanide drying process. Similarly, it is not a common practice in India to use natural gas for steam generation purpose as any shortfall will directly affect the productivity of the plant

It is not a common practice in India to use the hydrogen as a fuel for internal purposes as the loss due to reduced sale of hydrogen to other industries is estimated to INR 50 million/year.

Other barriers:

Installation of 4th generation cells is not yet prevalent in India and GACL has taken a technological risk in making this investment. Any failure is likely to affect the productivity of the caustic soda plant directly. Moreover, GACL has invested additional efforts in improving the skills of its staff for the operation of the upgraded DCS software, 4th generation cells and paddle dryer technology.

Thus it is sufficiently demonstrated that the investment, common practice and other barriers are real for the project activity and prevents any widespread replication. The above mentioned arguments thus demonstrate that the project is not a likely baseline scenario and that the emission reductions resulting from the project are additional.

3.5 Monitoring Plan

The selected monitoring methodology is in line with the monitoring methodology for project category types AMS-II.C (version 7), II.D (version 7) and III.B (version 9). It is justified that the selected monitoring methodologies are applicable for the project activity.

For AMS II C: The monitoring involves monitoring the "power" and "operating hours" of the equipments replaced.

For AMS II D: monitoring essentially involves monitoring of energy consumption provided at each of the plant area related to the technology change i.e. paddle dryer and DCS upgradation;

For AMS III B: monitoring essentially involves monitoring of the fuel used (natural gas, furnace oil and hydrogen) and output of the boiler house and CCU-II.

The methodology involves monitoring and measurement of electricity consumption by the equipment in the baseline, electricity consumed by the new installations, determination of the emission co-efficient for the electricity based on self generation and import from the grid. The energy savings due to the project is calculated as the difference of the energy consumed by the baseline equipment and the project equipment. The difference of energy consumed is annualised using the annual operating hours of the main drive. For equipment and devices with variable loads, actual power consumed is being monitored on a daily basis and this is considered acceptable.. The specifications of the replaced equipment are also monitored under the project activity.

Procedures for monitoring and verification have been presented and found to be in order. The plan details the parameters, source, method of collection and method of archiving the data which is sufficiently adequate. The organisation has established a management structure for the CDM project with clear roles and responsibilities, calibration of measuring instruments and authority for necessary corrective actions.

3.6 Calculation of GHG Emissions

The project essentially involves replacement of equipment/drives with energy efficient devices or drives.

The GHG emission reduction due to electricity savings measures is calculated as the difference in power consumed by the baseline equipment and the newly installed drive under the project activity. The baseline energy requirement of the equipment is calculated based on the monitored energy requirement of the drive and the annual operating hours of the main equipment. The actual energy consumed by the replaced equipment under the project activity is measured, as required by AMS II D. Only in the measures such as motors, the rated power of the device replaced at the baseline is considered. Thus, the saving in energy consumption is converted to tonnes of CO_2 equivalent using the emission factor for the electricity consumed in the project.

In the project activity the electricity consumed is a mix of self generation (power from the captive power plant in the Dahej complex of the GACL is wheeled to the GACL Vadodara facility) which is natural gas based and grid electricity. The western regional grid from which the plant imports power is taken as the baseline electrical grid. The grid emission factor is calculated *ex-ante* by applying the approved methodology AMS ID version-09. The grid emission factor is computed as 1136 tCO_2/GWh using the combined margin method comprising of simple operating margin and build margin for the western regional grid. For the OM calculation the

vintage data for the years 2002~2003, 2003~2004 and 2004~2005 is used. For the build margin, the most recently installed plants that account for 20% of the electricity generation have been considered. 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. The emission factor for self generation is evaluated to be 460.12 tCO_2/GWh, based on the specific heat consumptions, annual power produced from the captive plant and using IPCC default factors for natural gas. Based on the share of power to be used (grid power and captive power), the energy baseline for the project activities in the caustic soda plant and sodium cyanide will be evaluated and used in the determination of the CER's.

There is no leakage associated with the project as the equipment which have been disposed off due to the project have not been transferred for any other service. Records of disposal of the inefficient machines have been presented and are found to be in order.

The conservative estimate of emission reduction as a result of the project is around 13 157 tonnes of CO_2 equivalent per year over the selected 10 years crediting period

3.7 Environmental Impacts

EIA studies are not required for the project activity under Indian legislation However EIA has been done which describes the possible impacts for these measures. GACL is otherwise in compliance with all the applicable environmental regulations. The proposed project does not result in any adverse environmental impacts.

3.8 Comments by Local Stakeholders

A stakeholder consultation process consisted of a meeting of identified stakeholders arranged on 7 October 2005 at the site of GACL Vadodara complex. Comments were solicited from stakeholders representing the local community, suppliers and distributors. The local stakeholders support the project and no modifications to the project design were necessary. As the project is not expected to have considerable social and environmental impacts, the local stakeholder consultation process carried out for the project is deemed sufficient.

4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS

The PDD of October 2005 was made publicly available on DNV's climate change website (www.dnv.com/certification/climatechange) and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from I November 2005 to 30 November 2005.

One comment was received on 2005-11-30. The comment received (in unedited form) is given in the below text box.

Comment by: perumal, CMC Pvt Ltd,Kolkata

Inserted On: 2005-11-30

Subject: comments on sodium cynaide plant

Comment: Sodium cyanide plant:

Investment barrier

Energy Efficiency:

The PP has stated that the project has investment barrier which could be unrealistic based on the below

Investment INR 91 millions

Savings 13.25 Gwh

Unit cost at a highly conservative figure 3.50 /unit

Monetary savings per year INR 46.375

Simple Pay back period 1 year and 10 months

The pay back period of less than 2 years is a low risk project in terms of Investment. So I feel that the project is BAU with respect to Investment.

Fuel switching:

It is quiet confusing in the rates of the NG explained in the PDD .By the same project proponent three projects has been submitted for availing carbon credits.

