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Validation Report

VALIDATION OF THE LARGE SCALE CDM-PROJECT:

”N_2O ABATEMENT PROJECT OF CAPRO CORPORATION”

REPORT NO. 600500424

01 June 2011

TÜV SÜD Industrie Service GmbH

Carbon Management Service
Westendstr. 199 - 80686 Munich – GERMANY

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Subject: Validation of the large scale CDM Project	
Accredited TÜV SÜD Unit: TÜV SÜD Industrie Service GmbH Certification Body "climate and energy" Westendstr. 199, 80686 Munich, Germany	**TÜV SÜD Contract Partner:** TÜV SÜD Korea Ltd. 12F, KLI63 Bldg, #60, Yeoido-dong Youngdeungpo-gu, Seoul 150-763, Korea
Project Participant(s): Capro Corporation: 197-28 Gwanhoon-Dong, Jongno-Gu Baeksang Building, Seoul 110-718, Republic of Korea Hyosung Ebara Engineering Co.,Ltd: 1006-2 Bangbae-Dong, Seocho-Gu Bangbae Building, Seoul 137-850, Republic of Korea Hyosung Corporation: 450 Gongduk-Dong, Mapo-Gu Hyosung Building, Seoul 121-720, Republic of Korea	**Project Site(s):** Name of site: Capro Corporation Location: 402-1, Bugok-Dong, Nam-Gu, Ulsan Metropolitan city Republic of Korea GPS coordinates: - Lattitude: 35.4958° - Longitude: 129.3280°
Project Title: "N_2O Abatement Project of Capro Corporation"	
Applied Methodology / Version: AM0028 / Version 05	**Scope(s):** 5 **Technical Area(s):** 5.1
First PDD Version (GSP): Date of issuance: 19-10-2009 Version No.: 01 Starting Date of GSP 16-12-2009	**Final PDD version:** Date of issuance: 24-05-2011 Version No.: 08.1
Estimated Annual Emission Reduction: 660 995 tCO_2e	
Assessment Team Leader: Yutaka Yoshida **Assessment Team Members:** Jung-ho Yoon, In-Hwan Kim* **Trainees:** Ashely(Sang-Yeon) Park**	**Technical Review:** Martin Hammer **Responsible Certification Body Members:** Thomas Kleiser

* Under the old standard appointed as validator for CDM-projects; currently is still not re-appointed

** Appointed as Trainee at the time of validation on-site; currently is not an employee of the DOE in charge

Summary of the Validation Opinion:

☒ The review of the project design documentation and the subsequent follow-up interviews have provided TÜV SÜD with sufficient evidence for the determination of the project's fulfilment of all stated criteria. In our opinion, the project meets all relevant UNFCCC requirements for the CDM. Therefore, TÜV SÜD recommends the project for registration by the CDM Executive Board if the letters of approval of all Parties involved will be available before the expiring date of the applied methodology(s) or the applied methodology version respectively.

☐ The review of the project design documentation and the subsequent follow-up interviews have not provided TÜV SÜD with sufficient evidence for the determination of the project's fulfilment of all stated criteria. Therefore, TÜV SÜD will not recommend the project for registration by the CDM Executive Board and will inform the project participants and the CDM Executive Board of this decision.

Abbreviations

ACM	Approved Consolidated Methodology
AM	Approved Methodology
BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM EB	CDM Executive Board
CER	Certified Emission Reduction
CM	Combined Margin
CMP	Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol
CR / CL	Clarification Request
DNA	Designated National Authority
DOE	Designated Operational Entity
EF	Emission Factor
EIA / EA	Environmental Impact Assessment / Environmental Assessment
ER	Emission Reduction
FAR	Forward Action Request
FSR	Feasibility Study Report
GHG	GreenHouse Gas(es)
IPCC	Intergovernmental Panel on Climate Change
IRL	Information Reference List
IRR	Internal Rate of Return
KP	Kyoto Protocol
MP	Monitoring Plan
NGO	Non Governmental Organisation
OM	Operational Margin
PDD	Project Design Document
PP	Project Participant
TÜV SÜD	TÜV SÜD Industrie Service GmbH
UNFCCC	United Nations Framework Convention on Climate Change
VVM	Validation and Verification Manual

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1 INTRODUCTION

1.1 Objective

The objective of the validation process is to provide an independent assessment by a third party, a Designated Operational Entity (DOE), of a proposed project activity. The assessment involves the evaluation of the project basis and design identified in the Project Design Document (PDD) using the defined criteria outlined by the registration under the Clean Development Mechanism (CDM). Validation is part of the CDM project cycle and results in a conclusion by the executing DOE on whether or not a project activity is valid to be submitted for registration to the CDM Executive Board (CDM-EB). The ultimate decision on the registration of a proposed project activity rests with the CDM-EB and the Parties involved.

The project addressed in this validation report has been submitted under the following project title: **"N_2O Abatement Project of Capro Corporation"**

1.2 Scope

The scope of any assessment is defined by the underlying legislation, regulation and guidance given by relevant entities or authorities. In the case of CDM project activities, the scope is set by:

- The Kyoto Protocol, in particular § 12 and modalities and procedures for the CDM
- Decision 2/CMP1 and Decision 3/CMP.1 (Marrakech Accords)
- Further COP/MOP decisions with reference to the CDM (e.g. decisions 4 – 8/CMP.1)
- Decisions and specific guidance outlined by the EB which are published under http://cdm.unfccc.int
- Guidelines for Completing the Project Design Document (CDM-PDD) and the Proposed New Baseline and Monitoring Methodology (CDM-NM)
- Baselines and monitoring methodologies (including GHG inventories)
- Management systems and auditing methods
- Environmental issues relevant to the applicable sectoral scope
- Applicable environmental and social impacts and aspects of CDM project activity
- Sector specific technologies and their applications
- Current technical and operational knowledge of the specific sectoral scope and information on best practice

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

Once TÜV SÜD receives the PDD, it is made publicly available on the UNFCCC website and on TÜV SÜD's website, which initiates a 30 day global stakeholder consultation process (GSP). In special circumstances, such as when a project design changes, the GSP may need to be repeated. Information on the PDDs is presented on page 1 of this report.

The purpose of a validation is to demonstrate compliance or non-compliance of the project with all stated and valid CDM requirements. Additionally, the purpose of validation is to enable the

registration of CDM projects, which is only a part of the total CDM project cycle. Therefore, TÜV SÜD cannot be held liable by any party for decisions made, or not made, based on the validation opinion that go beyond this purpose.

2 METHODOLOGY

The project assessment is based on the "Clean Development Mechanism Validation and Verification Manual" and is conducted using standard auditing techniques to assess the correctness of the information provided by the project participants. Before the assessment begins, members of the team covering the technical scope(s), sectoral scope(s), and relevant host country experience for evaluating the CDM project activity are appointed. Once the project is made available for the stakeholder consultation process, members of the team carry out the desk review, follow-up actions, resolution of issues identified, and the preparation of the validation report. The prepared validation report and other supporting documents then undergo an internal quality control by the CB "climate and energy" before being submitted to the CDM-EB.

In order to ensure transparency, assumptions must be clear and stated explicitly and background material must also be referenced. TÜV SÜD has developed a methodology-specific protocol customized for the project. The protocol demonstrates, in a transparent manner, the project criteria (requirements), discussion on each criterion by the assessment team, and the results from validating the identified criteria.

The validation protocol serves the following purposes:

- To organize the details and provision of clarifications on the requirements of which a CDM project is expected to meet
- To elucidate how a particular requirement has been validated as well as to document the results of the validation and any adjustments made to the project design document.

The validation protocol consists of three tables. The different columns in these tables are described in the tables below.

Validation Protocol Table 1: Conformity of Project Activity and PDD				
Checklist Topic / Question	**Reference**	**Comments**	**PDD in GSP**	**Final PDD**
The checklist is organised in sections following the arrangement of the applied PDD version. Each section is then sub-divided. The lowest level constitutes a checklist question /	*The section gives reference to documents in which the answer to the checklist question or item is found in case the*	*The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is used to explain the conclusions reached. In some cases sub-checklists are applied indicating yes/no decisions*	*The section is used to present conclusions based on the assessment of the first PDD version. The PDD is either acceptable based on evidence provided (☑) or a **Corrective Action Request (CAR)** is issued due to non-compliance with the checklist question (See below). **Clarification Request (CR)** is used when the validation team has identified a need for*	*Conclusions are presented in the same manner based on the assessment of the final PDD version and further documents including assumptions presented in the*

criterion.	*comment refers to documents other than the PDD.*	*on the compliance with the stated criterion. Any **Request** has to be substantiated within this column.*	*further clarification. **Forward Action Request** is issued to highlight issues related to project implementation that require review during the first verification.*	*documentation.*

Validation Protocol Table 2: Compilation and Resolutions of CARs, CRs and FARs			
	Comments and Results	Ref	Conclusion and IRL
Issue	*Corrective Action, Clarification or Forward Action Requests.*	*Reference to the checklist question number in Table 1*	*Final conclusions and relevant references.*
Response	*The responses given by the client or other project participants during communication with the validation team.*		
Assessment	*Summary of the discussion and revision of project documentation together with the validation team's responses*		

In case of a denial of the project activity more detailed information on this decision will be presented in Table 3.

Validation Protocol Table 3: Unresolved Corrective Action and Clarification Requests		
Clarifications and corrective action requests	**Id. of CAR/CR**	**Explanation of the Conclusion for Denial**
Referenced request if final conclusions from table 2 resulted in a denial.	*Identifier of the Request.*	*Detailed explanation of why the project is considered non-compliant with a criterion and a clear reference to the criterion*

The completed validation protocol is enclosed in Annex 1.

2.1 Appointment of the Assessment Team

According to the technical scopes and experiences in the sectoral or national business environment, TÜV SÜD has composed a project team in accordance with the appointment rules of the TÜV SÜD certification body "climate and energy".

The composition of an assessment team has to be approved by the Certification Body (CB) to assure that the required skills are covered by the team. The CB TÜV SÜD operates the following qualification levels for team members that are assigned by formal appointment rules:

- Assessment Team Leader (ATL);
- Validator (V);
- Validator Trainee (T);
- Technical Experts (TE).

It is required that the sectoral scope(s) and the technical area(s) linked to the methodology and project have to be covered by the assessment team.

Assessment Team:

Name	Qualification	Coverage of scope	Coverage of technical area	Coverage of financial aspect	Host country experience
Yutaka Yoshida	**ATL**	☑	☑	☑	☑
Jung-Ho Yoon	V	-	-	-	☑
In-Hwan Kim *	-	-	-	-	☑
Ashely(Sang-yeon) Park **	-	-	-	-	☑

Technical Reviewer:
Martin Hammer

2.2 Review of Documents

The PDD for the GSP was submitted to the DOE in October 2009. The PDD and additional background documents related to the project design and baseline have been reviewed to verify the correctness, credibility, and interpretation of the presented information. Furthermore, a cross-check between information provided and information from other sources has been done as an initial step of the validation process. A complete list of all documents and evidence material reviewed is attached as annex 2 to this report.

2.3 Follow-up Interviews

On 22-23/12/2009, TÜV SÜD performed interviews, telephone conferences, and physical site inspections with project stakeholders to confirm relevant information, and to resolve issues identified in the first document review. The following table provides a list of all persons interviewed in this process.*

Persons Interviewed:

Name	Organisation
Heung-Jae Kim (Prof. Engineer)	Capro Corp./ Plant owner, PP
Gyu-Ho Heo (Manager)	Capro Corp./ Plant owner, PP
Cheong-Jeong Choi (Manager)	Capro Corp./ Plant owner, PP
Byoung-Yung Park (Assistant manager)	Capro Corp./ Plant owner, PP
Ik-Jin Bae (Staff)	Capro Corp./ Plant owner, PP
Jong-Hoon Park (Senior Manager)	Hyosung Ebara Eng./ Developer, PP
Kwan-Sik Yang (Manager)	Hyosung Ebara Eng./ Developer, PP
So-Young Myung (CEO)	Greenpolaris/ CDM Consulting company

* Under the old standard appointed as validator for CDM-projects; currently is still not re-appointed

** Appointed as Trainee at the time of validation on-site; currently is not an employee of the DOE

Ho-Soung Choi (Assistant manager)	Greenpolaris/ CDM Consulting company
Dong-Soo Lee (CEO)	C.K. Techpia Co., Ltd/ Monitoring system supplier
Young-Jung Choi (Manager)	Kolon Industries, INC/ Local Stakeholder

2.4 Cross-check

During the validation process the team has made reference to available information related to similar projects or technologies as the CDM project activity. Project documentation has also been reviewed against the approved methodology applied to confirm the appropriateness of formulae and correctness of calculations.

2.5 Resolution of Clarification and Corrective Action Requests

The objective of this phase of the validation is to resolve the requests for corrective actions, clarifications, and any other outstanding issues which need to be clarified for TÜV SÜD`s conclusion on the project design. The CARs and CRs raised by TÜV SÜD are resolved during communication between the client and TÜV SÜD. To guarantee the transparency of the validation process, the concerns raised and responses that have been given are documented in more detail in the validation protocol in Annex 1.

The final PDD (version 8.1) submitted May 2011 serves as the basis for the final assessment presented. Additional changes to the project during the validation process are not considered to be significant with respect to the main CDM objectives. The two CDM main objectives are the reduction of anthropogenic GHG emissions and the contribution of sustainable development to the host country.

2.6 Internal Quality Control

Internal quality control is the final step of the validation process and is conducted by the CB "climate and energy" who checks the final documentation, which includes the validation report and annexes. The completion of the quality control indicates that each report submitted has been approved either by the head of the CB or the deputy (a veto person is used if necessary). In projects where either the Head of the CB or his/her deputy is part of the assessment team, the approval is given by the one not serving on the project team.

After confirmation by the PP, the validation opinion and relevant documents are submitted to the EB through the UNFCCC web-platform.

3 SUMMARY

The assessment work and the main results are described below in accordance with the VVM reporting requirements. The reference documents indicated in this section and Annex 1 are stated in Annex 2 of this report.

3.1 Approval

The project participants are Capro Corporation, Hyosung Ebara Engineering Co., Ltd and Hyosung Corporation of the Republic of Korea. The host Party Republic of Korea meet the requirements to participate in the CDM.

The DNA of the Republic of Korea originally issued a LoA (IRL 54) on 11 August 2010 authorizing Capro Corporation, Hyosung Ebara Engineering Co., Ltd and Hyosung Corporation as a project participants. Due to the small difference of project title in PDD and LoA, the LoA was revised and reissued on 24 May 2011 again. TÜV SÜD received these letters from the project participants directly and considers the provided letters as authentic.

The final Korean LoA has further been double-checked with the staff of the Ministry of Knowledge Economy which is one of the approval entities of Korean government, which further confirms the approval of this CDM project.

Furthermore, after checking the provided LoAs, TÜV SÜD confirms that the letter refer to the precise proposed CDM project activity title in line with the title in the PDD "N2O Abatement project of Capro Corporation".

The letter also indicates that the participating party is a party to the Kyoto Protocol, and that the participation in the 'N_2O Abatement project of Capro Corporation' project is voluntary. The Korean LoA also confirm that the proposed CDM project activity contributes to the sustainable development of Korea (host country). Based on the information given in this letter, TÜV SÜD considers the approval as unconditional with respect to these items.

The Korean LoA has been issued by the respective party's DNA – Ministry of Knowledge Economy of the Republic of Korea. The LoA do not refer to a specific version of the PDD or validation report.

TÜV SÜD considers that the requirements of VVM (§§ 45-48) have been met.

3.2 Participation

The participants of the project activity have been approved by the corresponding Party, which is confirmed by the issued LoA.

The means of validation used are similar to the ones described in Section 3.1, specifically in regard to the approval process of the project activity.

3.3 Project design document

The PDD is compliant with relevant form and guidance as provided by UNFCCC.

The most recent version of the PDD form was used.

TÜV SÜD considers that the guidelines for the completion of the PDD in their most recent version have been followed. Relevant information was provided by the participants in the applicable PDD sections. Completeness was assessed through the protocol included in Annex 1.

3.4 Project description

The following description of the project as per PDD was verified during the on-site audit:

The project activity is to reduce nitrous oxide (N2O) emissions of the tail gas from the Caprolactam production process by installing DeN2O catalyst systems. The existing project plant is located in Ulsan City, Republic of Korea. The plant has three Caprolactam manufacturing plants in Capro corporation. However, only plant I and plant II are involved in this project. Currently, N2O from the plant is being released into the atmosphere without any treatment since N2O emissions are not regulated in Republic of Korea. The applied DeN2O catalyst systems will be provided by project participant and is expected to be able to decompose at least 90% of the emitted N2O. This project is the large scale of CDM project.

The information presented in the PDD on the technical design is consistent with the actual planning and implementation of the project activity confirmed in the following ways:

- A review and cross check of data and information (see annex 2).
- An on-site visit with relevant stakeholder and personnel with knowledge of the project in attendance. In case of doubt, further cross checks through additional interviews were conducted.
- A review of information related to similar projects or technologies which have been used if available to validate the accuracy and completeness of the project description.

In conclusion, TÜV SÜD confirms that the project description, as included in the PDD, is sufficiently accurate and complete in order to comply with the requirements of the CDM.

3.5 Baseline and monitoring methodology

3.5.1 Applicability of the selected methodology

Compliance with each applicability condition as listed in the chosen baseline and monitoring methodology AM0028 version 05 has been demonstrated.

Initially, the submitted PDD for GSP had applied AM0028 version 04.2. However, during the validation period, the validity was passed. Hence, the final PDD has been updated as AM0028 version 05 and the audit team has confirmed that the selected methodology and version is applicable.

The assessment was carried out for each applicability criterion and included, among other checks, a compliance check of the local project setting with the applicability conditions in regard to baseline setting and eligible project measures. This assessment also included the review of secondary sources to demonstrate the compliance with applicability conditions.

The methodology-specific protocol, included in Annex 1, documents the assessment process. The results of the compliance check as well as relevant evidence are detailed in the protocol and the information reference list.

TÜV SÜD confirms that the chosen baseline and monitoring methodology is applicable to the project activity.

Emission sources, not addressed by the applied methodology and expected to contribute more than 1% of the overall expected average annual emission reductions, have not been identified.

3.5.2 Project boundary

The project boundary was assessed considering information gathered from the physical site inspection, interviews, and secondary evidence received on the design of the project.

- The project boundary covers the catalytic N2O destruction facility such as DeNOx SCR, DeN2O catalyst and LNG used as reheating the tail gas in Caprolactam plant. And the Caprolactam production and operation parameters of the ammonia oxidation reactor(AOR) are included only for monitoring purpose.