1) Caustic soda and sodium cyanide plant at vadodara complex of GACL(Present project):

Hydrogen cost per SCM 7.26

NG Cost per SCM 3.8

Methodology applied AMS III B

Year of crediting period 2003

2) Switching of fuel from Natgas to hydrogen in CCU – II at Dahej complex of GACL

Hydrogen cost per SCM 6.25

NG Cost per SCM 7.26

Methodology applied AMS III B

Year of crediting period 2005

3) Efficient utilaization of waste heat and natural gas at dahej complex of GACL:

Hydrogen cost per SCM NIL

NG Cost per SCM 3.6

Methodology applied AMS II D

Year of crediting period 2003

From the above I have a doubt whether the prices of the gases are transparent and conservative. Does both the prices of NG and hydrogen are of same year or different.

As the PDD has mentioned its savings very elaborately, if it could have supplemented with investment for each Energy efficiency activity then the understanding would be still better.

Response by GACL:

The project activity consists of following measures:

1. Energy efficiency measures:
   a. Replacement of Tray Dryer System with Paddle Dryer System to enable reduction in steam and electricity consumption for Drying Sodium Cyanide.
   b. Retrofit measures like replacement of less efficient pumps and lights with higher efficiency pumps and lights.
   c. Up-gradation of distributed control software system for monitoring and controlling electrolysis process in Caustic Soda Plant and thus, reducing energy consumption.
   d. Installation of Eco-ventilators at Warehouses, Stores and Instrumentation/Mechanical workshops to reduce power consumption.
2. Switching from Furnace Oil to Natural Gas in the Boiler House of Sodium Cyanide Plant for process steam generation.
3. Switching from Natural Gas to Hydrogen in the firing system of the Caustic Concentration Unit-II (CCU-II) for concentration of Caustic Soda Flakes (CSF).

Actual energy saving achieved from all the above activities is 13.5 Gwh, which is less than 15 Gwh.

The total additional investment on these energy saving CDM activities is INR 91 million.

This additional direct investment does not include the investments already incurred by the company on the original equipment, which have been either replaced or modified. The approximate depreciated value for these equipments is in the range of around INR 22 million.

Another important aspect to be considered is that for an addition/deletion in the plant, there is some loss of production due to shutdown required for incorporation of any new additions/modifications requirements. As the project is a small-scale project, the impact of depreciated value of equipments and loss due to changeover and other potential losses have not been considered.

The unit cost mentioned in the comment is Rs.3.50/unit. GACL is getting power in its Vadodara Complex from captive GIPCL Power Plant and the cost of power for GIPCL Power Plant as well as from Captive Power Plant at Dahej Complex is low. The average cost of power for Vadodara Complex is Rs.2.0 and not Rs.3.5 as mentioned in the comment.

Thus, the monetary savings of INR 46.375 would come down to less than 40% after incorporating correct power cost and other factors.

Payback period shall be nearly 5 years 3 months after incorporating the revised power cost, loss of profit, depreciated value of idle equipments etc.

Response to fuel switch comments:

(A) Vadodara Complex:

GACL is sourcing Natural Gas from GAIL, which is supplying administered price Natural Gas on fallback basis. The prices of this administered price gas considered in the PDD is Rs.3.8/SCM as mentioned in the PDD's [based on actual billing inclusive taxes (at the time of switchover) etc].

The Hydrogen cost of Rs.7.26/NM^3 given in the PDD's is the actual realization achieved by the company for sale of Hydrogen Gas to various users. Vadodara Plant has the advantage of network of Hydrogen users and has great potential to sell additional hydrogen.

(B) Dahej Complex:

The cost of Hydrogen & Natural Gas in Dahej and Vadodara Plant are different due to various factors.

In Dahej, the company is sourcing Natural Gas from GSPC (which has its wells in Hazira) by a pipeline, which is almost 140 km away and transportation is done by Gujarat State Petronet Corporation Ltd (GSPC) on behalf of the company who has laid pipeline mainly to cater to the companies requirement. The prices are governed by separate contracts. As the pressure of Natural Gas from GSPC, which was started from November 2001 started coming down due to certain problems associated in GSPC, GACL started exploring other possibilities in the year 2004-2005 and it could tap some low pressure Natural Gas from GAIL by installing compressor in GAIL facilities at company's cost.

The cost of Natural Gas of Rs.7.26/SCM is due to blending of high price GSPC gas with low priced low pressure GAIL gas. Thus, the actual cost of Natural Gas in Dahej during FY 2004-05 is lower at Rs.7.26/SM^3 as against earlier price of Rs.8.58/SM^3 in the year 2001. This low pressure NG received from GAIL was being used at CCU II and hence, price for the same has been mentioned in the PDD on ***Switching of fuel from Natural Gas to Hydrogen in CCU-II at Dahej Complex of GACL.***

The cost of Natural Gas in Vadodara and Dahej Plant is not comparable due to locational reasons. The Hydrogen cost and the cost of Hydrogen in Dahej is considered as Rs.6.25/NM^3 based on agreement signed with M/s.Luna Chemicals for bulk supply.

The price of Hydrogen in Vadodara is higher as compared to Dahej due to locational advantage.

It is important to note that GACL Vadodara is at an old location whereas GACL Dahej is at new location and the prices for various items will vary depending upon the availability and the period of contract.

In GACL Dahej Plant, Natural Gas being used in Phosphoric Acid Plant was administered price GAIL gas at a low price of Rs.3.26/SCM. Thus, it is obvious that all calculations for changeover to Hydrogen are to be compared with actual price of Natural Gas at the time of changeover. However, it is important to note that Power Plant is getting GSFC gas, which was at Rs.8.38/SM^3.

In the absence of CDM incentives it is not a common practice for industries to invest such large amount of money in these projects especially when existing units are performing well and company is achieving full capacity utilization. Hence, the activity of GACL is not a business as usual scenario

How DNV has considered the comment received in its validation:

The project additionality has been analysed by assessing the presented barriers, barriers due to prevailing practice, technological barriers, and investment barrier along with the other barriers for the project (please refer section 3.4 of this report). DNV has validated the claims and it is sufficiently demonstrated that the investment and common practice barrier affect the project activity and prevents any widespread replication of the project activity.

The above mentioned arguments thus demonstrate that the project is not a likely baseline scenario and that the emission reductions resulting from the project are additional.

5 VALIDATION OPINION

Det Norske Veritas Certification Ltd. (DNV) has performed a validation of the "Energy efficiency and fuel switching measures in Caustic Soda and Sodium Cyanide plant at Vadodara complex of GACL". The validation was performed on the basis of UNFCCC criteria for the CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures and the subsequent decisions by the CDM Executive Board.

The project participant is GACL and the host Party, India meets all requirements to participate in the CDM. Approval of voluntary participation by the Designated National Authorities (DNA) of India and confirmation that the project assists in achieving sustainable development has been obtained. No participating Annex I Party has yet been identified.

The project correctly applies AMS-II.C (version 7), II.D (version 7) and III.B (version 9) and the determination of the baseline is well elaborated, transparent and conservative. Moreover, the barriers for the project demonstrate that the project is not a likely baseline scenario.

The project results in the reduction of GHG emissions that is real, measurable and gives long-term benefits and that are additional to what would have occurred in the absence of the project activity. Given that the project is implemented as designed, the project is likely to achieve 13 157 t CO_2 e per year of emission reductions as stated in the PDD.

The monitoring plan makes sufficient provision for monitoring relevant project and baseline emission indicators. Detailed responsibilities and authorities for project management, monitoring and reporting and QA/QC procedures have also been addressed.

In summary, it is DNV's opinion that the "Energy efficiency and fuel switching measures in Caustic Soda and Sodium Cyanide plant at Vadodara complex of GACL", as described in the PDD of December 2006, meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria and correctly applies the simplified baseline and monitoring methodology AMS-II.C (version 7), II.D (version7) and III.B (version 9. DNV thus requests the registration of the "Energy efficiency and fuel switching measures in Caustic Soda and Sodium Cyanide plant at Vadodara complex of GACL" as a CDM project activity.

REFERENCES

Documents provided by the project proponent that relate directly to the project:

/2/ Gujarat Alkalies and Chemicals Limited - *Clean Development Mechanism Project Design Document –" Energy efficiency and fuel switching measures in Caustic Soda and Sodium Cyanide plant at Vadodara complex of GACL*" Version October 2005 and December 2006

/3/ Indian DNA, Host country approval letter, dated 21 November, 2005

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

/3/ International Emission Trading Association (IETA) & the World Bank's Prototype Carbon Fund (PCF): *Validation and Verification Manual*. http://www.vvmanual.info

/4/ Approved methodologies for small scale activities – Type II C, Type II D & Type III B

Persons interviewed during the validation, or persons contributed with other information that are not included in the documents listed above:

/5/ Gujarat Alkalies and Chemicals Limited

Mr.V.K.Gulati – Sr. General Manager (Materials Management, Export & Resource mobilisation)

Mr.R.K.Gupta – Dy.General Manager

Mr. A.K.Tatte

Mr. R. B. Shah

/6/ Mr.Chandrakant G Patel – Sarpanch, Gram Panchayat, Ranoli Village

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APPENDIX A

CDM VALIDATION PROTOCOL

Table 1 Mandatory Requirements for Clean Development Mechanism (CDM) Project Activities

Requirement	Reference	Conclusion	Cross Reference / Comment
1. The project shall assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3	Kyoto Protocol Art.12.2	OK	No Annex 1 country is involved in the project.
2. The project shall assist non-Annex I Parties in achieving sustainable development and shall have obtained confirmation by the host country thereof	Kyoto Protocol Art. 12.2, CDM Modalities and Procedures §40a	OK	Table 2, Section A.3
3. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC	Kyoto Protocol Art.12.2.	OK	No Annex 1 country is involved in the project.
4. The project shall have the written approval of voluntary participation from the designated national authority of each party involved	Kyoto Protocol Art. 12.5a, CDM Modalities and Procedures §40a	~~CAR 1~~	The written approval of participation from the Indian govt has not been obtained.
5. The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change	Kyoto Protocol Art. 12.5b	OK	Table 2, Section E
6. Reduction in GHG emissions shall be additional to any that would occur in absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity	Kyoto Protocol Art. 12.5c, CDM Modalities and Procedures §43	OK	Table 2, Section B.2
7. Potential public funding for the project from Parties in Annex I shall not be a diversion of official development assistance	Decision 17/CP.7	OK	No public funding has been sought by the project proponent.
8. Parties participating in the CDM shall designate a national authority for the CDM	CDM Modalities and Procedures §29	OK	The Indian DNA for the CDM is the National Clean Development Mechanism Authority under the Ministry of Environment & Forests.

Requirement	Reference	Conclusion	Cross Reference / Comment
9. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol	CDM Modalities §30/31a	OK	India ratified the protocol on 26th August 2002.
10. The participating Annex I Party's assigned amount shall have been calculated and recorded	CDM Modalities and Procedures §31b	OK	No Annex 1 country is involved in the project.
11. The participating Annex I Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7	CDM Modalities and Procedures §31b	OK	No Annex 1 country is involved in the project.
12. Comments by local stakeholders shall be invited, a summary of these provided and how due account was taken of any comments received	CDM Modalities and Procedures §37b	OK	Table 2, Section G
13. Documentation on the analysis of the environmental impacts of the project activity, including transboundary impacts, shall be submitted, and, if those impacts are considered significant by the project participants or the Host Party, an environmental impact assessment in accordance with procedures as required by the Host Party shall be carried out.	CDM Modalities and Procedures §37c	OK	Table 2, Section F
14. Baseline and monitoring methodology shall be previously approved by the CDM Executive Board	CDM Modalities and Procedures §37e	OK	Table 2, Section B.1.1 and D.1.1
15. Provisions for monitoring, verification and reporting shall be in accordance with the modalities described in the Marrakech Accords and relevant decisions of the COP/MOP	CDM Modalities and Procedures §37f	OK	Table 2, Section D
16. Parties, stakeholders and UNFCCC accredited NGOs shall have been invited to comment on the validation requirements for minimum 30 days, and the project design document and comments have been made publicly available	CDM Modalities and Procedures §40		The PDD was published on 1st November 2005 on http://www.dnv.com/certification/climate change. Parties, stakeholders and NGO's were through the web site invited to provide comments until November 30th 2005. One comment was received during this period.