Relevant documents assessed to confirm the project boundary are the following:

- P & ID for N2O abatement system in Plant 1(IRL #10-1)
- P & ID for N2O abatement system in Plant 2(IRL #10-2)
- Monitoring parameters marked in P & IDs for Plant 1 & 2(IRL #10-3)

Details and observations are listed in Annex 1.

Therefore, TÜV SÜD confirms that the identified boundary, the selected sources, and gases as documented in the PDD are justified for the project activity and are fully in line with the requirements set by the applied methodology.

3.5.3 Baseline identification

The PDD defines the following baseline scenario:

- *In the absence of the CDM project activity, the existing Caprolactam plants would continue to directly release the N2O from tail gas without any treatment. The continuation of the current situation, where there will be no installation of technology for the abatement of N2O.*

The current NOx emission level of the plants meets the NOx regulation in the Republic of Korea.

The information presented in the PDD has been validated by an initial document review of all data. Further confirmation has been made based on the on-site visit and a review of information from similar projects and/or technologies. The sources referenced in the PDD have been quoted correctly. The information was verified against credible sources, such as the following:

- National Regulation on NOx emission by the Clean Air Conservation Act (IRL #50)
- Plot plan before the proposed project for Plant I & Plant II (IRL #7-1, #8-1)
- Plot plan of Plant I & Plant II for N2O facility location (IRL #7-2, #8-2)
- The general production process for N2O commercial sales (IRL #24)
- Market report by Korea Petrochemical Statics (IRL #25-1)
- Country report on Asia Petrochemical Industry Conference (IRL #25-2)
- Historical NOx concentration data by TMS of Plant I & Plant II (IRL #38-1, #38-2)
- The existing SCR inspection report by 3rd party (IRL #23)

TÜV SÜD has determined that no reasonable alternative scenario has been excluded.

Based on the validated assumptions used for project activity calculations, TÜV SÜD considers that the identified baseline scenario is reasonable.

Taking the definition of the baseline scenario into account, TÜV SÜD confirms that all relevant CDM requirements, including relevant and/or sectoral policies and circumstances, have been identified correctly in the project PDD.

A verifiable description of the baseline scenario has been included in the PDD.

In regard to item 87 of VVM, TÜV SÜD confirms the following statements:

(a) All the assumptions and data used by the project participants are listed in the PDD, including their references and sources;

(b) All documentation used is relevant for establishing the baseline scenario and correctly quoted and interpreted in the PDD;

(c) Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence, and can be deemed reasonable;

(d) Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD;

(e) The approved baseline methodology has been correctly applied to identify the most reasonable baseline scenario, and the identified baseline scenario reasonably represents what would occur in the absence of the proposed CDM project activity.

3.5.4 Algorithm and/or formulae used to determine emission reductions

TÜV SÜD has assessed the calculations of project emissions, baseline emissions, leakage, and emission reductions. Corresponding calculations have been carried out based on calculation spreadsheets. The parameters and equations presented in the PDD, as well as other applicable documents, have been compared with the information and requirements presented in the methodology and respective tools. An equation comparison has been made to ensure consistency between all the formulae presented in the calculation files and in the PDD, methodology, and tools.

The assumptions and data used to determine the emission reductions are listed in the PDD and all the sources have been checked.

Based on the information reviewed it is confirmed that the sources used are correctly quoted and interpreted in the PDD.

The values presented in the PDD are considered reasonable based on the documentation and references reviewed and the results of the interviews.

The baseline methodology has been applied correctly according to requirements.

The estimate of the baseline emissions are considered correct as the calculations have been reproduced by the audit team with the attainment of the same results.

Detailed information on the verification of the parameters used in the equations are found in Annex 1. The algorithms for the determination of the baseline, project, and leakage are discussed in the following sections.

3.5.4.1 Baseline Emissions

The calculation of the baseline emissions have been conducted using procedures described in the methodology AM0028 version 05.

In accordance with the applied methodology, the baseline N2O emissions ($BE_{N2O,y}$) can be calculated depending on the implementation of regulations on N2O emissions and the character of the regulation. In case of this project, it is applied the case 1, which is reflected the actual N2O destruction facility. Hence, the baseline emission was considered the historical operation data and also limited to the each designed capacity of the existing caprolactam plant 1 and plant 2. The design capacity of each plant is validated as 63,307 ton/year for plant 1 and 64,965 ton/year

for plant 2. The validated design capacity for each plant will be effective as an individual production cap of each plant.

Hence, the baseline N2O emissions ($BE_{N2O,y}$) are calculated as the quantity of N2O supplied to the N2O destruction facility($QI_{N2O,y}$). $QI_{N2O,y}$ is calculated based on continuous measurement of the tail gas volume flow rate($F_{TI,i}$), N2O concentration at the inlet of the N2O destruction facility($CI_{N2O,i}$) and length of measuring interval(M_i).

$BE_y = BE_{N2O,y} * GWP_{N2O}$

$BE_{N2O,y} = QI_{N2O,y} = \sum F_{TI,I} * CI_{N2O,i} * M_i$

The baseline N_2O emission is controlled by the historical operating temperature and pressure, $T_{g,hist}$ & $P_{g,hist}$ in ammonia oxidation reactor. The historical operating temperature range of the ammonia oxidation reactor, $T_{g,hist}$ were set as 656.57° ~ 731.66° & 662.08° ~ 743.92° for AOR-a & b in plant I and 738.95° ~ 774.92 & 734.53° ~ 770.57 for AOR-c & d in plant II respectively. For the historical operating pressure of the ammonia oxidation reactor, $P_{g,hist}$ were set as 43,320 ~ 98,564 Pa gauge for AOR-a & b in plant I and 79,317 ~ 96,381 Pa gauge for AOR-c & d in plant II.

If the actual average daily operating temperatures and pressures in the ammonia oxidation reactors are outside permitted ranges of $T_{g,hist}$ or $P_{g,hist}$, the baseline N_2O emission are calculated for that period based on lower value between $EF_{N2O,\ IPCC}$, $SE_{N2O,y}$ and any related value as a result of legal regulation. If the new national legal regulations on N2O emissions are introduced during the crediting period, it could be applied the case 2, which the baseline emissions shall be adjusted at the time the legislation has to be legally implemented. It is clearly mentioned on section B.4. of the PDD.

Based on the reviewed information, it can be confirmed that the sources used are correctly quoted and interpreted in the PDD. And the values presented in the PDD are considered reasonable based on the documentation reviewed, further references and the result of the interviews.

As a result, the estimated of the baseline emissions can be confirmed as the same have been replicated by the audit team using the information provided.

3.5.5 Project emissions

According to the applied methodology, AM0028 Version 05, the project emissions (PE_y) could be composed of the emissions of not destroyed N2O ($PE_{ND,y}$) and emissions from auxiliary ammonia and hydrocarbons input resulting from the operation of the N2O destruction facility ($PE_{DF,y}$).

$PE_y = PE_{ND,y} + PE_{DF,y}$

In case of (a) N2O emissions not destroyed ($PE_{ND,y}$), it is calculated the N2O concentration in the tail gas of the N2O destruction facility ($CO_{N2O,i}$) and the volume flow rate for the tail gas stream ($F_{TE,i}$). Detailed information on the verification of the parameters used in the equations can be found in the annex 1.

In case of (b) N2O emissions related to the operation of the N2O destruction facility($PE_{DF,y}$), it is given by upstream emissions through the production of ammonia used as input ($PE_{NH3,y}$) and onsite emissions due to the hydrocarbons use as input to the N2O destruction facility($PE_{HC,y}$).

The project ammonia input ($PE_{NH3,y}$) is considered equal to the ammonia input of the baseline scenario in case an existing SCR DeNOx unit is already installed prior to the starting date of the project activity or has to be installed according to legal requirements. DeNOx units are already

installed at the all plants in project activity (IRL #9). As a result, the project emission from the ammonia input is considered to be zero.

As well, the project emission through the hydrocarbon input ($PE_{HC,y}$) is considered and natural gas is used for re-heating the tail gas to enhance the catalytic N2O reduction efficiency in this project.

In conclusion, N2O emissions not destroyed by the project activity and project emissions from the operation of the destruction facility are both considered in the calculation for the project emissions.

$PE_y = PE_{ND,y} + PE_{DF,y} = PE_{ND,y} + (\cancel{PE_{NH3,y}} + PE_{HC,y})$

$= PE_{ND,y} + PE_{HC,y}$

Based on the reviewed information, it can be confirmed that the sources used are correctly quoted and interpreted in the PDD and ER calculation sheet. And the values presented in the PDD & ER calculation sheet are considered reasonable based on the documentation reviewed, further references and the result of the interviews.

3.5.6 Leakage

As per the methodology, AM0028 version 05, 'Leakage' is defined as below.

"Appropriate tail gas temperature at the inlet of the N2O destruction facility could either be obtained due to external energy sources (e.g. additional heat exchanger) or by adjustments of the internal energy flow. In other words, the increased tail gas temperature at the inlet of the N2O destruction facility may require additional external energy, but the additional energy might be recovered before the tail gas is released to the atmosphere (e.g. tail gas turbine to generate electricity, kinetic energy or other).

On condition that an energy converter (e.g. tail gas turbine) is installed at the end of the pipe, the installation of the N2O destruction facility will not result in significant additional energy consumption at the nitric acid or caprolactam production plant and therefore no leakage is expected."

Based on the reviewed information 41-1 ~ 3, 42-1 ~2 and 43-1 ~ 3) and on-site interviews with PPs, the DeN2O units equip the facility which has a function of heat exchanger/container to recover/transfer the heat before the tail gas is released to the atmosphere. The Heat exchanger/container for heat recovery was checked with the submitted several supporting documents i.e. Process and Instruments drawing (P & ID) for Plant 1 & 2 (IRL # 10-3), Heat exchanger temperature distribution comparison table (IRL # 41-1), Examples of temperature calculation of heat exchanger form plant I and II (IRL # 41-2, 3), Heat exchanger size (IRL #43-3) and other documents (IRL #42-1~ 2 and #43-1 ~ 2) Hence, this is not result in significant additional energy consumption at the caprolactam plant. In conclusion, no leakage is expected in this project.

3.5.7 Emission Reductions

Emission reductions is calculated as the below formulae

$ER_y = BE_y - (PE_y + LE_y) = BE_y - (PE_y + 0) = BE_y - PE_y$

In summary, the calculation of the baseline emissions, project emissions and the emission reductions are considered correct.

3.6 Additionality

The additionality of the project has been presented in the PDD using the latest version of Additionality tool, "Tool for the demonstration and assessment of additionality, Version 05".

To set up the additionality, the project participants choose the simple cost analysis of the investment analysis. It is surely understandable that, as described in the PDD, the project activity does not make any financial or economical benefits except for CERs income.

The approach used in the PDD has been assessed initially through the document review, during which the following documents were reviewed:

- Excel file for 'Investment analysis of Capro N2O project' (IRL #15)

On site, the additionality was discussed principally with Mr. Heung-Jae Kim who is prof. manager in Capro corporation and Mr. Jong-hoon Park who is senior manager of Hyosung Ebara Engineering, who are project participants, and documents have been reviewed on-site (see Annex 2).

Finally, the data, rationales, assumptions, justifications, and documentation provided have been verified using local knowledge as well as sectoral and financial expertise. This information was also confirmed through the following documentation:

- Main equipment: N_2O abatement system- Quotation for NAS(N2O Abatement System) (IRL #16)
- Minor equipment (Accessories): Purchase order for control valve (IRL #17-1),
  Purchase order for fitting/Tee, V-NECK (IRL #17-2),
  Construction contract for TIE-IN (IRL #17-3)
- Monitoring equipment: Quotation of monitoring system (IRL #18)
- Catalyst: Quotation of Catalyst (IRL #19)
- Electricity charges : Fan capacity(IRL #20-1), Electricity cost(IRL#20-2)
- Labor costs: Labor cost standard (IRL #21)
- LNG charges: LNG cost (IRL #22)

Based on the aforementioned approach, TÜV SÜD confirms that the documentation provided is appropriate for this project.

3.6.1 Prior consideration of the clean development mechanism

The starting date of the project activity is determined by the date of purchasing contract of catalyst for N2O abatement technology system, which is the earliest date of the commitments of the significant expenditure for the project activity. In order to corroborate this information, the assessment team reviewed 'Purchasing contract for Catalyst (IRL #44)' and verified the relevant information through the interview with Mr. Park, Jong-Hoon who is the project manager of Hyosung Ebara Engineering.

Also, the starting date is determined to be 06/09/2010, which is after the GSP; therefore, it is confirmed that the project complies with the requirement.

The PPs presented the following information to the assessment team:

- Purchasing contract of Catalyst (IRL #44)
- Feasibility Study Report (IRL #49)
- MOU for CDM project between PPs (IRL #46-1, #46-2)
- A contract with CDM consultancy (IRL #47)
- The plan report for CDM project as final version(IRL #48)

The original documents presented have been reviewed and cross checked based on interviews with Mr. Gyu-Ho Heo who is a manager in Technical Team, Capro Corporation and Mr. Kwan-Sik Yang who is a manager in Quality Control Team, Hyosung Ebara Engineering. Therefore, the documents can be considered appropriate to confirm the prior consideration of CDM. Additionally, in order to confirm that the PPs have taken real actions to continue the activity as CDM, activities have been reviewed against the documents provided to the DOE and a timeline of events is shown in the table bellow

Timeline of Project Activity

Activity	**Document**	**Auditor conclusion**
February, 2009: Discussion of project master plan including schedule, organization for the proposed project implementation	A report on the project plan	Checked the PP's internal document for this project. CDM progress activity before Starting of the project activity
March, 2009: Making a MOU between PPs for this project	MOU for CDM project between Capro Corporation and Hyosung Ebara Engineering	Prior to CDM consideration & CDM progress activity before Starting of the project activity.
March, 2009: Contract with CDM consultancy for this project	A contract with CDM consultancy(Greenpolaris)	Prior to CDM consideration & CDM progress activity before Starting of the project activity.
September ~ October, 2009 Performing of the feasibility study	Feasibility study	Prior to CDM consideration & CDM progress activity before Starting of the project activity.
October, 2009 Contract with DOE	Contract with TUV-SUD	Prior to CDM consideration & CDM progress activity before Starting of the project activity.
December, 2009: Starting of the CDM validation	Start of Global Stakeholder Consultation (GSP)	CDM actions were ongoing.
September, 2010 Starting of the project activity	Purchasing contract of Catalyst	The project activity was started with the main contract of catalyst

This confirms that the project complies with the requirements to demonstrate the prior consideration of the CDM.

3.6.2 Identifications of alternatives

The output of the project is the concentration of N2O from tail gas of nitric acid plant. In accordance with the applied methodology, AM0028 version 05, the baseline scenario alternatives should identify technically to the project activity. All technically feasible alternatives/options are mentioned in step 1a and 1b in section of 'Identification of the baseline scenario' of the applied methodology. All alternatives/options are as below.

Alternative/Option (1): Status quo: The continuation of the current situation, where there will be no installation of technology for the destruction or abatement of N2O

Alternative/Option (2): Switch to alternative production method not involving ammonia oxidation process

Alternative/Option (3): Alternative use of N2O such as:

- *Recycling of N2O as a feedstock for the plant*
- *The use of N2O for external purposes*

Alternative/Option (4): Installation of Non-Selective Catalytic Reduction (NSCR) DeNOx unit

Alternative/Option (5): The installation of an N2O destruction or abatement technology

- *Tertiary measure for N2O destruction*
- *Primary or secondary measures for N2O destruction or abatement*

Alternative/Option (6): The continuation of the current situation, where either a DeNOx unit is installed or not

Alternative/Option (7): Installation of a new Selective Catalytic Reduction (SCR) DeNOx unit;

Alternative/Option (8): Installation of a new Non-Selective Catalytic Reduction (NSCR) DeNOx unit;

Alternative/Option (9): Installation of a new tertiary measure that combines NOx and N2O emission reduction

The list of alternatives to supply the above mentioned outputs presented in the PDD includes the implementation of the project activity without registration as a CDM project. The remaining alternatives presented include all plausible scenarios taking into account the local and sectoral situations for the mentioned outputs. The list of alternatives is considered complete.

3.6.3 Investment analysis

The PP uses the 'Simple cost analysis' as investment analysis to demonstrate the additionality.

In accordance with the "Tool for the demonstration and assessment of additionnality", the investment analysis is determined whether to apply simple cost analysis, investment comparison or benchmark analysis.

The project would produce no financial or economic benefits other than CDM related income. This is confirmed through the N2O tail gas is just emitted from stack and no usage. Additionally ,

taking the costs associated with the project into account confirms that the baseline is less costly than the proposed CDM project activity.

The parameters used in the financial calculations have been validated based on a review of the sources, inter alia:

- Investment analysis for Capro N_2O project (IRL #15)
- As the main part of the investment, The quotation for NAS(N2O Abatement System) issued by the Key Engineering(IRL #16)
- As a part of the accessories, Purchase order for control valve (IRL #17-1), Purchase order for fitting/Tee, V-NECK (IRL #17-2), Construction contract for TIE-IN (IRL #17-3) issued by DKMI Co.Ltd
- Monitoring equipment: Quotation of monitoring system (IRL #18) issued by C.K Techpia
- Catalyst: Quotation of Catalyst (IRL #19) issued by CRI catalyst
- Electricity charges : Fan capacity(IRL #20-1), Electricity cost(IRL#20-2)
- Labor costs: Labor cost standard (IRL #21)
- LNG charges: LNG cost (IRL #22)

Furthermore based on a cross check with the above documents for each parameter, it can be seen that the parameters are plausible and can be considered acceptable under the project situation. These documents are attached in Annex 2. Hence it can be confirmed that the underlying assumptions are appropriate for this project

3.6.4 Common practice analysis

The region for the common practice analysis has been defined as the host country, Republic of Korea: There are no similar practices occurring in a host country, because Capro, one of PPs, is only company to produce caprolactam(IRL #25-1, #25-2). The project activity´s technology can be found in Thailand, where different situations can appear. As a result, the region is defined by taking into account similar technologies as well as similar industry types.

The assessment team has reviewed the approach presented in the PDD and confirms that relevant parameters such as location, infrastructure, economical situation, and development have been taken into account in order to define the region to be used for the common practice.

The assessment team has confirmed that no similar activities to the proposed project activity have been observed in Republic of Korea, including the projects implemented as CDM because there is only one company, Capro Corporation produces caprolactam in Korea. This information confirms the statement in PDD that there is no similar project in Korea. Additionally, the team further verified the information based on interviews.

Therefore, it is confirmed that the proposed CDM activity is not a common practice in the defined region.

3.7 Monitoring plan

The monitoring plan presented in the PDD complies with the requirements of the applicable methodology. The assessment team has verified all parameters in the monitoring plan against the requirements of the methodology and no deviations have been found.