Requirement	Reference	Conclusion	Cross Reference / Comment
17. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances	CDM Modalities and Procedures §45c,d	OK	Table 2, Section B.2
18. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure	CDM Modalities and Procedures §47	OK	Table 2, Section B.2
19. The project design document shall be in conformance with the UNFCCC CDM-PDD format	CDM Modalities and Procedures Appendix B, EB Decision	OK	The PDD is in conformance with the UNFCCC CDM-PDD format.

Table 2 Requirements Checklist

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
A. **Project Description** The project design is assessed.					
A.1. Small scale project activity It is assess whether the project qualifies as small scale CDM project activity.					
A.1.1. Does the project qualify as a small scale CDM project activity as defined in paragraph 6 (c) of decision 17/CP.7 on the modalities and procedures for the CDM?	/1/	DR, I	The project activity involves three types II C, II D. and III B. The small scale CDM project results in annual savings of 0.25 and 10.01 GWh for Type II C & II D respectively. The emission reductions achieved by fuel switching under category III B are 4 508 t CO_2 /yr.		OK
A.1.2. The small scale project activity is not a debundled component of a larger project activity?	/1/	DR, I	The proponent has not registered any small scale CDM project in the last 2 years and the project boundary is not within 1 km radius of any other proposed small scale CDM project.		OK
A.1.3. Does proposed project activity confirm to one of the project categories defined for small scale CDM project activities?	/1/	DR, I	The project activity confirms to the categories defined in Type II C – demand side energy efficiency programmes for specific technologies, Type II D – Energy efficiency and fuel switching measures for industrial facilities and Type III B – Switching of fossil fuels.		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
A.2. Project Design Validation of project design focuses on the choice of technology and the design documentation of the project.	/1/				
A.2.1. Are the project's spatial (geographical) boundaries clearly defined?	/1/	DR, I	The projects are located in GACL manufacturing facilities in Vadodara city in the state of Gujarat, India.		OK
A.2.2. Are the project's system (components and facilities used to mitigate GHG's) boundaries clearly defined?	/1/	DR, I	For project under Type II C the physical location of motor, tube light, each eco ventilator system has been considered as the project boundary. For Type II D – the boundary is DCS control system, sodium cyanide drying area and membrane cells of cell house 1 & 2 at GACL. For Type III C – the boundary is the boiler house in sodium cyanide plant and CCU – II furnace in GACL plant have been considered.		OK
A.2.3. Does the project design engineering reflect current good practices?	/1/	DR, I	Yes, the project design reflects current good practices through fuel switchover from natural gas to hydrogen in the CCU – II plant and through the use of energy efficient equipment.		OK
A.2.4. Will the project result in technology transfer to the host country?	/1/	DR	No transfer of technology is envisaged, as the same is available indigenously in India.		OK
A.2.5. Does the project require extensive initial training and maintenance efforts in order to work as presumed during the project period? Does the project make provisions for meeting training and maintenance	/1/	DR, I	Though not specifically addressed in the PDD, the project will require minimal additional training and maintenance efforts, as this involves fuel switch over from gas to hydrogen and use of more energy efficient equipment.		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
needs?					
A.3. Contribution to Sustainable Development The project's contribution to sustainable development is assessed					
A.3.1. Will the project create other environmental or social benefits than GHG emission reductions?	/1/	DR, I	Apart from environmental well being, the project activity contributes towards energy efficiency and resource conservation		OK
A.3.2. Will the project create any adverse environmental or social effects?	/1/	DR, I	No adverse effects could be envisaged due to the Project.		OK
A.3.3. Is the project in line with sustainable development policies of the host country?	/1/	DR, I	Approval from the DNA of India confirming the project's contribution to sustainable development shall be forwarded.	~~CAR 1~~	OK
A.3.4. Is the project in line with relevant legislation and plans in the host country?	/1/	DR, I	Yes, though the relevant legislation of host party i.e Government of India does not require an Environment Impact Assessment, the project proponent has carried out the EIA studies.		OK
B. **Project Baseline** The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.					
B.1. Baseline Methodology It is assessed whether the project applies an appropriate baseline methodology.					
B.1.1. Is the selected baseline methodology in line with the baseline methodologies provided for the relevant project category?	/1/	DR	The proposed project has chosen the baseline that is based on adopting energy efficient equipments to achieve energy savings, fuel switching measures		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
			like changing from Furnace Oil firing to Natural gas firing in boilers. The project activity falls under the types II C, II D, and III C.		
B.1.2. Is the baseline methodology applicable to the project being considered?	/1/	DR	The project activity involves retrofit measures in different equipment which are unique in itself and technicalities of each drive is unique as no two drives are in the same service or connected to the same main equipment. The project category IIC holds for energy efficiency measures of specific technology being replicated in different locations and thus the baseline guideline of summation of number of similar drives times the power of individual drive times the average operating hours of the similar drives is appropriate. It is also apparent that in the absence of the project activity, the baseline would be the consumption of natural gas for firing at the furnace of CCU II.		OK
B.2. Baseline Determination It is assessed whether the project activity itself is not a likely baseline scenario and whether the selected baseline represents a likely baseline scenario.					