The procedures have been reviewed by the assessment team through document review and interviews with the relevant personnel. The information provided and a physical inspection has allowed the assessment team to confirm that the proposed monitoring plan is feasible within the project design. The relevant points of monitoring plan have been discussed with the PPs. Specifically; these points include the location of meters, data management, and the quality assurance and quality control procedures to be implemented in the context of the project.

- The tail gas volume flow rate at the inlet and exit of the destruction facility, $F_{Ti,i}$ and $F_{TE,i,}$, are continuously measured by flow meter before and after the DeN2O system of the plant, respectively. Both parameters, $F_{Ti,i}$ and $F_{TE,i,}$, can be cross-checked to ensure that no leak of N2O is taking place. In case of discrepancy, conservative calculation of emission reduction is provided to apply the lower value of the two values as below calculation formulae.

$$F_{TI}^{*} = \min\left[F_{TI} ; \left(\frac{F_{TE}}{1+VEF} - Q_{NG} \times \frac{Q_{NG\ combustion\ gas}}{Q_{NG}} \right) \right]$$

F_{TI}^{*}	: Conservative volume flow at the inlet of destruction facility used for emission reduction calculation (Nm^3/h)
F_{TI}	: Measurement value by a flow meter at inlet of destruction facility (Nm^3/h)
F_{TE}	: Measurement value by a flow meter at outlet of destruction facility (Nm^3/h)
Q_{NG}	: Natural gas input for re-heating the tail gas (Nm^3/h)
$Q_{NG\ combustion\ gas}$	: Combustion gas of natural gas (Nm^3/h)
VEF	: Volumetric Expansion Factor

- The N2O concentration of tail gas at destruction facility outlet, $CO_{N2O,I}$, is measured by the Non-dispersion infrared absorption analyzer(NDIR) after the DeN2O system for both plants. The measured data by NDIR shall daily be recorded in the monitoring system. And the backup data will be recorded new PC. QA/QC for the NDIR shall be subjected to the EN 14181.
- The N_2O concentration of tail gas at destruction facility inlet, $CI_{N2O,I}$, is also continuously measured by NDIR before the DeN2O system for both plants. The record and QA/QC procedures of $CI_{N2O,I}$ are same as $CO_{N2O,I.}$
- Additionally, Temperature (T_g), Pressure (P_g), Ammonia flow rate ($A_{OR,d}$) of the AOR are monitored for checking whether normal operation is undertaken.

Therefore, the PPs will be able to implement the monitoring plan and the achieved emission reductions can be reported ex-post and verified.

3.8 Sustainable development

The LoA of the host country presents a statement that the project contributes to the sustainable development of the host party.

3.9 Local stakeholder consultation

The relevant key local stakeholders have been invited via announcement of the two presses on June 22nd on Ulsan newspaper and June 23rd on Ulsan Daily newspaper, 2009. The actual newspapers explained and shown in PDD were checked by the audit team during on-site audit. The meeting minute of a stakeholder's meeting is given by IRL #53. The assessment team has reviewed the documentation in order to validate the inclusion of relevant stakeholders. Team

local expertise has confirmed that the communication method used to invite the stakeholders is appropriate. The summary of comments presented in the PDD has been verified with the documentation of the stakeholder consultation and has been found to be complete.

Comments presented by the local stakeholders have been taken into account by the PP and has been verified with information obtained during interviews.

Hence, the local stakeholder consultation has been performed adequately according to the CDM requirements.

3.10 Environmental impacts

The environmental Impact Assessment (EIA) is not necessary for this project activity under the laws and regulations in Republic of Korea. However, an analysis of environmental impacts has been conducted by the project participants. The assessment team has reviewed the documentation of the presented information. The IRL #52, 'N2O abatement project of Capro corporation_ Environment Impact Assessment Report', confirms the correctness of the approach used by the PPs. In conclusion, the PPs have followed the requirements of the host country with regards to addressing environmental impacts.

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4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS

TÜV SÜD published the project documents on the UNFCCC website and invited comments by affected Parties, stakeholders, and non-governmental organisations during a 30 day period.

All key information gathered is presented in the table bellow

GSP Comments

<table>
<tr><td colspan="2">website:
http://cdm.unfccc.int/Projects/Validation/DB/5G9IN03Q4C07IONC5MZ82P4MQHTKBE/view.html</td></tr>
<tr><td colspan="2">Starting date of the global stakeholder consultation process:
2009-12-16</td></tr>
<tr><td>Comment submitted by:
None</td><td>Issues raised:
-</td></tr>
<tr><td colspan="2">Response by TÜV SÜD:
-</td></tr>
</table>

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5 VALIDATION OPINION

TÜV SÜD has performed a validation of the following proposed CDM project activity:

"N_2O Abatement Project of Capro Corporation"

Standard auditing techniques have been used for the validation of the project. A methodology-specific protocol for the project has been prepared to conduct the validation process in a transparent and comprehensive manner.

The review of the project design documentation, subsequent follow-up interviews, and further verification of references have provided TÜV SÜD with sufficient evidence to determine the fulfilment of stated criteria in the protocol. In the opinion of TÜV SÜD, the project meets all relevant UNFCCC requirements for the CDM if the underlying assumptions do not change. TÜV SÜD recommends the project for registration by the CDM Executive Board.

An analysis, as provided by the applied methodology, demonstrates that the proposed project activity is not a likely baseline scenario. Emission reductions attributable to the project are additional to any that would occur in the absence of the project activity. Considering that the project will be implemented as designed, the project is likely to achieve the estimated amount of emission reductions of 660 995 tCO_2e annually and a total estimated of 6 609 950 tCO_2e as specified within the final PDD version.

The validation has been performed following the requirements of the latest version of the CDM VVM and on the basis of the contractual agreement. The single purpose of this report is its use during the registration process as part of the CDM project cycle.

Munich, 01-06-2011

Thomas Kleiser

Certification Body "climate and energy"
TÜV SÜD Industrie Service GmbH

Munich, 01-06-2011

Yoshida Yutaka

Assessment Team Leader

Industrie Service

Annex 1: Validation Protocol

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Table 1 Conformity of Project Activity and PDD

CHECKLIST TOPIC / QUESTION		Ref.	COMMENTS	PDD in GSP	Final PDD
A. General description of project activity					
A.1. Title of the project activity					
A.1.1.	Does the used project title clearly enable to identify the unique CDM activity?		Yes, the project title clearly enables the identification of the CDM activity.	☑	☑
A.1.2.	Are there any indication concerning the revision number and the date of the revision?		The submitted PDD is as version 1 and was completed on 19/10/2009. This version was also used for the GSP. The version and data of final PDD were 08.1 and 24/05/2011.	☑	☑
A.1.3.	Is this consistent with the time line of the project's history?	3, 44	Yes. In section B.8 of the PDD, the completion date of the baseline determination is on 02/09/2009, which is consistent with the completion date of the PDD. **Corrective Action Request No.1.** According to the site checking, this project was not started yet as PDD described the starting time on 02/11/2009. Please submit the revised project time schedule containing the expected project starting date to the audit team.	CAR #1	☑
A.2. Description of the project activity					
A.2.1.	Is the description delivering a transparent overview of the project activities?		Yes, the description of the project activity delivers a clearly transparent overview of the project activities.	☑	☑
A.2.2.	What proofs are available demonstrating that the project description is in compliance with the actual situation or planning?	4-1 4-2 5-1 5-2	No submission of any proofs till now. According to section C.1 of the PDD, this project is not started yet. **Corrective Action Request No.2.** Please submit the plant approvals from the government which can	CAR #2	☑

CHECKLIST TOPIC / QUESTION		Ref.	COMMENTS	PDD in GSP	Final PDD
		5-3 11-1 11-2	demonstrate the starting time of plant I & II. And also please provide the supporting documents for the maximum daily production and project operation days to estimate the production capacity. The estimation of the production capacity should be set conservatively.		
A.2.3.	Is the information provided by these proofs consistent with the information provided by the PDD?		See above CAR #2.	CAR #2	☑
A.2.4.	Is all information presented consistent with details provided by further chapters of the PDD?		The information given in the PDD is consistent with the other chapters of the PDD.	☑	☑
A.3. Project participants					
A.3.1.	Is the form required for the indication of project participants correctly applied?		Yes, Capro Corporation, Hyosung Ebara Engineering Co., Ltd and Hyosung Corporation are correctly indicated as a form of UNFCCC.	☑	☑
A.3.2.	Is the participation of the listed entities or Parties confirmed by each one of them?		Yes, the contact responsible persons of all entities involved are indicated in Annex 1 of PDD. All PPs confirmed the participation of the proposed project each other.	☑	☑
A.3.3.	Is all information on participants / Parties provided in consistency with details provided by further chapters of the PDD (in particular annex 1)?		Yes, section A.3 and Annex I are matched. Hence, the information of project participant is consistent.	☑	☑
A.4. Technical description of the project activity					
A.4.1.	*Location of the project activity*				
A.4.1.1.	Does the information provided on the lo-		The location of the project site could be clearly identified in the	CR #1	☑

CHECKLIST TOPIC / QUESTION		Ref.	COMMENTS	PDD in GSP	Final PDD
	cation of the project activity allow for a clear identification of the site(s)?		PDD. The address of the plant is identified as well as corresponding map. **Clarification Request No. 1.** In PDD, the map is containing the local language. Please change the map containing only English. And also please update GPS coordinates with 'Decimal degrees' method.		
A.4.1.2.	How is it ensured and/or demonstrated, that the project proponents can implement the project at this site (ownership, licenses, contracts etc.)?	44	**Clarification Request No. 2.** PPs will provide the governmental approval and contracts for main equipment and/or catalyst supply as soon as PPs make.	CR #2	☑
A.4.2.	*Category(ies) of project activity*				
A.4.2.1.	To which category(ies) does the project activity belonging to? Is the category correctly identified and indicated?		The project belongs to category 5 (chemical industry), which is clearly indicated and identified in the PDD.	☑	☑
A.4.3.	*Technology to be employed by the project activity*				
A.4.3.1.	Does the technical design of the project activity reflect current good practices?	12-1 12-2 12-3 12-4 13-1 13-2	The applied technology will be designed and equipped by Hyosung, which is one of project participant. For this project, the investigation is in process at present to seek the proper N2O abatement catalyst with at least 90% of high efficiency and longer-lasting effective lifetime for containing N2O and SOx gas. This is the first of its kind project in Korea so the technical design for this project is definitely current good practices. **Clarification Request No. 3.**	CR #3	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		According to the audit team checking, PPs performed the catalyst tests for this project. Please provide the testing results of Catalysts' comparison for this project showing PPs' effort to implement the high technology.		
A.4.3.2. Does the description of the technology to be applied provide sufficient and transparent input/ information to evaluate its impact on the greenhouse gas balance?		The description of the technology allows a transparent overview on the abatement technology including information.	☑	☑
A.4.3.3. Does the implementation of the project activity require any technology transfer from annex-I-countries to the host country(ies)?		The implementation of the project activity requires the measuring equipments including monitoring IT system from one of German companies. It will also introduce the advanced catalyst technology and lead to an enhancement of skills as employees will be trained to operate the applied N2O abatement system.	☑	☑
A.4.3.4. Is the technology implemented by the project activity environmentally safe?	13-1 13-2 52	The implementing technology is environmentally safe and according to EIA results in section D of the PDD, this project activity is also environmentally safe.	☑	☑
A.4.3.5. Is the information provided in compliance with actual situation or planning?		See as CAR #1	CAR #1	☑
A.4.3.6. Does the project use state of the art technology and / or does the technology result in a significantly better performance than any commonly used technologies in the host country?	12-1 12-2 12-3 12-4 13-1	Please refer to CR #3 in A.4.3.1.for the technology implementation. Also the measuring equipments including the monitoring IT system will be imported from Germany so the necessary training will be held for operation staffs of Capro Corporation. In Korea, there is no mandatory regulation related to N2O emission. Therefore, N2O emitted from project site will be released	CR #3	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
	13-2	continuously without project implementation.		
A.4.3.7. Is the project technology likely to be substituted by other or more efficient technologies within the project period?	34-1 34-2	The implementing facilities consist of roughly Heat Sink material, Catalyst, Pipelines, measuring equipment, monitoring IT system, Blower and reaction chamber etc. The durable parts lasting more than 10 years are pipelines, measuring equipments, monitoring IT system, blower and reaction chamber. Hence, any substitution or replacement of the technology to be installed during the project period is not reasonable. **Clarification Request No. 4.** Please submit the technical documents demonstrate the technical lifetime of the project facilities.	CR #4	☑
A.4.3.8. Does the project require extensive initial training and maintenance efforts in order to be carried out as scheduled during the project period?		Yes, In section B.7.2 of the PDD, the project required training and maintenance efforts during the project period are clearly described as the monitoring plan. According to the training plan among this section, the supplier of the NDIR system will provide complete training to the monitoring engineers. And the provider of the De-N2O system will initiate the operation technique for the system to the staff in project activity site.	☑	☑
A.4.3.9. Is information available on the demand and requirements for training and maintenance?		Please see above A.4.3.8.	☑	☑
A.4.3.10. Is a schedule available for the implementation of the project and are there any risks for delays?	3, 44	This project does not started yet. Although this project seems to satisfy prior consideration of the CDM, there are risks for delays. Please See CAR #1.	CAR #1	☑

CHECKLIST TOPIC / QUESTION		Ref.	COMMENTS	PDD in GSP	Final PDD
A.4.4.	*Estimated amount of emission reductions over the chosen crediting period*				
A.4.4.1.	Is the form required for the indication of projected emission reductions correctly applied?		Yes, the form is correctly applied.	☑	☑
A.4.4.2.	Are the figures provided consistent with other data presented in the PDD?	36	**Corrective Action Request No.3.** In Table 1, "Total estimated reductions" is stated as 6,651,821 tCO_{2e}/yr. Please correct unit and the total volume of CER for 10 years.	CAR #3	☑
A.4.5.	*Public funding of the project activity*				
A.4.5.1.	Is the information provided on public funding provided in compliance with the actual situation or planning as available by the project participants?		Yes, this project doesn't involve any public funding. It was confirmed by the interview with Mr. Park, Jong-Hoon from Hyosung Ebara Engineering.	☑	☑
A.4.5.2.	Is all information provided consistent with the details given in remaining chapters of the PDD (in particular annex 2)?		Yes, Annex 2 mentions that no public funding from Parties included in Annex I is used for this project activity.	☑	☑
B. Application of a baseline and monitoring methodology					
B.1. Title and reference of the approved baseline and monitoring methodology					
B.1.1.	Are reference number, version number, and title of the baseline and monitoring methodology clearly indicated?		Yes, reference number, version number and title of the baseline and monitoring methodology are clearly indicated in the PDD.	☑	☑
B.1.2.	Is the applied version the most recent one and / or is this version still applicable?		Yes, the applied methodology is version 05 of AM0028, which is the most recent one and still applicable.	☑	☑

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<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
<tr><td colspan="5">B.2. Justification of the choice of the methodology and why it is applicable to the project activity</td></tr>
<tr><td>B.2.1. Is the applied methodology considered the most appropriate one?</td><td></td><td>Yes, N2O destruction from caprolactam production is clearly defined in AM0028. The used methodology is the most appropriate one.</td><td>☑</td><td>☑</td></tr>
<tr><td colspan="5">Integrate the required amount of sub-checklists on the applicability criteria as given by the applied methodology and comment on at least every line answered with “No”</td></tr>
<tr><td>B.2.2. Criterion 1:
The applicability is limited to the existing production capacity measured in tons of nitric acid, where commercial production began no later than 31 December 2005. Existing production capacity is defined as the designed capacity, measured in tons of nitric acid or caprolactam per year.</td><td>4-1
4-2
5-1
5-2
5-3
11-1
11-2</td><td><table><tr><th>Applicability checklist</th><th>Yes / No</th></tr><tr><td>Criterion discussed in the PDD?</td><td>Yes</td></tr><tr><td>Compliance provable?</td><td>Yes</td></tr><tr><td>Evidences provided in the PDD?</td><td>Yes</td></tr><tr><td>Compliance verified?</td><td>Yes</td></tr></table>The starting date of production has been checked with the old documents from Capro and they were attached in Annex 2.</td><td>☑</td><td>☑</td></tr>
<tr><td>B.2.3. Criterion 2:
Existing caprolactam plants are limited to those employing the Raschig process not using any external sources of nitrogen compounds other than feed ammonia. or those employing the HPO process that may use nitric acid as an external nitrogen source for caprolactam production in addition to feed ammonia.</td><td>6-1
6-2</td><td><table><tr><th>Applicability checklist</th><th>Yes / No</th></tr><tr><td>Criterion discussed in the PDD?</td><td>Yes</td></tr><tr><td>Compliance provable?</td><td>Yes</td></tr><tr><td>Evidences provided in the PDD?</td><td>Yes</td></tr><tr><td>Compliance verified?</td><td>Yes</td></tr></table>The audit team has checked the production site and the submitted operation manual for Raschig process has been checked.</td><td>☑</td><td>☑</td></tr>
<tr><td>B.2.4. Criterion 3:
The project activity will not result in shut down of an existing N_2O destruction or</td><td>7-1
7-2</td><td><table><tr><th>Applicability checklist</th><th>Yes / No</th></tr><tr><td>Criterion discussed in the PDD?</td><td>Yes</td></tr></table></td><td>☑</td><td>☑</td></tr>
</table>

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
abatement facility at the nitric acid or caprolactam production plant.	8-1 8-2	Compliance provable? Yes Evidences provided in the PDD? Yes Compliance verified? Yes The audit team has checked the plot plans of the plant and visited on the site. It was confirmed that any N2O destruction or abatement facility didn't exist before the proposed project activity.		
B.2.5. Criterion 4: The project activity shall not affect the nitric acid or caprolactam production level.	10-3	Applicability checklist: Yes / No Criterion discussed in the PDD? Yes Compliance provable? Yes Evidences provided in the PDD? Yes Compliance verified? Yes The audit team has confirmed the applied DeN2O technology is only for applying to tail gas treatment process. According to the P&ID, the DeN2O system is installed after the caprolactam production line. In addition, PDD has been stipulated that if caprolactam production level will be increased in the future, the variation of N2O reduction amount shall not be accounted.	☑	☑
B.2.6. Criterion 5: The project activity will not cause an increase in NOx emissions.	10-3 13-3	Applicability checklist: Yes / No Criterion discussed in the PDD? Yes Compliance provable? Yes Evidences provided in the PDD? Yes Compliance verified? Yes De-NOx system was already implemented in front of the facility of the proposed project. There is no change of NOx level.	☑	☑