B.2.1. Is it demonstrated that the project activity itself is not a likely baseline scenario due to the existence of one or more of the following barriers: investment barriers, technology barriers, barriers due to prevailing practice or other barriers?	/1/	DR	The additionality has been described by the way of barrier analysis. However it is not clear whether INR 91 million spent on these project activities does not constitute business as usual. The following shall be clarified: • Details of investment made is claimed to be indicated in Appendix 2. This is not seen in the PDD. Again, does this really demonstrate that	~~CL 1~~	OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
			the project overcomes an investment barrier – particularly when most of the programmes are normally implemented by most process industries as part of their routine energy conservation measures? This needs to be justified by GACL appropriately • Costs of NG and hydrogen needs to be justified and evidences provided. Has there been a drop in sales for hydrogen requirement around GACL? • Under II.C – how does replacement of motors, eco-ventilators and tube-lights – make it "additional". These are considered as "business as usual"		
B.2.2. Is the application of the baseline methodology and the discussion and determination of the chosen baseline transparent and conservative?	/1/	DR	Yes, the methodology has been chosen and applied in a transparent and conservative manner. Since the project activity displaces fuel used i.e. NG, IPCC emission factors has been used for estimations		OK
B.2.3. Are relevant national and/or sectoral policies and circumstances taken into account?	/1/	DR	The policies and the regional issues have been taken into account while evaluating the baseline emission level.		OK
B.2.4. Is the baseline selection compatible with the available data?	/1/	DR	Yes. The energy baseline of the replaced equipment is the differential of the amount of power drawn by the equipment in the baseline scenario and the power drawn by the replaced equipment after implementation of the project. Also, the emission baseline is the current emissions of the facility expressed as emissions per unit of output		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
B.2.5. Does the selected baseline represent the most likely scenario describing what would have occurred in absence of the project activity?	/1/	DR	Yes.		OK
C. **Duration of the Project / Crediting Period** It is assessed whether the temporary boundaries of the project are clearly defined.	/1/				
C.1.1. Are the project's starting date and operational lifetime clearly defined?	/1/	DR, I	The project starting date has been defined as 18 July 2002 for an operational lifetime of 20 years.		OK
C.1.2. Is the assumed crediting time clearly defined (renewable crediting period of seven years with two possible renewals or fixed crediting period of 10 years with no renewal)?	/1/	DR	Yes. Fixed crediting period of 10 years has been chosen with the starting date as 2003.01.01.		OK
D. **Monitoring Plan** The monitoring plan review aims to establish whether all relevant project aspects deemed necessary to monitor and report reliable emission reductions are properly addressed.					
D.1. Monitoring Methodology It is assessed whether the project applies an appropriate monitoring methodology.					
D.1.1. Is the selected monitoring methodology in line with the monitoring methodologies provided for the relevant project category?	/1/	DR	The selected monitoring methodology is in line with the monitoring methodology for small-scale CDM project activity category II.C, II.D and III.B		OK
D.1.2. Is the monitoring methodology applicable to the project being considered?	/1/	DR	The project consists of		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
			For AMS II C: the monitoring involves monitoring the "power" and "operating hours" of the equipments replaced For AMS II D: monitoring essentially involves monitoring of energy consumption provided at each of the plant area related to the technology change i.e. paddle dryer and DCS upgradation; For AMS III B: monitoring essentially involves monitoring of the fuel used (natural gas, furnace oil and hydrogen) and output of the boiler house and CCU-II		
D.1.3. Is the application of the monitoring methodology transparent?	/1/	DR	Yes, the application of the monitoring methodologies is simple and transparent.		OK
D.1.4. Will the monitoring methodology give opportunity for real measurements of achieved emission reductions?	/1/	DR	Yes.		OK
D.2. Monitoring of Project Emissions It is established whether the monitoring plan provides for reliable and complete project emission data over time.					
D.2.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the greenhouse gas emissions within the project boundary during the crediting period?	/1/	DR	Yes. A monitoring plan has been clearly defined sufficient for collection and archiving of relevant data. This is restricted to the burning of natural gas instead of furnace oil in the boiler		OK
D.2.2. Are the choices of project GHG indicators reasonable?	/1/	DR	The parameters chosen for the measurement of the project emissions are adequate.		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
D.2.3. Will it be possible to monitor / measure the specified project GHG indicators?	/1/	DR	Yes, The consumption of fuel and energy will be directly monitored.		OK
D.2.4. Will the indicators give opportunity for real measurements of project emissions?	/1/	DR	Yes.		OK
D.3. Monitoring of Leakage If applicable, it is assessed whether the monitoring plan provides for reliable and complete leakage data over time.	/1/				
D.3.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining leakage?	/1/	DR, I	No leakage calculations are required for this methodology.		OK
D.4. Monitoring of Baseline Emissions It is established whether the monitoring plan provides for reliable and complete project emission data over time.					
D.4.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	/1/	DR, I	Monitoring plan addressed has shown provision for all relevant data necessary for determining baseline emissions during the crediting period.		OK
D.4.2. Is the choice of baseline indicators, in particular for baseline emissions, reasonable?	/1/	DR	The methodology involves monitoring and measurement of electricity consumption by the equipment in the baseline, electricity consumed by the new installations, determination of the emission co-efficient for the electricity based on self generation and import from the grid.		OK
D.4.3. Will it be possible to monitor / measure the specified baseline indicators?	/1/	DR	Yes. It is possible as records of consumption of energy / fuel are available.		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
D.4.4. Will the indicators give opportunity for real measurements of baseline emissions?	/1/	DR	Yes, the identified indicators will provide opportunity for real measurements of baseline emissions.		OK