<table>
<tr><th colspan="2">CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
<tr><td colspan="2"></td><td></td><td>In addition, TMS (Tele Monitoring System) organized and supervised by the local government is running all the time to control the NOx level. The tele-transferred data and system has been checked by the audit team</td><td></td><td></td></tr>
<tr><td>B.2.7.</td><td>Criterion 6:
In case a $DeNO_x$ unit is already installed prior to the start of the project activity, the installed $DeNO_x$ is a Selective Catalytic Reduction (SCR) $DeNO_x$ unit.</td><td>9</td><td><table><tr><th>Applicability checklist</th><th>Yes / No</th></tr><tr><td>Criterion discussed in the PDD?</td><td>Yes</td></tr><tr><td>Compliance provable?</td><td>Yes</td></tr><tr><td>Evidences provided in the PDD?</td><td>Yes</td></tr><tr><td>Compliance verified?</td><td>Yes</td></tr></table>
The audit team has confirmed that the SCR DeNOx unit is already installed prior to the start of the project activity in accordance with the internal document (Process Safety Manual) in capro corporation.</td><td>☑</td><td>☑</td></tr>
<tr><td>B.2.8.</td><td>Criterion 7:
The N_2O concentration in the flow at the inlet and the outlet of the catalytic N2O destruction facility is measurable. Furthermore, for a caprolactam plant using the HPO process, the N2O concentration in the gas flow between the ammonia oxidation reactor and the absorption column is also measurable, and the N2O in the product flow from the absorption column to the HPO process area is quantifiable.</td><td>10-1
10-2
10-3</td><td><table><tr><th>Applicability checklist</th><th>Yes / No</th></tr><tr><td>Criterion discussed in the PDD?</td><td>Yes</td></tr><tr><td>Compliance provable?</td><td>Yes</td></tr><tr><td>Evidences provided in the PDD?</td><td>Yes</td></tr><tr><td>Compliance verified?</td><td>Yes</td></tr></table>``
The audit team has checked the P&ID. Both N2O concentrations at the inlet and the outlet are measured by analyzer.
In addition, this project is not for a caprolactam plant using the HPO process.</td><td>☑</td><td>☑</td></tr>
<tr><td colspan="6">B.3. Description of the sources and gases included in the project boundary</td></tr>
<tr><td colspan="6">Integrate the required amount of sub-checklists for sources and gases as given by the methodology applied and comment on at least every line ans-</td></tr>
</table>

Industrie Service

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
wered with "No".				
B.3.1. Source: Emissions of N_2O as a result of side reaction to the nitric acid or caprolactam production process Gas(es): N_2O Type: Baseline Emissions		Boundary checklist / Yes / No Source and gas(es) discussed in the PDD? Yes Inclusion / exclusion justified? Yes Explanation / Justification sufficient? Yes Consistency with monitoring plan? Yes	☑	☑
B.3.2. Source: In an HPO caprolactam production process emissions of N2O as a result of the decomposition of hydroxylamine(hyam) in the absorption column Gas(es): N_2O Type: Baseline Emissions		Boundary checklist / Yes / No Source and gas(es) discussed in the PDD? Yes Inclusion / exclusion justified? Yes Explanation / Justification sufficient? Yes Consistency with monitoring plan? N/A		☑
B.3.3. Source: Emissions related to the production of ammonia used for NOx reduction Gas(es): CO_2, CH_4, N_2O Type: Baseline Emissions		Boundary checklist / Yes / No Source and gas(es) discussed in the PDD? Yes Inclusion / exclusion justified? Yes Explanation / Justification sufficient? Yes Consistency with monitoring plan? Yes	☑	☑
B.3.4. Source: N_2O emissions from SCR DeNOx-unit Gas(es): N_2O Type: Baseline Emissions		Boundary checklist / Yes / No Source and gas(es) discussed in the PDD? Yes Inclusion / exclusion justified? Yes Explanation / Justification sufficient? Yes Consistency with monitoring plan? Yes	☑	☑
B.3.5. Source: Emissions of N_2O as a result of side reaction to the nitric acid or caprolactam pro-		Boundary checklist / Yes / No Source and gas(es) discussed in the PDD? Yes	☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
duction process Gas(es): N_2O Type: Project Emissions		Inclusion / exclusion justified? Yes Explanation / Justification sufficient? Yes Consistency with monitoring plan? Yes		
B.3.6. Source: Emissions related to the production of ammonia input used for NO_x reduction Gas(es): CO_2, CH_4, N_2O Type: Project Emissions		Boundary checklist / Yes / No Source and gas(es) discussed in the PDD? Yes Inclusion / exclusion justified? Yes Explanation / Justification sufficient? Yes Consistency with monitoring plan? Yes	☑	☑
B.3.7. Source: Emissions at the project site resulting from hydrocarbons used as reducing agent and/or re-heating the tail gas Gas(es): CO_2, CH_4 Type: Project Emissions		Boundary checklist / Yes / No Source and gas(es) discussed in the PDD? Yes Inclusion / exclusion justified? Yes Explanation / Justification sufficient? Yes Consistency with monitoring plan? Yes	☑	☑
B.3.8. Source: Emissions from electricity demand Gas(es): CO_2, CH_4, N_2O Type: Project Emissions		Boundary checklist / Yes / No Source and gas(es) discussed in the PDD? Yes Inclusion / exclusion justified? Yes Explanation / Justification sufficient? Yes Consistency with monitoring plan? Yes	☑	☑
B.3.9. Source: Emissions related to the production of the hydrocarbons Gas(es): CO_2, CH_4, N_2O Type: Project Emissions		Boundary checklist / Yes / No Source and gas(es) discussed in the PDD? Yes Inclusion / exclusion justified? Yes Explanation / Justification sufficient? Yes Consistency with monitoring plan? Yes	☑	☑
B.3.10. Do the spatial and technological boundaries as verified on-site comply with the	10-1	**Corrective Action Request No.4.**	CAR #4	☑

CHECKLIST TOPIC / QUESTION		Ref.	COMMENTS	PDD in GSP	Final PDD
	discussion provided by / indication included to the PDD?	10-2 10-3	The spatial and technological boundaries are indicated in the PDD. However, the boundary is too brief to explain overall project technology. Please indicate more detail including the measuring points, parameters and etc.		
B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario					
B.4.1.	Have all technically feasible baseline scenario alternatives (at least all scenarios listed under step 1a in AM0028, vers.05) to the project activity been identified and discussed by the PDD? Why can this list be considered as being complete?	23 24 25-1 25-2 50	Yes, all options as provided by step 1a for identifying the baseline scenario have been considered. There are no further scenarios that might present attractive options to those ones presented. All of these options stipulated as step 1a are technically feasible as alternatives for the baseline scenario.	☑	☑
B.4.2.	Have all technically feasible alternatives (at least all scenarios listed under step 1b in AM0028, vers.05) to handle NO_x emissions been identified and discussed by the PDD?	23 24 25-1 25-2 50	Yes, all options as provided by step 1b for identifying the baseline scenario of handling NOx emission have been considered. There are no further scenarios that might present attractive options to those ones presented. All of these options stipulated as step 1b are technically feasible as alternatives for the baseline scenario.	☑	☑
B.4.3.	Does the project identify correctly and exclude those options not in line with regulatory or legal requirements (step 2)?	50	Yes, All options as provided by step 1a and 1b comply with regulatory and legal requirements. Hence, none of them has been eliminated from further description.	☑	☑
B.4.4.	Have applicable regulatory or legal requirements been identified (step 2)?	50	Yes, In Korea, there are no regulation or legal requirements dealing with restricting N2O emissions from production process. Hence, all feasible baseline options fully under the legal requirements and not eliminated at this baseline step.	☑	☑

CHECKLIST TOPIC / QUESTION		Ref.	COMMENTS	PDD in GSP	Final PDD
B.4.5.	Is a complete list of barriers developed that prevent alternatives to occur (step 3a)?		The project participants have been chosen 'investment barriers' for developing that prevent alternatives to occur.	☑	☑
B.4.6.	Is transparent and documented evidence provided on the existence and significance of these barriers?	23 24 25-1 25-2 50	Yes, all options as provided by step 1a and 1b for identifying the baseline scenario are 9 alternatives. The analysis of each scenario is as follows: This project has no profit but for CERs income, also no mandatory regulation for N2O emission in the host country. Hence, it is not economically reasonable and necessary that introducing N2O destruction or abatement technology, or replacing the existed production method to new one. Accordingly, the following 2 options are eliminated. ✓ Option 2: Switch to alternative production method not involving ammonia oxidation process ✓ Option 5: The installation of a Non-Selective Catalytic Reduction(NSCR) De-NOx unit N2O is not a component which can be used as a feedstock for producing caprolactam. Also, there is no legal enforcement of recycling N2O emitted in the host country. Hence, there is no reason to recover N2O without the economic gains by selling N2O for external purposes. Accordingly, Option 3 is eliminated. ✓ Option 3: Alternative use of N2O such as: - Recycling of N2O as a feedstock for the plant - The use of N2O for external purposes. The existed SCR type units in Capro are durable and don't need to install new SCR unit for project activity. Accordingly, Option 7 is	☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		eliminated. ✓ Option 7: Installation of a new Selective Catalytic Reduction(SCR) De-NOx unit NSCR type is not so much economically attractive as replace exist SCR units, because the initial cost for installing new NSCR-type De-NOx unit is huge. In operating NSCR-type De-NOx unit, larger amount of natural gas is required than SCR type De-NOx units. Hence, there is no economically feasible reason to install new NSCR to replace the existed SCR unit. Accordingly, Option 4 and 8 are eliminated. ✓ Option 4: Installation of a NSCR De-NOx unit ✓ Option 8: Installation of a new NSCR De-DOx unit There is no compulsory reason to install any units including tertiary type in order to reduce N2O emission. And it doesn't have to introduce a new installation, regardless of the type of units, for NOx emission reduction, because SCR De-NOx unit, kind of tertiary measure, is already existed for each involved plant to this project. Hence, Option 9 is eliminated. ✓ Option 9: Instatllation of a new tertiary measure that combines NOx and N2O emission reduction. Consequently, most alternative scenarios are eliminated and Option 1 and Option 6 are only remained in this step. ● Option 1: Status quo: The continuation of the current situation, where there will be no installation of technology for the destruction or abatement of N2O.		

CHECKLIST TOPIC / QUESTION		Ref.	COMMENTS	PDD in GSP	Final PDD
			●Option 6: The continuation of the current situation, where either a De-NOx unit is installed or not.		
B.4.7.	Is it transparently shown that at least one of the alternatives is not prevented by the identified barriers (step 3b)?		Through sub-step 3a, Option 1 and Options 6 are considered as feasible alternative to be baseline scenario. That is considered the continuation of current situation. **Clarification Request No. 5.** Please describe this step in more detail in the PDD.	CR #5	☑
B.4.8.	Does the PDD include an appropriate discussion if and how any alternatives generate financial or economic benefits? (step 4)	15	Yes, the PDD include a description of financial benefit for remaining alternative. Consequently, the continuation of current practice, which is applicable baseline scenario, generates no financial or economic benefits.	☑	☑
B.4.9.	In case of Option I: Is the least costly alternative clearly identified?	15	Yes, that is clearly described in the PDD. All alternatives except for the continuation of the current practice require substantial investment. **Clarification Request No. 6.** Please submit the investment analysis for this project activity.	CR #6	☑
B.4.10.	In case of Option II: Is the most suitable financial indicator clearly identified?		Not applicable.	N/A	N/A
B.4.11.	In case of Option II: Is the calculation of financial figures for this indicator correctly done for all remaining alternatives?		Not applicable.	N/A	N/A
B.4.12.	In case of Option II: Is the investment analysis presented in a transparent manner providing public available proofs for data?		Not applicable.	N/A	N/A

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
B.4.13. In case of Option II: Is the sensitivity analysis evidencing the robustness of the financial attractiveness of the selected baseline scenario?		Not applicable.	N/A	N/A
B.4.14. In case of Option II: Have reasonable variations been applied in critical assumptions?		Not applicable.	N/A	N/A
B.4.15. In case of a re-assessment in the course of the project's lifetime: Are there any new or modified NO_x-emission regulations, which may address the project baseline?		Not applicable.	N/A	N/A
B.4.16. In case of a re-assessment in the course of the project's lifetime: Have new baseline scenarios been properly discussed reflecting the altered situation?		Not applicable.	N/A	N/A
B.4.17. In case of a re-assessment in the course of the project's lifetime: Are there any new or modified N_2O-emission regulations, which may address the project baseline?		Not applicable.	N/A	N/A
B.4.18. In case of a re-assessment in the course of the project's lifetime: Have new baseline scenarios been properly discussed reflecting the altered situation?		Not applicable.	N/A	N/A
B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):				
B.5.1. In case of applying step 2 / investment analysis of the additionality tool: Is the	15	Yes, Simple cost analysis is applied for this project activity, which doesn't make any profit but expected CER income.	☑	☑

	CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
	analysis method identified appropriately (step 2a)?				
B.5.2.	In case of Option I (simple cost analysis): Is it demonstrated that the activity produces no economic benefits other than CDM income?	15	See as B.5.1.	☑	☑
B.5.3.	In case of Option II (investment comparison analysis): Is the most suitable financial indicator clearly identified (IRR, NPV, cost benefit ratio, or (levelized) unit cost)?		Not applicable.	N/A	N/A
B.5.4.	In case of Option III (benchmark analysis): Is the most suitable financial indicator clearly identified (IRR, NPV, cost benefit ratio, or (levelized) unit cost)?		Not applicable.	N/A	N/A
B.5.5.	In case of Option II or Option III: Is the calculation of financial figures for this indicator correctly done for all alternatives and the project activity?		Not applicable.	N/A	N/A
B.5.6.	In case of Option II or Option III: Is the analysis presented in a transparent manner including publicly available proofs for the utilized data?		Not applicable.	N/A	N/A
B.5.7.	In case of applying step 3 (barrier analysis) of the additionality tool: Is a complete list of barriers developed that prevent the different alternatives to occur?	15 24 50	**Corrective Action Request No.5.** In case of step 3 of the additionality tool, it should describe for barrier analysis of identified baseline alternative. Please clarify in this section.	CAR #5	☑
B.5.8.	In case of applying step 3 (barrier analy-	15	Same as B. 5.7.	CAR #5	☑

CHECKLIST TOPIC / QUESTION		Ref.	COMMENTS	PDD in GSP	Final PDD
	sis): Is transparent and documented evidence provided on the existence and significance of these barriers?	24 50			
B.5.9.	In case of applying step 3 (barrier analysis): Is it transparently shown that the execution of at least one of the alternatives is not prevented by the identified barriers?	15 24 50	Same as B. 5.7.	CAR #5	☑
B.5.10.	Have other activities in the host country / region similar to the project activity been identified and are these activities appropriately analyzed by the PDD (step 4a)?	25-1 25-2	Yes, there are no other activities similar to the proposed project activity. The caprolactam production facility is unique in the host country.	☑	☑
B.5.11.	If similar activities are occurring: Is it demonstrated that in spite of these similarities the project activity would not be implemented without the CDM component (step 4b)?	25-1 25-2	See B. 5.10. There are no similar options occurring in the host country, because Capro which is project participant, is only company to produce caprolactam in host country. Similar project to abate N2O emitted from caprolactam projection plant is registered as a CDM project hosted by Thailand.	☑	☑
B.6. Emissions reductions					
B.6.1.	*Explanation of methodological choices*				
B.6.1.1.	Is it explained how the procedures provided in the methodology are applied by the proposed project activity?	36	Yes, The discussion under section B.6.1 is referencing all formulae and emissions in compliance with the applied methodology.	☑	☑
B.6.1.2.	Is every selection of options offered by the methodology correctly justified and is this justification in line with the situation verified on-site?	36	Yes, every selection of options offered by the methodology correctly justified in the PDD and verified by audit team.	☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
B.6.1.3. Are the formulae required for the determination of project emissions correctly presented, enabling a complete identification of parameter to be used and / or monitored?	36	Yes, The discussion under section B.6.1 is in principle referencing all formulae and emissions in compliance with the applied methodology and the project boundaries as presented earlier in the PDD.	☑	☑
B.6.1.4. Are the formulae required for the determination of baseline emissions correctly presented, enabling a complete identification of parameter to be used and / or monitored?	36	Yes, The discussion under section B.6.1 is in principle referencing all formulae and emissions in compliance with the applied methodology and the project boundaries as presented earlier in the PDD.	☑	☑
B.6.1.5. Are the formulae required for the determination of leakage emissions correctly presented, enabling a complete identification of parameter to be used and / or monitored?	36	In line with the methodology, leakage emissions needs only be analyzed if the project activity does not involve any energy recovery from the tail gas. In case of this project activity, Reaction chamber and Heat Sink are important parts for considering of leakage. Hence, Same as CR#3.	CR #3	☑
B.6.1.6. Are the formulae required for the determination of emission reductions correctly presented?	36	Yes, The formulae for determine the emission reductions are correctly presented.	☑	☑
B.6.2. Data and parameters that are available at validation				
B.6.2.1. Is the list of parameters presented in chapter B.6.2 considered to be complete with regard to the requirements of the applied methodology?		The version 05 of AM0028 does not specify explicitly parameters to be fixed ex-ante (besides historic operation range) but the discussion under this section includes all parameter to be determined ex-ante.	☑	☑
Integrate the required amount of sub-checklists for monitoring parameter and comment on any line answered with "No"				
B.6.2.2. Parameter Title: GWP_{N2O}		Data Checklist | Yes / No	CAR #6	☑

<table>
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<tr><td>Data unit correctly expressed?</td><td>No</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>Yes</td></tr>
<tr><td>Correct value provided?</td><td>Yes</td></tr>
<tr><td>Has this value been verified?</td><td>Yes</td></tr>
<tr><td>Choice of data correctly justified?</td><td>Yes</td></tr>
<tr><td>Measurement method correctly described?</td><td>N/A</td></tr>
</table>

<u>Corrective Action Request No.6.</u>
Please correct the data unit of ‘GWP of N_2O’ in PDD.</td><td></td><td></td></tr>
<tr><td>B.6.2.3. Parameter Title:
GWP_{CH4}</td><td></td><td>
<table>
<tr><th>Data Checklist</th><th>Yes / No</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>No</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>Yes</td></tr>
<tr><td>Correct value provided?</td><td>Yes</td></tr>
<tr><td>Has this value been verified?</td><td>Yes</td></tr>
<tr><td>Choice of data correctly justified?</td><td>Yes</td></tr>
<tr><td>Measurement method correctly described?</td><td>N/A</td></tr>
</table>