D.5. Project Management Planning It is checked that project implementation is properly prepared for and that critical arrangements are addressed.	/1/				
D.5.1. Is the authority and responsibility of project management clearly described?	/1/	DR, I	Procedures exist as part of the quality and environment management systems of the company. The company is certified to ISO 9001 and ISO 14001 systems.		OK
D.5.2. Is the authority and responsibility for registration monitoring measurement and reporting clearly described?	/1/	DR	The responsibility for registration and reporting of data is clearly outlined in the PDD.		OK
D.5.3. Are procedures identified for training of monitoring personnel?	/1/	DR	As in D.5.1		OK
D.5.4. Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	/1/	DR	No GHG emission relevant emergency situations are expected to occur.		OK
D.5.5. Are procedures identified for calibration of monitoring equipment?	/1/	DR	As in D.5.1		OK
D.5.6. Are procedures identified for maintenance of monitoring equipment and installations?	/1/	DR	As in D.5.1		OK
D.5.7. Are procedures identified for monitoring, measurements and reporting?	/1/	DR	As in D.5.1		OK
D.5.8. Are procedures identified for day-to-day records handling (including what records	/1/	DR	As in D.5.1		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
to keep, storage area of records and how to process performance documentation)					
D.5.9. Are procedures identified for dealing with possible monitoring data adjustments and uncertainties?	/1/	DR	As in D.5.1		OK
D.5.10. Are procedures identified for internal audits of GHG project compliance with operational requirements as applicable?	/1/	DR	As in D.5.1		OK
D.5.11. Are procedures identified for project performance reviews?	/1/	DR	As in D.5.1		OK
D.5.12. Are procedures identified for corrective actions?	/1/	DR	As in D.5.1		OK
E. **Calculation of GHG emission** It is assessed whether all material GHG emission sources are addressed and how sensitivities and data uncertainties have been addressed to arrive at conservative estimates of projected emission reductions.					
E.1. Project GHG Emissions The validation of predicted project GHG emissions focuses on transparency and completeness of calculations.					
E.1.1. Are all aspects related to direct and indirect project emissions captured in the project design?	/1/	DR	Project activity emissions are restricted to the burning of natural gas instead of furnace oil in the boiler.		OK
E.1.2. Have all relevant greenhouse gases and sources been evaluated?	/1/	DR	Only CO2 is relevant.		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
E.1.3. Do the methodologies for calculating project emissions comply with existing good practice?	/1/	DR	Detailed calculations need to be submitted.	~~CL 2~~	OK
E.1.4. Are the calculations documented in a complete and transparent manner?	/1/	DR	As in E.1.3	~~CL 2~~	OK
E.1.5. Have conservative assumptions been used?	/1/	DR	As in E.1.3	~~CL 2~~	OK
E.1.6. Are uncertainties in the project emissions estimates properly addressed?	/1/	DR	The major uncertainties are foreseen.		OK
E.2. Leakage It is assessed whether there leakage effects, i.e. change of emissions which occurs outside the project boundary and which are measurable and attributable to the project, have been properly assessed.	/1/				
E.2.1. Are leakage calculation required for the selected project category and if yes, are the relevant leakage effects assessed?	/1/	DR, I	Not Applicable.		OK
E.3. Baseline GHG Emissions The validation of predicted baseline GHG emissions focuses on transparency and completeness of calculations.					
E.3.1. Are the baseline emission boundaries clearly defined and do they sufficiently cover sources for baseline emissions?	/1/	DR, I	Yes the baseline emissions boundaries are clearly defined in the PDD.		OK
E.3.2. Are all aspects related to direct and indirect baseline emissions captured in the	/1/	DR	Yes.		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
project design?					
E.3.3. Have all relevant greenhouse gases and sources been evaluated?	/1/	DR	Only CO2 is applicable.		OK
E.3.4. Do the methodologies for calculating baseline emissions comply with existing good practice?	/1/	DR	Detailed calculations need to be presented	~~CL 2~~	OK
E.3.5. Are the calculations documented in a complete and transparent manner?	/1/	DR	As in E.3.4	~~CL 2~~	OK
E.3.6. Have conservative assumptions been used?	/1/	DR	As in E.3.4	~~CL 2~~	OK
E.3.7. Are uncertainties in the baseline emissions estimates properly addressed?	/1/	DR	No. The uncertainties have not been properly addressed.		OK
E.4. Emission Reductions Validation of baseline GHG emissions will focus on methodology transparency and completeness in emission estimations.	/1/				
E.4.1. Will the project result in fewer GHG emissions than the baseline case?	/1/	DR	As in E.3.4	~~CL 2~~	OK
F. **Environmental Impacts** It is assessed whether environmental impacts of the project are sufficiently addressed.	/1/				
F.1.1. Does host country legislation require an analysis of the environmental impacts of the project activity?	/1/	DR, I	As per the MoEF, an EIA is not required for projects costing less than INR 500 Million, as is the case with the proposed project activity. GACL is otherwise in compliance with all the applicable environmental regulations.		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
F.1.2. Does the project comply with environmental legislation in the host country?	/1/	DR	As in F.1.2.		OK
F.1.3. Will the project create any adverse environmental effects?	/1/	DR	No, the proposed project does not result in any adverse impacts.		OK
F.1.4. Have environmental impacts been identified and addressed in the PDD?	/1/	DR	A review has been addressed in the PDD for the environmental impacts and is deemed sufficient.		OK
G. **Comments by Local Stakeholder** Validation of the local stakeholder consultation process.	/1/				
G.1.1. Have relevant stakeholders been consulted?	/1/	DR, I	Yes. Local village sarpanch, school teachers, distributors and suppliers were consulted as indicated in the PDD.		OK
G.1.2. Have appropriate media been used to invite comments by local stakeholders?	/1/	DR	Meetings with the representatives of local government bodies, suppliers and distributors and the electronic media have been used to solicit comments.		OK
G.1.3. If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	/1/	DR	Indian Regulations do not warrant a stakeholder consultation for the project activity.		OK
G.1.4. Is a summary of the comments received provided?	/1/	DR	Yes, none of the interested parties have raised any significant objections to the project.		OK
G.1.5. Has due account been taken of any comments received?	/1/	DR	Since no adverse comments were received, no action has been required to be taken up.		OK