<u>Corrective Action Request No.7.</u>
Please correct the data unit of ‘GWP of CH_4’ in PDD.</td><td>CAR #7</td><td>☑</td></tr>
<tr><td>B.6.2.4. Parameter Title:
$P_{product,hist}$</td><td>11-1
11-2</td><td>
<table>
<tr><th>Data Checklist</th><th>Yes / No</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
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</td><td>CR #7</td><td>☑</td></tr>
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<table>
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<table>
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<tr><td>Correct value provided?</td><td>Yes</td></tr>
<tr><td>Has this value been verified?</td><td>Yes</td></tr>
<tr><td>Choice of data correctly justified?</td><td>Yes</td></tr>
<tr><td>Measurement method correctly described?</td><td>N/A</td></tr>
</table>

<u>Clarification Request No. 7.</u>
Please change the title of parameter as described in the applied methodology. Also please correct the equation no. in footnote page 30 in PDD.
</td><td></td><td></td></tr>
<tr><td>B.6.2.5. Parameter Title:
$A_{OR,hist}$</td><td>26
29</td><td>
<table>
<tr><th>Data Checklist</th><th>Yes / No</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>Yes</td></tr>
<tr><td>Correct value provided?</td><td>Yes</td></tr>
<tr><td>Has this value been verified?</td><td>Yes</td></tr>
<tr><td>Choice of data correctly justified?</td><td>Yes</td></tr>
<tr><td>Measurement method correctly described?</td><td>Yes</td></tr>
</table>
</td><td>☑</td><td>☑</td></tr>
<tr><td>B.6.2.6. Parameter Title:
$T_{g,hist}$</td><td>26
27-1
27-2</td><td>
<table>
<tr><th>Data Checklist</th><th>Yes / No</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>Yes</td></tr>
<tr><td>Correct value provided?</td><td>Yes</td></tr>
<tr><td>Has this value been verified?</td><td>Yes</td></tr>
</table>
</td><td>CR #24</td><td>☑</td></tr>
</table>

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		Choice of data correctly justified? — Yes Measurement method correctly described? — Yes **Clarification Request No. 24.** According to the operation data for AOR, the range of T_g was slightly changed between the first-submitted data and the second-submitted data. Please explain the reason of the change.		
B.6.2.7. Parameter Title: $P_{g,hist}$	26 28	Data Checklist — Yes / No Title in line with methodology? — Yes Data unit correctly expressed? — Yes Appropriate description of parameter? — Yes Source clearly referenced? — Yes Correct value provided? — Yes Has this value been verified? — Yes Choice of data correctly justified? — Yes Measurement method correctly described? — Yes **Clarification Request No. 8.** According to the audit team checking, the applied values were not correctly converted from kgf/cm2 to Pa. Therefore, the values are slightly different from the audit team's calculation. Please update correct values for $P_{g,hist}$.	CR #8	☑
B.6.2.8. Parameter Title: $G_{sup,hist}$	14	Data Checklist — Yes / No Title in line with methodology? — Yes	CAR #8	☑

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
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<table>
<tr><td>Data unit correctly expressed?</td><td>N/A</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>No</td></tr>
<tr><td>Correct value provided?</td><td>Yes</td></tr>
<tr><td>Has this value been verified?</td><td>Yes</td></tr>
<tr><td>Choice of data correctly justified?</td><td>Yes</td></tr>
<tr><td>Measurement method correctly described?</td><td>N/A</td></tr>
</table>
<u>Corrective Action Request No.8.</u>
Please submit the clear evidences such as a purchase and/or delivery orders, etc.</td><td></td><td></td></tr>
<tr><td>B.6.2.9. Parameter Title:
$G_{com,hist}$</td><td>14</td><td>
<table>
<tr><th>Data Checklist</th><th>Yes / No</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>No</td></tr>
<tr><td>Correct value provided?</td><td>Yes</td></tr>
<tr><td>Has this value been verified?</td><td>Yes</td></tr>
<tr><td>Choice of data correctly justified?</td><td>Yes</td></tr>
<tr><td>Measurement method correctly described?</td><td>N/A</td></tr>
</table>
<u>Corrective Action Request No.9.</u>
Please submit the clear evidences for identifying the composition of catalyst..</td><td>CAR #9</td><td>☑</td></tr>
<tr><td>B.6.2.10. Parameter Title:
$OXID_{HC}$</td><td>1-1</td><td>
<table>
<tr><th>Data Checklist</th><th>Yes / No</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
</table>
</td><td>☑</td><td>☑</td></tr>
</table>

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		Source clearly referenced? Yes Correct value provided? Yes Has this value been verified? Yes Choice of data correctly justified? Yes Measurement method correctly described? N/A		
B.6.2.11. Parameter Title: EF_{CH4}		Data Checklist / Yes / No Title in line with methodology? Yes Data unit correctly expressed? Yes Appropriate description of parameter? Yes Source clearly referenced? Yes Correct value provided? Yes Has this value been verified? Yes Choice of data correctly justified? Yes Measurement method correctly described? N/A This parameter is applied theoretically calculated one.	☑	☑
B.6.2.12. Parameter Title: ρ_{CH4}		Data Checklist / Yes / No Title in line with methodology? Yes Data unit correctly expressed? Yes Appropriate description of parameter? Yes Source clearly referenced? Yes Correct value provid□d? Yes Has this value been□verified? Yes Choice of data correctly justified? Yes Measurement method correctly described? N/A This parameter is applied theoretically calculated one.	☑	☑

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
<tr><td>B.6.2.13. Parameter Title:
M_i</td><td>1-1
35-1
35-2
35-3</td><td>
<table>
<tr><th>Data Checklist</th><th>Yes / No</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>Yes</td></tr>
<tr><td>Correct value provided?</td><td>Yes</td></tr>
<tr><td>Has this value been verified?</td><td>Yes</td></tr>
<tr><td>Choice of data correctly justified?</td><td>Yes</td></tr>
<tr><td>Measurement method correctly described?</td><td>Yes</td></tr>
</table>
<u>Clarification Request No. 9.</u>
Please submit the technical specification of data logging system (DCS) to define the Mi (Length of measuring interval).
</td><td>CR #9</td><td>☑</td></tr>
<tr><td>B.6.2.14. Parameter Title:
Reg_{NOx}</td><td>50</td><td>
<table>
<tr><th>Data Checklist</th><th>Yes / No</th></tr>
<tr><td>Title in line with methodology?</td><td>No</td></tr>
<tr><td>Data unit correctly expressed?</td><td>No</td></tr>
<tr><td>Appropriate description of parameter?</td><td>No</td></tr>
<tr><td>Source clearly referenced?</td><td>No</td></tr>
<tr><td>Correct value provided?</td><td>No</td></tr>
<tr><td>Has this value been verified?</td><td>No</td></tr>
<tr><td>Choice of data correctly justified?</td><td>No</td></tr>
<tr><td>Measurement method correctly described?</td><td>N/A</td></tr>
</table>
<u>Corrective Action Request No.10.</u>
Please include the parameter, Reg_{NOx} in this section

<u>Further comments:</u>
</td><td>CAR #10</td><td>☑</td></tr>
</table>

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		Please provide the English translated version of the main part of NO_x regulation.		
B.6.3. Ex-ante calculation of emission reductions				
B.6.3.1. Is the projection based on the same procedures as used for future monitoring?	36	Yes, The projection is done by the same algorithms as used for later monitoring.	☑	☑
B.6.3.2. Are the GHG calculations documented in a complete and transparent manner?	36	**Corrective Action Request No.11.** During on-site audit, the Emission Reduction calculation sheet (ER spread sheet) of the project has been verified by the audit team. However some used values cannot be assessed because the values cannot be traced back in the calculation files. Please state the background of data value and/or activate the trace functions at all columns in the spread sheet.	CAR #11	☑
B.6.3.3. Is the data provided in this section consistent with data as presented in other chapters of the PDD?	36	Yes, The data provided under this section is consistent with data in other chapters of the PDD. However, refer to CAR#11.	CAR #11	☑
B.6.4. Summary of the ex-ante estimation of emission reductions				
B.6.4.1. Will the project result in fewer GHG emissions than the baseline scenario?	36	Yes, The project activity will result in emission reductions.	☑	☑
B.6.4.2. Is the form/table required for the indication of projected emission reductions correctly applied?	36	The form/table is correctly applied in the PDD.	☑	☑
B.6.4.3. Is the projection in line with the envisioned time schedule for the project's implementation and the indicated crediting period?	36	The indicated crediting period for the project's implementation as described in the PDD is applicable.	☑	☑

<table>
<tr><th colspan="2">CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
<tr><td>B.6.4.4.</td><td>Is the data provided in this section in consistency with data as presented in other chapters of the PDD?</td><td>36</td><td>Yes, The data is consistent with data presented in other chapters.</td><td>☑</td><td>☑</td></tr>
<tr><td colspan="6">B.7. Application of the monitoring methodology and description of the monitoring plan</td></tr>
<tr><td colspan="6">B.7.1. Data and parameters monitored</td></tr>
<tr><td>B.7.1.1.</td><td>Is the list of parameters presented in chapter B.7.1 considered to be complete with regard to the requirements of the applied methodology?</td><td></td><td>The list of parameters presented in this chapter is considered to be complete.</td><td>☑</td><td>☑</td></tr>
<tr><td colspan="6">Integrate the required amount of sub-checklists for monitoring parameter and comment on any line answered with “No”</td></tr>
<tr><td>B.7.1.2.</td><td>Parameter Title:
$F_{TI,i}$</td><td>32-1
32-2
38-1
38-2
38-3</td><td><table><tr><th>Monitoring Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided for estimation?</td><td>Yes</td></tr><tr><td>Has this value been verified?</td><td>Yes</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr><tr><td>Correct reference to standards?</td><td>Yes</td></tr><tr><td>Indication of accuracy provided?</td><td>No</td></tr><tr><td>QA/QC procedures described?</td><td>Yes</td></tr><tr><td>QA/QC procedures appropriate?</td><td>Yes</td></tr></table></td><td>☑</td><td>☑</td></tr>
<tr><td>B.7.1.3.</td><td>Parameter Title:
$F_{TE,i}$</td><td>32-1
32-2
33-2</td><td><table><tr><th>Monitoring Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr></table></td><td>CAR #12</td><td>☑</td></tr>
</table>

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
<tr><td></td><td>40
41-1
42-1
42-2
43-1
43-2
43-3</td><td>
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<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>Yes</td></tr>
<tr><td>Correct value provided for estimation?</td><td>No</td></tr>
<tr><td>Has this value been verified?</td><td>Yes</td></tr>
<tr><td>Measurement method correctly described?</td><td>Yes</td></tr>
<tr><td>Correct reference to standards?</td><td>Yes</td></tr>
<tr><td>Indication of accuracy provided?</td><td>No</td></tr>
<tr><td>QA/QC procedures described?</td><td>Yes</td></tr>
<tr><td>QA/QC procedures appropriate?</td><td>Yes</td></tr>
</table>
<u>Corrective Action Request No.12.</u>
According to the site checking, the input value of each plant, $F_{TE,i}$ is not correct. Please correct and revise in the PDD.
</td><td></td><td></td></tr>
<tr><td>B.7.1.4. Parameter Title:
$CI_{N2O,i}$</td><td>37-1
37-2</td><td>
<table>
<tr><th>Monitoring Checklist</th><th>Yes / No</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>Yes</td></tr>
<tr><td>Correct value provided for estimation?</td><td>Yes</td></tr>
<tr><td>Has this value been verified?</td><td>Yes</td></tr>
<tr><td>Measurement method correctly described?</td><td>Yes</td></tr>
<tr><td>Correct reference to standards?</td><td>Yes</td></tr>
<tr><td>Indication of accuracy provided?</td><td>No</td></tr>
<tr><td>QA/QC procedures described?</td><td>Yes</td></tr>
<tr><td>QA/QC procedures appropriate?</td><td>Yes</td></tr>
</table>
<u>Clarification Request No. 25.</u>
</td><td>CR #26</td><td>☑</td></tr>
</table>

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
<tr><td></td><td></td><td>The test report of N2O concentration by Gas Chromatography (GC) was submitted to the audit team. However, the values in test reports did not indicate the N_2O concentration value but the area/portion of N_2O only. Please provide the test results with N_2O concentration value to compare with the $CI_{N2O,I}$ values.

Furthermore, please explain a relevance to the test report and de-signed value for N2O concentration.</td><td></td><td></td></tr>
<tr><td>B.7.1.5. Parameter Title:
$CO_{N2O,i}$</td><td>12-1
13-1
37-1
37-2</td><td><table><tr><th>Monitoring Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided for estimation?</td><td>Yes</td></tr><tr><td>Has this value been verified?</td><td>Yes</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr><tr><td>Correct reference to standards?</td><td>Yes</td></tr><tr><td>Indication of accuracy provided?</td><td>No</td></tr><tr><td>QA/QC procedures described?</td><td>Yes</td></tr><tr><td>QA/QC procedures appropriate?</td><td>Yes</td></tr></table>
Refer to CR #25 in B.7.1.4.</td><td>CR #25</td><td>☑</td></tr>
<tr><td>B.7.1.6. Parameter Title:
$P_{product,\ y}$</td><td>30-1
30-2</td><td><table><tr><th>Monitoring Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided for estimation?</td><td>N/A</td></tr></table></td><td>CR #10</td><td>☑</td></tr>
</table>

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Has this value been verified?</td><td>N/A</td></tr>
<tr><td>Measurement method correctly described?</td><td>Yes</td></tr>
<tr><td>Correct reference to standards?</td><td>Yes</td></tr>
<tr><td>Indication of accuracy provided?</td><td>Yes</td></tr>
<tr><td>QA/QC procedures described?</td><td>Yes</td></tr>
<tr><td>QA/QC procedures appropriate?</td><td>Yes</td></tr>
</table>

<u>Clarification Request No. 10.</u>
Please provide the technical specification of the measuring device, mass flow meter for the parameter, $P_{product, y}$.
</td><td></td><td></td></tr>
<tr><td>B.7.1.7. Parameter Title:
T_g</td><td>27-1
27-2</td><td>
<table>
<tr><th>Monitoring Checklist</th><th>Yes / No</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>Yes</td></tr>
<tr><td>Correct value provided for estimation?</td><td>N/A</td></tr>
<tr><td>Has this value been verified?</td><td>N/A</td></tr>
<tr><td>Measurement method correctly described?</td><td>Yes</td></tr>
<tr><td>Correct reference to standards?</td><td>Yes</td></tr>
<tr><td>Indication of accuracy provided?</td><td>Yes</td></tr>
<tr><td>QA/QC procedures described?</td><td>Yes</td></tr>
<tr><td>QA/QC procedures appropriate?</td><td>Yes</td></tr>
</table>

Same as CR #10 in B. 7.1.6.
</td><td>CR #10</td><td>☑</td></tr>
<tr><td>B.7.1.8. Parameter Title:
P_g</td><td>28</td><td>
<table>
<tr><th>Monitoring Checklist</th><th>Yes / No</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
</table>
</td><td>CR #11</td><td>☑</td></tr>
</table>

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		Appropriate description of parameter? Yes Source clearly referenced? Yes Correct value provided for estimation? N/A Has this value been verified? N/A Measurement method correctly described? Yes Correct reference to standards? Yes Indication of accuracy provided? Yes QA/QC procedures described? Yes QA/QC procedures appropriate? Yes **Clarification Request No. 11.** The unit in the technical specification, measuring range is expressed as kg/cm2Gr. Please correctly express the unit of parameter, P_g. Please also provide the technical specification of it.		
B.7.1.9. Parameter Title: $A_{OR,d}$	29	Monitoring Checklist / Yes / No Title in line with methodology? Yes Data unit correctly expressed? Yes Appropriate description of parameter? Yes Source clearly referenced? Yes Correct value provided for estimation? N/A Has this value been verified? N/A Measurement method correctly described? Yes Correct reference to standards? Yes Indication of accuracy provided? Yes QA/QC procedures described? Yes QA/QC procedures appropriate? Yes **Corrective Action Request No.13.**	CAR #13	☑

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
<tr><td></td><td></td><td>The input value for Measuring range of Plant I and Plant II are not consistent. Please correct the input value in the PDD.</td><td></td><td></td></tr>
<tr><td>B.7.1.10. Parameter Title:
G_{sup}</td><td>14</td><td><table><tr><th>Monitoring Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>N/A</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided for estimation?</td><td>N/A</td></tr><tr><td>Has this value been verified?</td><td>N/A</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr><tr><td>Correct reference to standards?</td><td>N/A</td></tr><tr><td>Indication of accuracy provided?</td><td>N/A</td></tr><tr><td>QA/QC procedures described?</td><td>Yes</td></tr><tr><td>QA/QC procedures appropriate?</td><td>Yes</td></tr></table></td><td>☑</td><td>☑</td></tr>
<tr><td>B.7.1.11. Parameter Title:
G_{com}</td><td>14</td><td><table><tr><th>Monitoring Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>N/A</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided for estimation?</td><td>N/A</td></tr><tr><td>Has this value been verified?</td><td>N/A</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr><tr><td>Correct reference to standards?</td><td>N/A</td></tr><tr><td>Indication of accuracy provided?</td><td>N/A</td></tr><tr><td>QA/QC procedures described?</td><td>Yes</td></tr><tr><td>QA/QC procedures appropriate?</td><td>Yes</td></tr></table></td><td>☑</td><td>☑</td></tr>
<tr><td>B.7.1.12. Parameter Title:</td><td>39-1</td><td></td><td>CR #12</td><td>☑</td></tr>
</table>

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
$TYPE_{HC}$	39-2 39-3	Monitoring Checklist / Yes / No Title in line with methodology? Yes Data unit correctly expressed? N/A Appropriate description of parameter? Yes Source clearly referenced? Yes Correct value provided for estimation? N/A Has this value been verified? N/A Measurement method correctly described? N/A Correct reference to standards? N/A Indication of accuracy provided? N/A QA/QC procedures described? N/A QA/QC procedures appropriate? N/A **Clarification Request No. 12.** This parameter is stated as $Type_{NG}$ in the PDD. Please correct the parameter title from $Type_{NG}$ to $Type_{NG}$		
B.7.1.13. Parameter Title: Q_{NG}	36 39-1 39-2 39-3	Monitoring Checklist / Yes / No Title in line with methodology? Yes Data unit correctly expressed? Yes Appropriate description of parameter? Yes Source clearly referenced? Yes Correct value provided for estimation? Yes Has this value been verified? No Measurement method correctly described? Yes Correct reference to standards? Yes Indication of accuracy provided? N/A QA/QC procedures described? Yes QA/QC procedures appropriate? No	CR #13	☑