Table 3 Resolution of Corrective Action and Clarification Requests

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
CAR 1: Approval from the DNA of India confirming the project's contribution to sustainable development shall be forwarded.	A.3.3	The DNA approval has been forwarded	Accepted. The letter of approval from the DNA of India, dated 21 November 2005 has been verified. This CAR is closed
CL 1 The additionality has been described by the way of barrier analysis. However it is not clear whether INR 91 million spent on these project activities does not constitute business as usual. The following shall be clarified: • Details of investment made is claimed to be indicated in Appendix 2. This is not seen in the PDD. Again, does this really demonstrate that the project overcomes an investment barrier – particularly when most of the programmes are normally implemented by most process industries as part of their routine energy conservation measures? This needs to be appropriately justified by GACL • Costs of NG and hydrogen needs to be justified and evidences provided. Has there been a drop in sales for hydrogen requirement around GACL? Under II.C – how does replacement of eco-ventilators and tube-lights – make it "additional". These are considered as "business as usual"	B.2.1	Please see attached note below	Complimentary information provided has been verified and accepted. Modified PDD has excluded the activity of installation of eco ventilators and replacement of tubelights. This CL is closed.

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
CL 2 Detailed calculations for the baseline and emission reductions shall be presented.	E.1.3, 3.5	Excel sheet calculations are hereby provided	Calculations have been verified and accepted. This CL is closed.

ATTACHMENT RESPONSE TO CL 1:

GACL is having two Complexes one located at Baroda and another located at Dahej. The operation at Baroda and Dahej are looked after by Sr.ED (Baroda Complex) & ED (Dahej Complex)

GACL management is environment friendly and has been taking steps from time to time.

GACL is having "Energy Policy" and based on the Energy Policy GACL management has taken up various steps towards energy improvement. A note on this from the Managing Director dated 22/01/2003 after establishment of the Energy Policy is enclosed herewith for the reference at **Annexure-1**. As per the above, all the projects, which improve the energy efficiency and are environment friendly are to be identified and are to be examined for economic viability. Based on the discussions with Ministry of Environment, GACL management has speeded up initiatives to identify the projects, which are environment-friendly and conform to the objectives of Clean Development Mechanism. The project activities identified under B-1 project are identified at GACL Baroda Complex. These activities are for CDM because of the reason mentioned below:

(a) Replacement of Tray dryer with Paddle Dryer: GACL was operating its Sodium Cyanide Plant with turbo tray Dryer which was imported based on the recommendation of Technology Licensor. Although the turbo tray dryer was operating without any problems GACL has adopted Paddle Dryer for drying Sodium Cyanide for the first time in the country after putting extensive technical efforts because it was expected to be energy efficient (as claimed by supplier). This calculated risk was taken and we had number of teething problems in the initial stage. Thus the turbo tray dryer has become the redundant non-paying asset for GACL.

The letter from M/s.Kilburn Engineering requesting GACL to give permission to see the operation of Paddle Dryer by M/s.Cyanide And Chemicals, Surat who are the only other manufacturer of Sodium Cyanide in India proves that GACL is the first company in India to adopt the Paddle Dryer for Sodium Cyanide application. This document, further justifies that GACL is the first to take a major risk in plant operations of a hazardous unit like Sodium Cyanide so as to achieve CDM initiatives. (**Annexure-2**)

(b) Up-gradation of DCS was taken-up even though the AMC and LLPIU were giving satisfactory control results without any loss of production. The production data of our Caustic Soda Plant shows full capacity utilization and no production loss, which proves that plant could have been continued operating at full production level without upgrading DCS (**production data enclosed as Annexure-3).** Thus up-gradation of DCS was taken-up by GACL purely as energy efficient CDM activities even though the AMC and LLPIU were good and having life.

Replacement/up-gradation of such critical system involves some loss of production during changeover. It further subjects the unit to some risk of operation till stabilization. The failure of upgraded system would have created major operational and economic problems.

(c) Similarly, GACL is the first company in the country who has adopted 4th Generation Electrolyser in their existing plant although existing Electrolysers were operating satisfactorily. The investment on this item becomes redundant. The letter from M/s.UHDE India Ltd., who are technology suppliers that the GACL is the first company in the country to implement the 4th Generation Membrane Cell in place of older version (the copy of the letter is enclosed- **Annexure-4).**

GACL has invested INR 91 Million in this project, which is the principle investment. However, the existing equipments and infrastructure, which was in place, became redundant due to the CDM project activity. This investment after accounting for depreciation amounts to about INR 22 million. Thus, the total investment on account of implementation of the CDM project activity is the sum of (depreciated) amount of investment made on the earlier infrastructure and the principle investment made on the CDM project activity. The pay back period based on this and the cost per unit is Rs.2.00 works out to be 5 years and 6 months. The investment analysis provided in the PDD indicates that irrespective of the scale of total investments required on the project activity or expectations of commensurate returns, the Project Proponent went ahead with the CDM project implementation based on intention to cause reduction in GHG emissions.

As explained above the CDM projects undertaken are unique for GACL as they are the 1st unit in the country to take up such bold initiatives especially when its plants were running at full capacity and it had no operational necessity for these replacements.

Investment details & payback calculations are provided in the Annexure-5.

The costs of Natural Gas and Hydrogen have already been submitted earlier. We are enclosing here with the Invoices for supply of Hydrogen to various parties as under:

1. Supply of Hydrogen to GEB @ Rs.19 NM^3
2. Supply of Hydrogen to M/s.Jayant Agro @ Rs.14/ NM^3
3. We have signed a contract with M/s.Luna Chemicals @ Rs.6.25/NM^3 for bulk sale in Dahej.

The quantity of Hydrogen Gas to M/s.GEB is in the range of 1000 NM^3/day, to M/s.Jayant Agro in the range of about 5000 NM^3/day & our contract with M/s.Luna Chemicals shall be around 50000 NM^3/day. The average rate of Hydrogen is in the range of Rs.7.26 NM^3.

The copy of the Bills of M/s.GAIL indicating the price of Natural Gas for the year 2003 and 2004 is enclosed for your ready reference**(Annexure-6**).

There is a demand for the supply of Hydrogen to various customers and the copies of the letter of M/s.Jayant Agro, M/s.Indu-Nissan and M/s.Deepak Nitrite requesting GACL to supply Hydrogen / increased quantity of Hydrogen is enclosed for ready reference. GACL has opted for going for CDM project by changing over from NG to Hydrogen even though there was a benefit by sale of Hydrogen.

Annexure-6 provides quantity of hydrogen sold, and the invoices regarding sales and demand of Hydrogen.

i. GACL is leader in Chlor Alkali Industry and there are more than 40 producers of Caustic Soda in the country. It is not possible for us to get the data of all competitors but based on the information available from the Balance Sheet of M/s. Chem-Fab Alkali and M/s. DCW, it is proved that the GACL is having the lowest energy consumption**.(Annexure-7)**

Name of the Company	Power Consumption per unit of production for the year 2002-03 (KWH)	Power Consumption per unit of production for the year 2003-04 (KWH)	Power Consumption per unit of production for the year 2004-05 (KWH)
M/s.Chem-Fab Alkalies	2,731	2,722	--
M/s. DCW	--	3,020	3,005
M/s. GACL	--		--

ii. This has already been explained in against point # 1 above that GACL is the first company in India to implement the above projects.

iii. There is a recent article (Economic Times, Bombay Edition dated 30th November 2005) on the availability of Natural Gas, which explained that the Natural Gas availability in Gujarat is booked fully. The article quotes the Mr. R.B. Shahi, Secretary of Power, Government of India there is no availability in both domestically as well as imported form of LNG. It further says that 2000 MW Power capacity at an investment of Rs.8000 Crores may have to go slow**.(Annexure-8)**

iv. The use of FO is a normal practice for steam generation in the industry and any changeover initiative requires availability of gas and bold attitude of the management towards CDM.

The PDD is being modified to remove the installation of eco ventilators and replacement of tube lights etc in view of small CER generated and the practicality of monitoring the CER even though it was individual

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APPENDIX B

CERTIFICATES OF COMPETENCE

CERTIFICATE OF COMPETENCE

Michael Lehmann

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	Yes
CDM Verifier:	Yes	***JI Verifier:***	Yes
Industry Sector Expert for Sectoral Scope(s):	Sectoral scope 1,2,3 & 9		
Technical Reviewer for (group of) methodologies:			
ACM0001, AM0002, AM0003, AM0010, AM0011, AM0012, AMS-III.G	Yes	*AM0021*	Yes
ACM0002, AMS-I.A-D, AM0019, AM0026, AM0029	Yes	*AM0023*	Yes
ACM0003, ACM0005, AM0033, AM0040	Yes	*AM0024*	Yes
ACM0004	Yes	*AM0027*	Yes
ACM0006, AM0007, AM0015, AM0036, AM0042	Yes	*AM0028, AM0034*	Yes
ACM0007	Yes	*AM0030*	Yes
ACM0008	Yes	*AM0031*	Yes
ACM0009, AM0008, AMS-III.B	Yes	*AM0032*	Yes
AM0006, AM0016, AMS-III.D	Yes	*AM0035*	Yes
AM0009, AM0037	Yes	*AM0038*	Yes
AM0013, AM0022, AM0025, AM00379, AMS-III.H, AMS-III.I	Yes	*AM0041*	Yes
AM0014	Yes	*AM0034*	Yes
AM0017	Yes	*AMS-II.A-F*	Yes
AM0018	Yes	*AMS-III.A*	Yes
AM0020	Yes	*AMS-III.E, AMS-III.F*	Yes

Høvik, 6 November 2006

Einar Telnes
Director, International Climate Change Services

Michael Lehmann
Technical Director

CERTIFICATE OF COMPETENCE

Kumaraswamy Chandrashekara

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	--
CDM Verifier:	Yes	***JI Verifier:***	--
Industry Sector Expert for Sectoral Scope(s):	Sectoral scope 4 & 5		
Technical Reviewer for (group of) methodologies:			
ACM0001, AM0002, AM0003, AM0010, AM0011, AM0012, AMS-III.G	Yes	*AM0021*	Yes
ACM002, AMS-I.A-D, AM0019, AM0026, AM0029	Yes	*AM0023*	Yes
ACM003, ACM0005, AM0033, AM0040	Yes	*AM0024*	Yes
ACM0004	Yes	*AM0027*	Yes
ACM0006, AM0007, AM0015, AM0036, AM0042	Yes	*AM0028, AM0034*	Yes
ACM0007	Yes	*AM0030*	Yes
ACM0008	Yes	*AM0031*	Yes
ACM0009, AM0008, AMS-III.B	Yes	*AM0032*	Yes
AM0006, AM0016, AMS-III.D	Yes	*AM0035*	Yes
AM0009, AM0037	Yes	*AM0038*	Yes
AM0013, AM0022, AM0025, AM00379, AMS-III.H, AMS-III.I	Yes	*AM0041*	Yes
AM0014	Yes	*AM0034*	Yes
AM0017	Yes	*AMS-II.A-F*	Yes
AM0018	Yes	*AMS-III.A*	Yes
AM0020	Yes	*AMS-III.E, AMS-III.F*	Yes

Høvik, 6 November 2006

Einar Telnes
Director, International Climate Change Servicer

Michael Lehmann
Technical Director

CERTIFICATE OF COMPETENCE

Raman Venkata Kakaraparthi

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	--
CDM Verifier:	--	***JI Verifier:***	--
Industry Sector Expert for Sectoral Scope(s):	--		

Høvik, 6 November 2006

Einar Telnes
Director, International Climate Change Servicer

Michael Lehmann
Technical Director

Vinod Richharia

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	--	***JI Validator:***	--
CDM Verifier:	--	***JI Verifier:***	--
Industry Sector Expert for Sectoral Scope(s):	--		

Høvik, 6 November 2006

Einar Telnes
Director, International Climate Change Services

Michael Lehmann
Technical Director