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
<tr><td></td><td></td><td><u>Clarification Request No. 13.</u>
For the QA/QC procedures, Capro’s Maintenance and testing re-gime will be applied. Please provide it to the audit team.</td><td></td><td></td></tr>
<tr><td>B.7.1.14. Parameter Title:
CF_{CH4}</td><td>36
39-1
39-2
39-3</td><td><table><tr><th>Monitoring Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>N/A</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided for estimation?</td><td>No</td></tr><tr><td>Has this value been verified?</td><td>No</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr><tr><td>Correct reference to standards?</td><td>Yes</td></tr><tr><td>Indication of accuracy provided?</td><td>Yes</td></tr><tr><td>QA/QC procedures described?</td><td>N/A</td></tr><tr><td>QA/QC procedures appropriate?</td><td>N/A</td></tr></table>
This parameter is related to composition data provided by LNG supplier. Hence, refer to CR #14 and CR #15.</td><td>CR #14
CR #15</td><td>☑</td></tr>
<tr><td>B.7.1.15. Parameter Title:
Q_{CH4}</td><td>36
39-1
39-2
39-3</td><td><table><tr><th>Monitoring Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided for estimation?</td><td>Yes</td></tr><tr><td>Has this value been verified?</td><td>No</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr></table></td><td>CR #14
CR #15</td><td>☑</td></tr>
</table>

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		Correct reference to standards? — Yes Indication of accuracy provided? — No QA/QC procedures described? — Yes QA/QC procedures appropriate? — Yes		
B.7.1.16. Parameter Title: $Q_{HC, y}$	36 39-1 39-2 39-3	Monitoring Checklist — Yes / No Title in line with methodology? — Yes Data unit correctly expressed? — Yes Appropriate description of parameter? — Yes Source clearly referenced? — Yes Correct value provided for estimation? — Yes Has this value been verified? — Yes Measurement method correctly described? — Yes Correct reference to standards? — Yes Indication of accuracy provided? — Yes QA/QC procedures described? — N/A QA/QC procedures appropriate? — N/A	CR #14 CR #15	☑
B.7.1.17. Parameter Title: ρ_{NG}	36 39-1 39-2 39-3	Monitoring Checklist — Yes / No Title in line with methodology? — Yes Data unit correctly expressed? — Yes Appropriate description of parameter? — Yes Source clearly referenced? — Yes Correct value provided for estimation? — Yes Has this value been verified? — No Measurement method correctly described? — Yes Correct reference to standards? — Yes Indication of accuracy provided? — Yes QA/QC procedures described? — N/A	CR #14	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		QA/QC procedures appropriate? N/A **Clarification Request No. 14.** The density of natural gas, ρ_{NG} shall be obtained monthly from the natural gas supplier. By the way, the source of input value in PDD was not clear so please revise the input value with the monthly average from the natural gas supplier.		
B.7.1.18. Parameter Title: ρ_{HC}	36 39-1 39-2 39-3	Monitoring Checklist: Yes / No Title in line with methodology? Yes Data unit correctly expressed? Yes Appropriate description of parameter? Yes Source clearly referenced? Yes Correct value provided for estimation? Yes Has this value been verified? No Measurement method correctly described? Yes Correct reference to standards? Yes Indication of accuracy provided? Yes QA/QC procedures described? N/A QA/QC procedures appropriate? N/A **Clarification Request No. 15.** The parameter, ρ_{HC} can be calculated monthly based on the monthly documents, Natural Gas Composition Data, from the natural gas supplier. Therefore, this parameter can be monitored monthly basis. Please revise the PDD description with the above information.	CR #15	☑
B.7.1.19. Parameter Title: EF_{NG}	36	Monitoring Checklist: Yes / No	CR #16	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
	39-1 39-2 39-3	<table><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided for estimation?</td><td>Yes</td></tr><tr><td>Has this value been verified?</td><td>No</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr><tr><td>Correct reference to standards?</td><td>No</td></tr><tr><td>Indication of accuracy provided?</td><td>Yes</td></tr><tr><td>QA/QC procedures described?</td><td>n/a</td></tr><tr><td>QA/QC procedures appropriate?</td><td>n/a</td></tr></table> **Clarification Request No. 16.** The input value in PDD is not consistent with the practical data which was checked by the audit team during the site checking. Please revise the input value in the PDD.		
B.7.1.20. Parameter Title: EF_{HC}	36 39-1 39-2 39-3	<table><tr><th>Monitoring Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided for estimation?</td><td>Yes</td></tr><tr><td>Has this value been verified?</td><td>No</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr><tr><td>Correct reference to standards?</td><td>Yes</td></tr><tr><td>Indication of accuracy provided?</td><td>Yes</td></tr><tr><td>QA/QC procedures described?</td><td>N/A</td></tr><tr><td>QA/QC procedures appropriate?</td><td>N/A</td></tr></table>	CR #16	☑

<table>
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<tr><td></td><td></td><td>Refer to CR#16 on B.7.19.</td><td></td><td></td></tr>
<tr><td>B.7.1.21. Parameter Title:
SE_{N2O}</td><td></td><td><table><tr><th>Monitoring Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided for estimation?</td><td>Yes</td></tr><tr><td>Has this value been verified?</td><td>N/A</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr><tr><td>Correct reference to standards?</td><td>Yes</td></tr><tr><td>Indication of accuracy provided?</td><td>N/A</td></tr><tr><td>QA/QC procedures described?</td><td>N/A</td></tr><tr><td>QA/QC procedures appropriate?</td><td>N/A</td></tr></table></td><td>☑</td><td>☑</td></tr>
<tr><td>B.7.1.22. Parameter Title:
CO_{CH4}</td><td>36
39-1
39-2
39-3</td><td><table><tr><th>Monitoring Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided for estimation?</td><td>Yes</td></tr><tr><td>Has this value been verified?</td><td>N/A</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr><tr><td>Correct reference to standards?</td><td>Yes</td></tr><tr><td>Indication of accuracy provided?</td><td>Yes</td></tr><tr><td>QA/QC procedures described?</td><td>N/A</td></tr><tr><td>QA/QC procedures appropriate?</td><td>N/A</td></tr></table></td><td>CR #17</td><td>☑</td></tr>
</table>

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
<tr><td></td><td></td><td><u>Clarification Request No. 17.</u>
Please specify the measuring point.</td><td></td><td></td></tr>
<tr><td>B.7.1.23. Parameter Title:
$OXID_{CH4}$</td><td></td><td><table><tr><th>Monitoring Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided for estimation?</td><td>Yes</td></tr><tr><td>Has this value been verified?</td><td>Yes</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr><tr><td>Correct reference to standards?</td><td>Yes</td></tr><tr><td>Indication of accuracy provided?</td><td>N/A</td></tr><tr><td>QA/QC procedures described?</td><td>N/A</td></tr><tr><td>QA/QC procedures appropriate?</td><td>N/A</td></tr></table></td><td>☑</td><td>☑</td></tr>
<tr><td>B.7.1.24. Parameter Title:
RSE_{NOX}</td><td>50</td><td><table><tr><th>Monitoring Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided for estimation?</td><td>Yes</td></tr><tr><td>Has this value been verified?</td><td>N/A</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr><tr><td>Correct reference to standards?</td><td>Yes</td></tr><tr><td>Indication of accuracy provided?</td><td>N/A</td></tr><tr><td>QA/QC procedures described?</td><td>N/A</td></tr><tr><td>QA/QC procedures appropriate?</td><td>N/A</td></tr></table></td><td>☑</td><td>☑</td></tr>
</table>

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PDD in GSP</th><th>Final PDD</th></tr>
<tr><td>B.7.1.25. Parameter Title:
RSE_{N2O}</td><td>50</td><td><table><tr><th>Monitoring Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>No</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided for estimation?</td><td>Yes</td></tr><tr><td>Has this value been verified?</td><td>N/A</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr><tr><td>Correct reference to standards?</td><td>Yes</td></tr><tr><td>Indication of accuracy provided?</td><td>N/A</td></tr><tr><td>QA/QC procedures described?</td><td>N/A</td></tr><tr><td>QA/QC procedures appropriate?</td><td>N/A</td></tr></table>
<u>Corrective Action Request No.14.</u>
Data unit of RSE_{N2O} is expressed as tNOx/Caprolactam. Please correct it in the PDD.</td><td>CAR #14</td><td>☑</td></tr>
<tr><td colspan="5">B.7.2. Description of the monitoring plan</td></tr>
<tr><td>B.7.2.1. Is the operational and management structure clearly described and in compliance with the envisoned situation?</td><td></td><td>Yes, the operational and management structure clearly described in the PDD.</td><td>☑</td><td>☑</td></tr>
<tr><td>B.7.2.2. Are responsibilities and institutional arrangements for data collection and archiving clearly provided?</td><td></td><td><u>Clarification Request No. 18.</u>
The description of data collection and archiving for this project is included in this section. However, the responsibility of the tasks was not assigned clearly. Please clarify more detail for the job assignments and responsibility.</td><td>CR #18</td><td>☑</td></tr>
</table>

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
B.7.2.3. Does the monitoring plan provide current good monitoring practice as explicetly defined by the methodology?		Yes, the monitoring plan is clearly reflected by the methodology. Checking on-site audit.	☑	☑
B.7.2.4. Will the three quality assurance levels been met by the planned Automated Measuring System (AMS)?	35-1 35-2 35-3	Yes, Three QALs and AST performance record for AMS will be documented.	☑	☑
B.8. Date of completion of the application of the baseline study and monitoring methodology an the name of the responsible person(s)/entity(ies)				
B.8.1. Is there any indication of a date when the baseline was determined?		Yes, the date of completion of the application of the baseline study and monitoring methodology is 02/09/2009.	☑	☑
B.8.2. Is this consistent with the time line of the PDD history?	3 44	Yes, date of completion of the application of the baseline study and monitoring methodology is prior to the completion date of the PDD. Hence, this is consistent with the time line of the PDD history.	☑	☑
B.8.3. Is the information on the person(s) / entity(ies) responsible for the application of the baseline and monitoring methodology provided consistent with the actual situation?		Yes, the information on the person for the application of the baseline and monitoring methodology provided from CDM consulting company for this project.	☑	☑
B.8.4. Is information provided whether this person / entity is also considered a project participant?		No, this person is only consultant for this project not project participant.	☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
C. Duration of the project activity / crediting period				
C.1. Duration of the project activity				
C.1.1. Are the project's starting date and operational lifetime clearly defined and reasonable?	3 44	**Clarification Request No. 19.** As mentioned above CAR #1 and CR #4, The project's starting date will be revised in the PDD.	CAR#1 CR#4 CR#19	☑
C.2. Choice of the crediting period and related information				
C.2.1. Is the assumed crediting time clearly defined and reasonable (renewable crediting period of max 7 years with potential for 2 renewals or fixed crediting period of max. 10 years)?		Yes, the starting date of the crediting period is 01/09/2010 and the length of crediting period is 10 years and fixed type.	☑	☑
D. Environmental impacts				
D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts				
D.1.1. Has the analysis of the environmental impacts of the project activity been sufficiently described?	52	Yes, the EIA for this project activity was voluntarily conducted and the main conclusions are presented briefly in PDD. EIA report has been reviewed during on-site audit and it was attached in Annex 2. IRL #6 EIA report.	☑	☑
D.1.2. Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, has an EIA been approved?	52	No, there is no such requirement for the proposed project according to relevant environmental law and regulations of the Host Party.	CR #20	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		Clarification Request No. 20. Please submit a relevant environmental law and regulations to the audit team.		
D.1.3. Will the project create any adverse environmental effects?	52	No, the project will not create any adverse environmental effects.	☑	☑
D.1.4. Were transboundary environmental impacts identified in the analysis?	52	Yes, there are described several environmental impacts in the PDD. Additionally, the audit team has checked the EIA report.	☑	☑
D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party				
D.2.1. Have the identified environmental impacts been addressed in the project design sufficiently?	52	Yes, no such impacts are considered being relevant.	☑	☑
D.2.2. Does the project comply with environmental legislation in the host country?	52	Under the law and regulation in the host country, the EIA does not necessary for this project.	☑	☑
E. Stakeholders' comments				
E.1. Brief description how comments by local stakeholders have been invited and compiled				
E.1.1. Have relevant stakeholders been consulted?	53	Yes, the project participants held on the stakeholders meeting to introduce the proposed project activity and compile stakeholders' comments on 25/06/2009.	☑	☑
E.1.2. Have appropriate media been used to invite comments by local stakeholders?	53	Yes, the invitation of local stakeholders' consultation for the project activity was published on June 22 & 23, 2009 at Ulsan Daily Newspaper and Ulsan Press respectively.	☑	☑

CHECKLIST TOPIC / QUESTION	Ref.	COMMENTS	PDD in GSP	Final PDD
		The attendants from various organizations such as local government organizations, neighboring companies and Korea Environmental Preservation Association (NGO) etc. were 59 stakeholders joined the meeting.		
E.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?	53	No, there are no regulations/laws for the stakeholder consultation process in the host country for the project which do not require any EIA.	☑	☑
E.1.4. Is the undertaken stakeholder process that was carried out described in a complete and transparent manner?	53	Yes, the undertaken stakeholder process is described in a transparent manner.	☑	☑
E.2. Summary of the comments received				
E.2.1. Is a summary of the received stakeholder comments provided?	53	Yes, the project participants prepared a questionnaire for the stakeholders. And a summary of the received comments from stakeholders' is provided in the PDD. The audit team has checked the questionnaires and comments. The list of participants is also checked by the audit team.	☑	☑
E.3. Report on how due account was taken of any comments received				
E.3.1. Has due account been taken of any stakeholder comments received?	53	The received comments have been answered by the project participants. **<u>Clarification Request No. 21.</u>** During the on-site audit discussion with PPs, PPs confirmed that all comments from Stakeholders' have been fully answered. How-	CR #21	☑

CHECKLIST TOPIC / QUESTION		Ref.	COMMENTS	PDD in GSP	Final PDD
			ever, the PDD description on E.3 was not fully explained for the employment issue. Please update the PPs' reply in E.3.		
F. Annexes 1 – 4					
Annex 1: Contact Information					
F.1.1.	Is the information provided consistent with the one given under section A.3?		Yes, the provided information is consistent with section A. 3.	☑	☑
F.1.2.	Is the information on all private participants and directly involved Parties presented?		Yes, the information is presented on all private participants.	☑	☑
Annex 2: Information regarding public funding					
F.1.3.	Is the information provided on the inclusion of public funding (if any) in consistency with the actual situation presented by the project participants?		Not applicable.	☑	☑
F.1.4.	If necessary: Is an affirmation available that any such funding from Annex-I-countries does not result in a diversion of ODA?		Not applicable.	☑	☑
Annex 3: Baseline information					
F.1.5.	If additional background information on baseline data is provided: Is this information consistent with data presented by other sections of the PDD?		Yes, production and tail gas information are included in this section. Additionally, Parameters and technical specification applied are summarized.	CR #22	☑

CHECKLIST TOPIC / QUESTION		Ref.	COMMENTS	PDD in GSP	Final PDD
			Clarification Request No. 22. According to site checking, some of input values in this information should be corrected. Please revised the PDD and provide the supporting documents to the audit team.		
F.1.6.	Is the data provided verifiable? Has sufficient evidence been provided to the validation team?		See F. 1.5.	CR #22	☑
F.1.7.	Does the additional information substantiate / support statements given in other sections of the PDD?		See F. 1.5	CR #22	☑
Annex 5: Monitoring information					
F.1.8.	If additional background information on monitoring is provided: Is this information consistent with data presented in other sections of the PDD?		Yes, supplementary information of monitoring equipments and monitoring parameters are stipulated in this section. **Clarification Request No. 23.** Please provide the technical specifications for the stipulated information to the audit team.	CR #23	☑
F.1.9.	Is the information provided verifiable? Has sufficient evidence been provided to the validation team?		See F.1.8.	CR #23	☑
F.1.10.	Do the additional information and / or documented procedures substantiate / support statements given in other sections of the PDD?		See F.1.8.	CR #23	☑

Table 2 Resolution of Corrective Action and Clarification Requests

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
Corrective Action Request No.1. According to the site checking, this project was not started yet as PDD described the starting time on 02/11/2009. Please submit the revised project time schedule containing the expected project starting date to the audit team.	A.1.3.	PPs submitted revised project time schedule containing the project starting date to the audit team and revised the starting date from 02/11/2009 to 28/05/2010 in PDD (Ver.3) in accordance with project time schedule. In addition, PPs submitted audit team engineering service contract for N_2O Abatement Technology systems as an evidence for starting date. Finally, the project started at 06/09/2010 when was the purchasing contract date of the catalyst with CRI and the date was updated in the final PDD (Ver.8)	PDD has been finally revised to update the starting date of project activity, which is 06/09/2010. The starting date is in line with the submitted project schedule. This issue has been solved.

Corrective Action Request No.2. Please submit the plant approvals from the government which can demonstrate the starting time of plant 1 & 2. And also please provide the supporting documents for the maximum daily production and project operation days to estimate the production capacity. The estimation of the production capacity should be set conservatively.	A.2.2.	Plant starting time: Plant 1&2 in Capro commenced its commercial production from 10th April 1974(plant I) and 30th Dec 1988 (plant II) respectively, which are earlier than 31st Dec 2005 described in applicability of AM0028. The PPs have submitted supporting documents which can demonstrate the starting time of plant 1&2 to audit team. The documents are as follows. Plant 1 1. Report for annual operation records for caprolactam production plant I in Capro corporation 2. Registration document for capro production plant I in Capro corporation Plant 2 1. Report for monthly process analysis for caprolactam production plant II in Capro corporation 2. Confirmation of installation notification of capro production plant II in Capro corporation 3. Application for technology inspection (The above documents are attached in Annex 2. IRL)	The audit team checked the supporting documents for the plant approval of plant 1 & plant 2, respectively. The relevant documents are acceptable to prove the actual situation for plant installation and/or existence. Also, the evidence, which is for identifying of the daily production were recorded through SAP system by PPs and provided as corrected data to audit team. The audit team has confirmed the value for maximum daily production and operation day. This issue has been solved.

		Production capacity: To estimate the production capacity conservatively, The project proponents established each plant of Capro's design capacity upon maximum daily production and maximum operating date (1st Jan 2003-31st DEC 2005) In addition, to set the production capacity conservatively, outliers of historical maximum daily production and operating days are eliminated by statistical methods. Therefore, the time series data are interpreted as a sample from a stochastic variable. All data that are part of 2.5% Quantile or that are part of the (100-2.5)% Quantile of the sample distribution are defined as outliers and are eliminated. Therefore, production capacity is calculated as follows. Design Capacity (ton/yr) = Maximum daily production(ton/day) X Operating days(day/year) Plant 1: - Maximum daily production: 174.4ton/day (on 19/03/2004) - Maximum operation days: 363 day/year (in 2005) Therefore, Design capacity is 63307 ton/yr. Plant 2: - Maximum daily production: 183ton/day (on 13/01/2003) - Maximum operation days: 355days (in 2003) Therefore, Design capacity is 64965 ton/yr.	

		The PPs have submitted supporting document for the maximum daily production and project operation days Maximum operation day in plant 1 is 363days. However, according to submitted caprolactam daily production raw data in excel file, maximum operation days in plant1 is 365days. Therefore, PPs have submitted the additional supporting document to demonstrate that maximum operation day in plant1 is 363 days described in PDD.	
Clarification Request No. 1. In PDD, the map is containing the local language. Please change the map containing only English. And also please update GPS coordinates with 'Decimal degrees' method.	A.4.1.1.	In Figure 1 of PDD, the maps for identification of the project activity location contained local language. So PPs have changed the maps with local language to the maps containing only English in PDD. And also the GPS coordinates for the project site has been updated with 'decimal degrees' method. The updated GPS coordinates are as below. - Latitude: 35.4958 / Longitude: 129.3280	PDD has been corrected to change the map with only English. This issue has been solved.

Clarification Request No. 2. PPs will provide the governmental approval and/or contracts for main equipment and/or catalyst supply as soon as PPs make.	A.4.1.2.	Governmental approval: Governmental approval of temporary container building will be issued by Ulsan Nam-gu office in June. PPs will provide audit team with the approval as soon as it is issued. Also, PPs have submitted the governmental approval schedule in project time schedule which is the same supporting document for #CAR1. Contract for main equipments and/or catalyst supply: PPs have submitted engineering service contract for N_2O Abatement Technology systems, which is the commencement contract for catalyst supply.	PPs have submitted the engineering service contract for this project, which is actual activity of project activity. Hence, it ensured that the project can implemented at the site. This issue has been solved.
Clarification Request No. 3. According to the audit team checking, PPs performed the catalyst tests for this project. Please provide the testing results of Catalysts' comparison for this project showing PPs' effort to implement the high technology.	A.4.3.1.	PPs conducted the catalyst test of three different companies Documents related to catalyst tests are as follows 1. Test report for A catalyst 2. Test report for B catalyst 3. Test report for C catalyst 4. Test result summary Test reports above are issued by Taesung Environment Institute Co., Ltd, which is laboratory certified by Korea Laboratory Accreditation Scheme in 2007. PPs submitted catalyst reports above to the audit team.	The test reports of considered catalysts for the project has been checked by audit team. The PPs has been fully considered to select the optimized catalyst for the project. This issue has been solved.

Clarification Request No. 4. Please submit the technical documents demonstrate the technical lifetime of the project facilities.	A.4.3.7.	Documents related the technical lifetime of the project activity facilities are as follows. 1. Measuring equipments specification 2. Monitoring system specification 3. Mechanical guarantee of Capro's RCS 4. Heat Exchange Media Guarantee of Capro's RCS PPs submitted documents above to the audit team.	The documents for specification and guarantee of main components in the applied technology have been confirmed by the audit team. This issue has been solved.
Corrective Action Request No.3. In Table 1, "Total estimated reductions" is stated as 6,651,821 tCO_{2e}/**yr**. Please correct unit and the total volume of CER for 10 years.	A.4.4.2.	PPs have corrected unit and the total volume of estimated emission reduction for 10 years in the revised PDD version 8.1.	PDD has been appropriately corrected the unit.
Corrective Action Request No.4. The spatial and technological boundaries are indicated in the PDD. However, the boundary is too brief to explain overall project technology. Please indicate more detail including the measuring points, parameters and etc.	B.3.9.	PPs have added the flow diagram of project boundary to B.3 of PDD to indicate more detail including the measuring points, parameters and etc.	The shown diagrams have been updated for specifying of project boundaries in the PDD. This issue has been solved.
Clarification Request No. 5. Please describe this step in more detail in the PDD.	B.4.7.	PPs revised Sub-step 3b in more detail in the PDD.	PDD has been appropriately revised in this step. This issue has been solved.

Clarification Request No. 6. Please submit the investment analysis for this project activity.	B.4.9.	The PPs has been applied the simple cost analysis. All following supporting documents and the spread sheet for investment analysis are submitted to the audit team. 1. Construction cost - N2O abatement facility quotation - DK valve purchase order - TEE, V-NECK purchase order - Tie-in construction contract - Monitoring system quotation. - CRI catalyst quotation 2. Running cost - LNG charge - Electric charge - Labor cost - Consulting contract for monitoring 3. Investment analysis sheet - Exchange rate (EURO,USD) - CER price	All relevant supporting documents for the applied values have been assessed by the audit team. This issue has been solved.
Corrective Action Request No.5. In case of step 3 of the additionality tool, it should describe for barrier analysis of identified baseline alternative. Please clarify in this section.	B.5.7.	PPs have described the barrier analysis in Step3 of additionality tool.	PDD has been revised to describe the barrier analysis sufficiently. This issue has been solved.

<table>
<tr>
<td><u>Corrective Action Request No.6.</u>
Please correct the data unit of ‘GWP of N_2O’ in PDD.</td>
<td>B.6.2.2.</td>
<td>The data unit of GWP of N_2O has been corrected from tCO_2e/tN_2O to blank because there is no unit of GWP of N_2O.</td>
<td>PDD has been appropriately corrected.
This issue has been solved.</td>
</tr>
<tr>
<td><u>Corrective Action Request No.7.</u>
Please correct the data unit of ‘GWP of CH_4’ in PDD.</td>
<td>B.6.2.3.</td>
<td>The data unit of GWP of CH_4 has been corrected from tCO_2e/tN_2O to blank because there is no unit of GWP of CH_4.</td>
<td>PDD has been appropriately corrected.
This issue has been solved.</td>
</tr>
<tr>
<td><u>Clarification Request No. 7.</u>
Please change the title of parameter as described in the applied methodology. Also please correct the equation no. in footnote page 30 in PDD.</td>
<td>B.6.2.4.</td>
<td>PPs have changed the title of parameter about design capacity of caprolactam production from $P_{product,,max}$ to $P_{product,hist}$ as described in the applied methodology. and also the equation number in footnote at page 30 of PDD.</td>
<td>The title of parameter has been changed in accordance with expression of the applied methodology and also corrected the equation no. in the footnote.
This issue has been solved.</td>
</tr>
<tr>
<td><u>Clarification Request No. 8.</u>
According to the audit team checking, the applied values were not correctly converted from kg/cm^2 to Pa. Therefore, the values are slightly different from the audit team’s calculation. Please update correct values for $P_{g,hist}$.</td>
<td>B.6.2.7.</td>
<td>There was some discrepancy while applied values were converted from kg/cm^2 to Pa. PPs used 98066.5 as unit conversion factor from kg/cm^2 to Pa. However, the values of historical operating pressure are applied to three decimal places only.
So PPs have updated correct value for $P_{g,hist}$, after recalculating with the raw values in Excel file containing operating data of the ammonia oxidation reactor. The updated values are as follows.
<table>
<tr><th>Data/Parameter (Unit:Pa gauge)</th><th>Existing values</th><th>Updated values</th></tr>
<tr><td>$P_{g,hist\_1}$</td><td>47268-93752</td><td>43320-98564</td></tr>
<tr><td>$P_{g,hist\_2}$</td><td>54525-93654</td><td>79317-96381</td></tr>
</table>
</td>
<td>In the historical data for AOR operation, the unit for $P_{g,\ hist}$ has been recorded as Kgf/cm^2. For consistency of data unit referring to the methodology, the data were correctly converted to Pa.
This issue has been solved.</td>
</tr>
</table>

Corrective Action Request No.8. Please submit the clear evidences such as a purchase and/or delivery orders, etc.	B.6.2.8.	From the beginning to present, Johnson Matthey's catalyst has been used in Capro. PPs have submitted catalyst delivery confirmation documents by Johnson Matthey as supporting document to the audit team.	The submitted evidence for identifying of supplier is fully acceptable. This issue has been solved.
Corrective Action Request No.9. Please submit the clear evidences for identifying the composition of catalyst.	B.6.2.9.	PPs have submitted catalyst delivery confirmation documents by Johnson Matthey to the audit team for identifying the composition catalyst.	The submitted evidence for checking of the catalyst composition is fully acceptable. Also, the composition of the applied catalyst has been correctly shown in the PDD. This issue has been solved.
Clarification Request No. 9. Please submit the technical specification of data logging system (DCS) to define the M*i* (Length of measuring interval).	B.6.2.13.	PPs have submitted NDIR and Tail gas flow meter specification to the audit team.	The audit team checked the specifications of NDIR and tail gas flow meter, which has continuously measured period and daily recorded. Hence, the applied M*i,* 'Hour' is fully acceptable. This issue has been solved.
Corrective Action Request No.10. Please include the parameter, Reg_{NOx} in this section. Further comments: Please provide the English translated version of the main part of NO_x regulation.	B.6.2.14.	The NO_x regulation has been included as the parameter, Reg_{NOx} in the section B.6.2. According to NO_x regulation, Article 15 of the Enforcement Regulation Of The Clean Air Conservation Act, the highest permit for NO_x emission is 200ppm(v) as NO_2 concentration level. In addition, English translated version of the main part of NOx regulation has been submitted to the audit team as evidence.	PDD has been updated to add the Parameter, Reg_{NOx}. The NO_x regulation level has been checked and confirmed by the audit team. . This issue has been solved.

Corrective Action Request No.11. During on-site audit, the Emission Reduction calculation sheet (ER spread sheet) of the project has been verified by the audit team. However some used values cannot be assessed because the values cannot be traced back in the calculation files. Please state the background of data value and/or activate the trace functions at all columns in the spread sheet.	B.6.3.2.	PPs have made some values which could not be traced back in calculation traceable except for Net Caloric Value of LNG. However PPs submitted the document with Net Caloric Value of LNG as its evidence.	The submitted ER calculation sheet has been updated that all input values are traceable and checked by audit team. This issue has been solved.
Corrective Action Request No.12. According to the site checking, the input value of each plant, $F_{TE,i}$ is not correct. Please correct and revise in the PDD.	B.7.1.3.	Input values of $F_{TE,i}$ were 45415Nm^3/hr and 49498Nm^3/hr for Plant I and II respectively in PDD ver.1. However, PPs revised them to 45878m^3/hr and 49980m^3/hr in PDD version 8.1 after re-calculation. PPs have made some values of submitted document [Basis of calculation on LNG consumption] traceable at this time and submitted them as supporting document.	Refer to CAR #11. The PDD and ER sheet has been revised the correct values. This issue has been solved.
Clarification Request No. 10. Please provide the technical specification of the measuring device, mass flow meter for the parameter, $P_{product, y}$.	B.7.1.6.	PPs have submitted technical specification of mass flow meter for caprolactam production plant 1&2 respectively	The mass flow meters information has been correctly recorded in the PDD in accordance with the specifications of mass flow meter provided, respectively. This issue has been solved.

Clarification Request No. 11. The unit in the technical specification, measuring range is expressed as kg/cm2Gr. Please correctly express the unit of parameter, P_g. Please also provide the technical specification of it.	B.7.1.8.	In PDD, the unit of measuring range for operating pressure of AOR was wrongly expressed. Therefore, PPs have revised the measuring range unit from 0~3kg/cm^2Gr to 0~3kg/cm^2. Also, PPs have submitted the technical specification of AOR operating pressure.	PDD has been revised to correct the unit. This issue has been solved.
Corrective Action Request No.13. The input value for measuring range of Plant I and Plant II are not consistent. Please correct the input value in the PDD.	B.7.1.9.	In PDD, The input value for measuring range of Plant 1&2 were 0~2500Nm^3/hr and 0~2000Nm^3/hr respectively. After checking technical information, PP s have corrected them 0~2500Nm^3/hr as measuring range of plant1&2.	PDD has been revised to correct the measuring range for AOR in Plant I and Plant II. This issue has been solved.
Clarification Request No. 12. This parameter is stated as $Type_{NG}$ in the PDD. Please correct the parameter title from $Type_{NG}$ to $Type_{HC}$.	B.7.1.12.	PPs have corrected the parameter title of hydrocarbon type from $Type_{NG}$ to $Type_{HC}$ referring to the applied methodology.	PDD has been revised to change the parameter title, referring to the methodology. This issue has been solved.
Clarification Request No. 13. For the QA/QC procedures, Capro's Maintenance and testing regime will be applied. Please provide it to the audit team.	B.7.1.13.	PPs revised QA/QC procedures to be applied for parameter Q_{NG} which is natural gas input for re-heating the tail gas in table.	PDD has been revised to stipulate QA/QC procedure, concretely. This issue has been solved.
Clarification Request No. 14. The density of natural gas, ρ_{NG} shall be obtained monthly from the natural gas supplier. By the way, the source of input value in PDD was not clear so please revise the input value with the monthly average from the natural gas supplier.	B.7.1.17.	PPs revised the input value of ρ_{NG} from 0.000798t/Nm^3 to 0.000797t/Nm^3 which is the input value with monthly average provided by supplier.	Audit team checked the data of LNG composition and monthly density provided by supplier. The applied value and data source are acceptable. This issue has been solved.

Clarification Request No. 15. The parameter, ρ_{HC} can be calculated monthly based on the monthly documents, Natural Gas Composition Data, from the natural gas supplier. Therefore, this parameter can be monitored monthly basis. Please revise the PDD description with the above information.	B.7.1.18.	This parameter ρ_{HC} is calculated by methane content(CF_{CH4}), the density of natural gas($\boldsymbol{\rho_{NG}}$) monthly provided by natural gas supplier and methane density($\boldsymbol{\rho_{CH4}}$). Therefore, ρ_{HC} can be monitored monthly. PPs revised its monitoring frequency from daily monitoring to monthly monitoring in PDD In addition, PPs have submitted official natural gas report provided by natural supplier.	The parameter, $\rho_{HC,}$ is calculated from ρ_{NG}. The derived equation for ρ_{HC} has been correctly applied and accepted as CR #14. This issue has been solved.
Clarification Request No. 16. The input value in PDD is not consistent with the practical data which was checked by the audit team during the site checking. Please revise the input value in the PDD.	B.7.1.19.	PPs revised input value of EF_{NG} from 2.798tCO_2/tNG to 2.768 tCO_2/tNG. Because input values needed for EF_{NG} calculation such as net calorific value of the natural gas (NCV_{NG}) and density of the natural gas(ρ_{NG}) offered by natural gas supplier were revised. NCV_{NG} was revised from 9500kcal/Nm^3 to 9393kcal/Nm^3. ρ_{NG} revised from 0.000798t/Nm^3 to 0.000797t/Nm^3.	The parameter, EF_{NG} is calculated from ρ_{NG}. The calculation has been correctly applied and the supporting documents for input values were confirmed by audit team. This issue has been solved.
Clarification Request No. 17. Please specify the measuring point.	B.7.1.22.	The measuring point of methane concentration at destruction facility outlet, $CO_{CH4,}$ in a table is not described clearly. Hence, PPs revised it from the same with CO_{N2O} to after the outlet of N_2O abatement system to specify its measuring point.	PDD has been revised to specify the measuring point of CO_{CH4}.in a table. This issue has been solved.
Corrective Action Request No.14. Data unit of RSE_{N2O} is expressed as tNOx/Caprolactam. Please correct it in the PDD.	B.7.1.25.	PPs expressed tNOx/tCaprolatam as date unit of RSE_{N2O} in the table due to typing error. However, RSE_{N2O} is regulatory limit of N_2O emissions per unit of outlet of caprolactam. Therefore, PPs revised it from tNOx/tCaprolatam to tN_2O/tCaprolactam.	PDD has been accurately corrected. This issue has been solved.

Clarification Request No. 18. The description of data collection and archiving for this project is included in this section. However, the responsibility of the tasks was not assigned clearly. Please clarify more detail for the job assignments and responsibility.	B.7.2.2.	PPs have clarified the job assignments and responsibilities in B.7.2 of PDD.	PDD has been revised that the responsibility of the tasks are clarified. This issue has been solved.
Clarification Request No. 19. As mentioned above CAR #1 and CR #2, The project's starting date will be revised in the PDD.	C.1.1.	PPs revised project starting date to 06/09/2010 in the PDD which is the contract date of the main component, catalyst with CRI.. According to submitted PDD ver2.0, the project expected starting date is 25/03/2010. However, project time schedule is slightly delayed. PPs submitted revised time schedule to audit team. Also, PPs provided for the catalyst supply contract to the audit team. PPs wrote 10years as expected operational lifetime of the project activity in the PDD, according to the documents for specification and guarantee of main components in the applied technology.	According to CAR #1 and submitted PDD ver.8.1, the project starting date is 06/09/2010, which is the contract date of the catalyst supply for this project. This issue has been solved.
Clarification Request No. 20. Please submit a relevant environmental law and regulations to the audit team.	D.1.2.	PPs submitted relevant environmental law to demonstrate that the EIA is required for this project.	The relevant environment law checked by audit team and has been confirmed that the EIA is required for this project. This issue has been solved.

Clarification Request No. 21. During the on-site audit discussion with PPs, PPs confirmed that all comments from Stakeholders' have been fully answered. However, the PDD description on E.3 was not fully explained for the employment issue. Please update the PPs' reply in E.3.	E.3.1.	PPs have revised PDD description about employment issue raised by stakeholder on E.3 and submitted the CDM project stakeholders' meeting report as relevant evidence to the audit team.	PDD has been revised to describe the received comments from stakeholder and answers. The relevant documents of stakeholder's meeting were checked by audit team. This issue has been solved.
Clarification Request No. 22. According to site checking, some of input values in this information should be corrected. Please revised the PDD and provide the supporting documents to the audit team.	F.1.5.	PPs revised some input values correctly in Annex 3 of PDD ver2.0. Also, PPs submitted supporting documents to the audit team. The submitted supporting documents are as follows. 1. Capro production amount 2. Designed N_2O flow and concentration 3. LNG used for project 4. LNG information provided by supplier 5. AOR operating condition(Temperature, Pressure) 6. Emission reduction calculation sheet PPs revised input values of C_3H_8 and i-C_4H_{10} in accordance with supporting document after double-check.	Baseline information, Annex 3, is entirely consistent with the applied values and descriptions in section B in the PDD. And the submitted supporting documents are acceptable and confirmed by audit team. This issue has been solved.

Clarification Request No. 23. Please provide the technical specifications for the stipulated information to the audit team.	F.1.8.	Technical documents related monitoring system are as follows 1. NDIR 2. Tail gas flow meter 3. Caprolactam production flow rate 4. Temperature and pressure of AOR 5. Ammonia flow rate of AOR PPs have provided the audit team with supporting documents above.	The submitted specifications for monitoring system are main parameters monitored and all is acceptable. This issue has been solved.
Clarification Request No. 24. According to the operation data for AOR, the range of T_g was slightly changed between the first-submitted data and the second submitted data. Please explain the reason of the change.	B.6.2.6.	The permitted range of operating temperatures are set base on historical data within latest 3years before 31, December, 2005. Hence, PPs applied operating temperature raw data from 1st Jan.2003 to 31st Dec.2005 at first submission. However, In the raw data, the value on 1st Jan 2003 means the value between 31st Dec 2002, 07:00AM and 1ST Jan 2003, 07:00AM. Therefore, PPs have applied raw data between 2nd Jan 2003 and 1st Jan 2006 at second submission because they are closer to historical data within latest 3years before 31, December 2005. That is the reason that the range of T_g was slightly different between first and second submission.	Audit team checked the historical data of AOR. The revised value and applied time are acceptable. This issue has been solved.

Clarification Request No. 25. The test report of N2O concentration by Gas Chromatography (GC) was submitted to the audit team. However, the values in test reports did not indicate the N_2O concentration value but the area/portion of N_2O only. Please provide the test results with N_2O concentration value to compare with the $CI_{N2O,I}$ values. Furthermore, please explain a relevance to the test report and designed value for N2O concentration.	B.7.1.4	PPs submitted the test report of N_2O concentration by Gas Chromatography. But the report includes the area of N_2O only. Therefore, PPs have submitted additional documents to demonstrate how to determine N_2O concentration calculation with the test report by GC. As a result of N_2O concentration results, N_2O concentration average is 1510ppm(plant I) and 1511ppm(plant2) respectively. Therefore, PPs determined 1500ppm conservatively as designed value for N_2O concentration.	The audit team checked the all submitted documents, which are reliable data provided by a third party. Also, the designed value of N2O concentration is acceptable as conservative one. This issue has been solved.

Table 3 Unresolved Corrective Action and Clarification Requests (in case of denials)

Clarifications and / or corrective action requests by validation team	Id. of CAR/CR	Explanation of Conclusion for Denial
-	-	-

Annex 2: Information Reference List

Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date	Additional Information
		Onsite interview (22.12.2009 – 23.12.2009) carried out by TÜV SÜD: Validation Team on-site: Jung-ho Yoon GHG Validator TÜV SÜD Korea In-hwan Kim* TÜV SÜD Korea (*Under the old standard he was appointed as validator for CDM-Projects; currently is still not re-appointed) Ashely (Sang-yeon) Park** TÜV SÜD Korea (**Under the old standard she was appointed as trainee for CDM-projects; currently is not an employee of the DOE) Interviewed Persons: Heung-jae Kim Prof. Engineer/ Planning Team Capro Corp. (Operator/ PP) Gyu-ho Heo Manager/Technical Team Capro Corp. (Operator/ PP) Cheong-jeong Choi Manager/ Technical Team Capro Corp. (Operator/ PP) Byoung-yung Park Assistant Manager/ Technical Team Capro Corp. (Operator/ PP) Ik-Jin Bae Safety & Environment Team Capro Corp. (Operator/ PP) Jong-hoon Park Senior Manager/ Env. & Business Div. Hyosugn Ebara Eng. (Developer/ PP) Kwan-sik Yang Manager/ Quality Control Team Hyosung Ebara Eng. (Developer/ PP)	22/12/2009 – 23/12/2009	*Onsite audit*

Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date	Additional Information
		So-young Myung CEO Greenpolaris (CDM consulting company) Ho-soung Choi Assistant Manager Greenpolaris (CDM consulting company) Dong-soo Lee CEO C.K Techpia Co., Ltd. (Monitoring system supplier) Young-jung Choi Manager/ Environment, Safety Group Kolon industries, INC. (Local Stakeholder)		
0.	UNFCCC Webpage	"N2O Abatement Project of Capro Corporation" http://cdm.unfccc.int/Projects/Validation/DB/5G9IN03Q4C07IONC5MZ82P4MQHTKBE/view.html	16/12/2009 – 14/01/2010	GSP
1.	UNFCCC	(1) AM0028, Catalytic N_2O destruction in the tail gas of Nitric Acid or Caprolactam Production Plants, version 05 (2) Methodological tool, Tool for the demonstration and assessment of additionality,version 05.2	12/02/2010 26/08/2008	Applied Methodology Additionality Tool
2.	PP	Project Design Document (PDD)_Ver.8.1	24/05/2011	Final PDD
3.	Hyosung Ebara Eng.	The expected project schedule/ Capro N2O abatement project schedule	04/2010	Reference for the expected project starting date
4.	(1) The provincial governor of Gyeongsamnam-do (2) Capro Corp.	(1) Plant approval for plant I / Registration document for capro production plant I in Capro corporation (2) Report for operation record in 1974 _plant I	05/05/1979 28/01/1975	- Applicability condition 1 Checking the production starting date (10/04/1974) for plant I

Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date	Additional Information
5.	(1) Capro Corp. (2) Ulsan Metropolitan City Mayor (3) Capro Corp.	(1) Report for monthly process analysis in 1988.12_plant II (2) Plant approval for plant II / Confirmation of installation notification of capro production plant II in Capro corporation (3) Application for technology inspection_Plant II	12/1998 24/01/1989 11/09/1986	- Applicability condition 1 Checking the completion date(30/12/1988) for plant II
6.	Stamicarbon	(1) Raschig_No.1/ Operating manual for plant I (2) Raschig_No.2/ Operating manual for plant II	15/05/1973	- Applicability condition 2 Raschig Process
7.	Hyosung Ebara Eng.	(1) Plot plan in Plant I before the proposed project (2) Plot plan for N2O facility location in Plant I	28/10/2009 14/11/2009	- Applicability condition 3 P&ID on Plant I (before and after)
8.	Hyosung Ebara Eng.	(1) Plot plan in Plant II before the proposed project (2) Plot plan for N2O facility location in Plant II	28/10/2009 14/11/2009	- Applicability condition 3 P&ID on Plant II (before and after)
9.	Capro Corp.	DeNOx manual / Identification of SCR type	26/09/1997	- Applicability condition 6
10.	Capro Corp.	(1) Monitoring equipment/P&ID for N2O abatement plant I (2) Monitoring equipment/P&ID for N2O abatement plant II (3) Monitoring equipments/Tag No. for N2O abatement Plant I & II	18/01/2010 18/01/2010 10/08/2010 (Sub.)	- Applicability condition 4, 5, 7 Measuring point
11.	Capro Corp.	(1) Caprolactam production amount / SAP capture & daily production for plant I & Plant II (2) Maximum operation days for Plant I	22/02/2010 (Sub.) 08/06/2010 (Sub.)	Reference for choosing a maximum daily production for plant I & II
12.	(1) Hyosung Ebara Eng. (2, 3, 4) Taesung	(1) Pilot Test Result Summary/ The test result for Catalyst A, B and C (2) Test Report for A Catalyst (3) Test Report for B Catalyst	24/02/2010 (Sub.) 30/08/2009 30/08/2009	Reference for reflecting a current good practice.(Catalyst)

Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date	Additional Information
	Environment Institute Co., Ltd	(4) Test Report for C Catalyst	30/08/2009	
13.	CRI Catalyst	(1) CRI_N2O Abatement technology(C-NAT)_ Application & Performance (2) C-NAT _Feature (3) Mechanical guantee of Capro's C-NAT	10/08/2010 (Sub.) 10/08/2010 (Sub.) 26/07/2010	Reference for the applied technology (C-NAT) Applicability condition 5
14.	Johnson Mattey Korea	Catalyst Delivery Confirmation document	04/01/2010	Reference for Catalyst supplier
15.	Capro Corp.	Investment analysis for Capro N2O project	22/02/2010 (Sub.)	Apply the Simple cost analysis
16.	Key Engineering (Supplier)	Quotation for NAS(N2O Abatement System)	18/11/2009	Investment for Construction (NAS)
17.	(1) DKMI Co.Ltd. (2) SBC BEND Co.,Ltd (3) Key Engineering	(1) Purchase order for control valve (2) Purchas order for fitting/ TEE, V-NECK (3) Construction contract for TIE-IN	21/08/2009 08/09/2009 29/09/2009	Investment for Construction (TIE-IN)
18.	C.K Techpia Co.Ltd.	Quotation of monitoring system/ Estimated cost of monitoring system	21/08/2009	Investment for Construction (MS)
19.	CRI Catalyst	Quotation of Catalyst / Budget price proposal	22/07/2008	Investment for Construction (Catalyst)
20.	(1) Hyosung Ebara Corp. (2) Capro Corp.	(1) Fan capacity (2) Electricity average price	22/02/2010 (Sub.) 09/02/2010	Reference for Investment analysis (Electricity cost)
21.	Korea Engineering & consulting	Labor cost/Reference for labor cost	22/02/2010	Reference for Investment analysis (Labor cost)

Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date	Additional Information
	association			
22.	Kyungdong city gas	LNG cost/ Reference for LNG cost	30/06/2009	Reference for Investment analysis (LNG cost)
23.	ITS	SCR Inspection report/ Pipe, NOx Converter, inspection history check	12/08/2010	SCR life time
24.	Danil Syschem Co.,Ltd	N2O Production process/ the production process for N2O commercial sales	03/08/2010	Additionality (Barrier)
25.	Korea Petrochemical Industry Association (KPIA)	(1) Korea Petrochemical Statistics/ Market report (2) Country report on Asia Petrochemical Industry Conference/ Market report	2009 13/05/2010	Additionality (Barrier)
26.	Capro Corp.	AOR operating condition(Temperature, pressure)(2007~2009) / Historical Operation Data	08/06/2010 (Sub.)	Historical data for AOR, Tg, Pg
27.	(1) WISE (2) YAMARI	(1) AOR Temp_TE(plant I)/ Technical information on temperature of AOR (2) AOR Temp_TE(plant II)/ Technical information on temperature of AOR	01/04/1994 10/11/2004	T_g specification
28.	Honeywell	AOR-pressure-STG944/ Technical information on pressure of AOR for plant I & II	13/05/2010	P_g specification
29.	Honeywell	AOR-flowmeter-STD924/ Specification data sheet on flow-meter of AOR for plant I & II	13/05/2010	A_{OR} flow-meter
30.	Endress+Hauser GmbH.	(1) Caprolactam_flowmeter_PROMASS63(plant I)/ technical information (2) Caprolactam_flowmeter_PROMASS60(plant II)/ technical information	30/12/2006 29/12/2006	Caprolactam production
31.	(1) TUV-SUD (2) Simens	(1) NDIR Certification/ Declaration of conformity (2) NDIR Specification/ N2O,CH4-ultramat 6-SIEMENS (3) Product Conformity Cert_ ultramat 6-SIEMENS	10/2008 01/2005 04/2003	The applied NDIR specification and Cert.

Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date	Additional Information
32.	(1) Sira Certification service (2) DURAG Group	(1) Tail gas flow meter Certification/ Product Conformity Certificate (2) Tail gas flow meter Specification /Product Overview “D-FL200-system (page 15.)”	04/2003 2008	The applied flow monitor specification and Cert.
33.	Key Engineering	(1) Efficiency of RCS burner (2) RCS heat radiation loss	04/01/2010 04/01/2010	RCS burner
34.	Key Engineering (Supplier)	(1) Mechanical Guarantee of Capro’s RCS (2) Heat Exchange Media Guarantee of Capro’s RCS	04/01/2010 27/01/2010	Reference for technical life time (RCS)
35.	DURAG DURAG HEEC	(1) Monitoring system(spec)/D-EMS2000 (2) Monitoring interval/Emission Monitoring Guidance Book (3) Monitoring Configuration/System Configuration	05/2008 06/2005 12/08/2009	Monitoring system
36.	Hyosung Ebara Eng.	(1) ER Calculation/ ER calculation sheet for Capro plant I & II (Ver. 3.0) (2) ER Calculation/ ER calculation sheet for Capro plant I & II (Ver. 7.0) (3) ER Calculation/ ER calculation sheet for Capro plant I & II (Ver. 8.1)	0806/2010 (Sub.) 03/03/2011 24/05/2011	ER Calculation & LNG consumption
37.	Hyosung Ebara Eng.	(1) N2O Concentration data/ Designed data (2) N2O test result by GC	29/04/2010 08/06/2010	N2O Designed value
38.	Ministry of Environment	(1) Volume flow rate from tail gas(plant I) _TMS(Tele Monitoring System) (2) Volume flow rate from tail gas(plant II) _TMS (3) Designed capacity and measured data for FTI (Excel)	23/12/2009 23/12/2009 22/02/2010 (Sub.)	Reference for F_{TI}
39.	Kyungdong City Gas	(1) LNG properties/ Caloric value, density and composition of LNG used (2) LNG properties/ Official format (Monthly based) (3) Physical property of gas	28/04/2010 (sub.) 01/11/2008~ 31/09/2009 08/19/2010	Reference for used Natural gas

Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date	Additional Information
40.	Korea Gas Corp. <website>	NCV(Net Caloric Value) of LNG < "http://www.kogas.or.kr/kogas_kr/05_gas/heating/01.jsp "	2009	Reference for Natural gas
41.	Hyosung Ebara Eng.	(1) Heat exchanger temperature distribution comparison table/ Programming data for the Heat exchanger's design (2) Example of temperature calculation of heat exchanger for Plant I/ the calculation based on VDI system (3) Example of temperature calculation of heat exchanger for Plant II/ the calculation based on VDI system	11/05/2010 22/02/2010(Sub.) 22/02/2010(Sub.)	Sub- data for calculation of LNG consumption & Leakage exclusion
42.	Hyosung Ebara Eng.	(1) Calculation on the specific heat (2) Specific heat of gases_ reference data for IRL#42-1.	22/02/2010(Sub.)	Sub- data for calculation of LNG consumption
43.	(1) Hyosung Ebara Eng. (2) Porzellanfabrik Frauenthal GmbH (3) Hyosung Ebara Eng.	(1) Calculation of Purge volume/ Calculated value (2) Material data on technical information of heat exchanger/ the data for calculation of Purge volume. (4) Heat exchanger size/ the data for calculation of Purge volume	(1) 08/06/2010 (2) 16/01/2004 (3) 11/05/2010	Sub- data for calculation of LNG consumption
44.	CRI catalyst & Hyosung Ebara Engineering	Purchasing contract of Catalyst	06/09/2010	Project starting date
45.	Hyosung Ebara Eng.	(1) A report on the project plan1 (2) A report on the project plan2/ Revised version	23/02/2009 13/04/2009	Prior consideration
46.	Carpo Corp. & Hyosung Ebara Eng.	(1) MOU for CDM project between PPs (2) MOU for CDM project between PPs_attachment	19/03/2009	Prior consideration

Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date	Additional Information
47.	Hyosung Ebara Eng. & Greenpolaris	A contract with CDM consultancy	20/03/2009	Prior consideration
48.	Hyosung Ebara Eng.	The plan report for CDM project/ final version	23/03/2009	Prior consideration
49.	Hyosung Ebara Eng.	(1) Feasibility Study1 (2) Feasibility Study2 (3) Feasibility Study3	17/09/2009 14/10/2009 23/10/2009	Prior consideration (Revised feasibility study by financial variation)
50.	Ministry of Environment (Republic of KOREA)	National Regulation on NOX emission/ Clean Air Conservation Act	06/01/2010	Reference for Reg.NO_X
51.	Ministry of Environment	Environment law (EIA) in Korea	15/12/2009	Reference for EIA
52.	Hyosung Ebara Eng.	EIA report of Capro N2O project	05/2009	Reference for EIA
53.	PP	Report on CDM project stakeholder's meeting	25/06/2009	Stakeholder's comments
54.	Ministry of knowledge Economy (Republic of Korea)	Letter of Approval by host country Revised LoA by host country (Korean DNA)	11/08/2010 24/05/2011	LoA

Industrie Service

Annex 3: Appointment Certificates

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

CERTIFICATE OF APPOINTMENT

TÜV SÜD Industrie Service

Mr Yoshida, Yutaka , fulfills the requirements of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH to participate in audits.

Qualification applicable to						
Standard	CDM	JI	GS	VCS	VER	Other
Date	25.03.11					

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		25.03.11	25.03.11	25.03.11		

Other qualification					
Country Expertise					
Region	1	2	3	4	5
Date	25.03.11				
Financial Expertise					
Date					

Qualification in technical areas	
Technical Area	**Date**
3.1_Energy demand	25.03.11
5.1_4.9_11.1_12.1_Chemical process industries	25.03.11
11.2_GHG capture and destruction	25.03.11

This appointment is valid for 1 year from its date of signature below and is bound by internal requirements of the Management System of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH.
In case of loss of validity of this certificate as per result of an assessment according internal procedures or due to any other reason, it will be properly communicated to you.
Your Certificate has the internal reference No. CMS-Z-0026/00.

Date	Signature
25.03.11	Thomas Kleist

TÜV®

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

CERTIFICATE OF APPOINTMENT

TÜV SÜD Industrie Service

Mr Jung-Ho, Yoon, fulfills the requirements of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH to participate in audits.

Qualification applicable to						
Standard	CDM	JI	GS	VCS	VER	Other
Date	27.04.11					

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		27.04.11	27.04.11			

Other qualification					
Country Expertise					
Region	1	2	3	4	5
Date	27.04.11				
Financial Expertise					
Date					

Qualification in technical areas	
Technical Area	**Date**
13.1_Waste handling and disposal	27.04.11

This appointment is valid for 1 year from its date of signature below and is bound by internal requirements of the Management System of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH.
In case of loss of validity of this certificate as per result of an assessment according internal procedures or due to any other reason, it will be properly communicated to you.
Your Certificate has the internal reference No. CMS-Z-0048/00.

Date	Signature
27.04.11	Thomas Klein

TÜV®

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

CERTIFICATE OF APPOINTMENT

TÜV SÜD Industrie Service

Mr Hammer, Martin, fulfills the requirements of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH to participate in audits.

Qualification applicable to						
Standard	CDM	JI	GS	VCS	VER	Other
Date	23.03.11					

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		23.03.11	23.03.11	23.03.11	31.03.11	

Other qualification					
Country Expertise					
Region	1	2	3	4	5
Date	23.03.11				
Financial Expertise					
Date	23.03.11				

Qualification in technical areas	
Technical Area	**Date**
1.2_Energy generation from renewable energy source	23.03.11
5.1_4.9_11.1_12.1_Chemical process industries	23.03.11

This appointment is valid for 1 year from its date of signature below and is bound by internal requirements of the Management System of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH.
In case of loss of validity of this certificate as per result of an assessment according internal procedures or due to any other reason, it will be properly communicated to you.
Your Certificate has the internal reference No. CMS-Z-0005/00.

Date	Signature
23.03.11	Thomas Klein
31.03.11	Vidacek

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