



**Validation report form for post-registration changes for  
CDM project activities  
(Version 02.0)**

*Complete this form in accordance with the instructions attached at the end of this form.*

**BASIC INFORMATION**

|  |   |
|--|---|
| <b>Title and UNFCCC reference number of the project activity</b>                     | Catalytic abatement of N <sub>2</sub> O in Nitric Acid Plant of Shiraz Petrochemical Company<br>(UNPA reference number: 8249)   |
| <b>Process track</b>   | <input checked="" type="checkbox"/> Prior approval<br><input type="checkbox"/> Issuance<br><input type="checkbox"/> Renewal of crediting period   |
| <b>Version number of the validation report on PRCs</b>                               | 01  |
| <b>Completion date of the validation report on PRCs</b>                              | 31/03/2019  |
| <b>Type(s) of PRCs</b>   | <input type="checkbox"/> Temporary deviations from the registered monitoring plan, applied methodologies or applied standardized baselines<br><input type="checkbox"/> Corrections<br><input type="checkbox"/> Changes to the start date of the crediting period<br><input type="checkbox"/> Inclusion of a monitoring plan<br><input type="checkbox"/> Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools<br><input checked="" type="checkbox"/> Changes to the project design<br><input type="checkbox"/> Changes specific to afforestation and reforestation project activities |
| <b>Version number of PDD to which this report applies</b>                            | Version 09, Dated 07/03/2019  |
| <b>Project participants</b>  | Shiraz Petrochemical Company<br>Mehr Renewable Energies Company<br>Climate Protection Finance AG  |
| <b>Host Party</b>  | Iran  |
| <b>Applied methodologies and standardized baselines</b>                              | AM0028 / version 05.1.0<br>"Catalytic N <sub>2</sub> O destruction in the tail gas of nitric acid or caprolactam production plants"   |
| <b>Mandatory sectoral scopes linked to the applied methodology</b>                   | Sectoral Scope (5): Chemical industries   |
| <b>Conditional sectoral scopes linked to the applied methodologies</b>               | NA  |
| <b>Name and UNFCCC reference number of the DOE</b>                                   | Carbon Check (India) Private Ltd.<br>(E-0052)   |
| <b>Name, position and signature of the approver of the validation report on PRCs</b> | Amit Anand, CEO   |

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**SECTION A. Executive summary**

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Purpose, general description and location of the project activity:

The Project Participant, Climate Protection Finance AG, has commissioned the DOE, Carbon Check (India) Private Ltd. (CCIPL) to perform an independent validation of the post registration changes of the CDM Project Activity “Catalytic abatement of N<sub>2</sub>O in Nitric Acid Plant of Shiraz Petrochemical Company” in Islamic Republic of Iran (hereafter referred to as “Project Activity”).

The objective of the project activity is to reduce the emission of Nitrous Oxide (N<sub>2</sub>O), which is a greenhouse gas, from tail gas of Nitric Acid production process in the Nitric Acid Plant of Shiraz Petrochemical Company (SPC) by installing a catalytic N<sub>2</sub>O abatement system. N<sub>2</sub>O is an undesired by-product of ammonia oxidation reaction (to produce nitric acid). The project activity includes installation of a DeN<sub>2</sub>O-DeNO<sub>x</sub> unit at the tail gas of nitric acid plant, which is decomposing N<sub>2</sub>O and NO<sub>x</sub> by chemical reaction over a catalytic bed to N<sub>2</sub> and O<sub>2</sub>. This abatement unit utilizes a catalytic bed to decompose N<sub>2</sub>O to its elements N<sub>2</sub> and O<sub>2</sub>, thereby reducing GHG emissions. The plant utilizes Natural Gas as fuel for heating the tail gas and some ammonia to decompose NO<sub>x</sub> emissions, which results in some project emissions. In the baseline scenario Nitrous Oxide (an undesired by product) of ammonia oxidation reaction (to produce nitric acid) and was released to atmosphere in absence of any regulation to restrict N<sub>2</sub>O emissions in Iran.

PP proposes the following three project design changes:

- The value of the ex-ante fixed parameter “Historical operating temperature range of the ammonia oxidation reactor” ( $T_{g,hist}$ ), was stated as 840<sup>0</sup> C – 860<sup>0</sup> C in the registered PDD. PP proposes to change this value to 810<sup>0</sup> C – 885<sup>0</sup> C.
- As per the registered PDD, for the ex-ante estimation of emission reductions, “N<sub>2</sub>O concentration at the inlet of the N<sub>2</sub>O destruction facility” ( $Cl_{N_2O,i}$ ) was assumed as 1,120 ppmv and “N<sub>2</sub>O concentration at destruction facility outlet” ( $CO_{N_2O,i}$ ) as 120 ppmv (i.e. 90% efficiency). Based on the actual monitored value, PP proposes to change the value of inlet concentration of N<sub>2</sub>O to 2,014.7 ppmv for the ex-ante estimation of emission reductions and outlet concentration as 201.47 ppmv (90% efficiency).
- Change in the AOR catalyst from “woven” to “knitted” type with its composition remaining same (90% Pt and 10% Rh)

Scope of validation:

This validation is an independent and objective review of the post registration changes in the registered PDD /B04/. The scope of the validation of post registration changes is to determine whether there are proposed or actual changes to the project design of the registered CDM project activity. CCIPL also determined whether the description in the revised PDD /1/ submitted by project participants, which describe the nature and extent of the actual changes, accurately reflects the implementation, operation and monitoring of the modified project activity.

The validation of post registration changes in the revised PDD /1/ were based on the following:

- (i) Approved methodology AM0028 (version 05.1) /B02/
- (ii) Revised PDD (in track change and clean mode) /1/
- (iii) CDM VVS for Project Activities (version 02.0) /B01-1/
- (iv) CDM PS for Project Activities (version 02.0) and /B01-2/
- (v) CDM PCP for Project Activities (version 02.0) /B01-3/
- (vi) Relevant decisions, guidance and clarifications of the CMP and CDM EB

Validation process:

The validation process for post registration changes includes the following steps:

- (a) Contract with project participants and appointment of validation team and technical review team
- (b) Desk review of the revised PDD by validation team and planning of onsite visit
- (c) On site visit and follow up interviews by the validation team
- (d) Reporting and closure of findings (CARs/CLs/FARs) and preparation of validation report
- (e) Independent technical review of the validation report
- (f) Issuance of final validation report to the contracted PP and submission to UNFCCC for approval of post registration changes as appropriate.

The description in the revised PDD (version 09; dated 07/03/2019) /1/ meets all relevant UNFCCC requirements for the CDM PDD and correctly applies the selected baseline and monitoring methodology /B02/.

The version of the template for PDD was the latest version. CCIPL confirms that the revised PDD as provided by the PP complies with the instructions for completion of the PDD. Furthermore, CCIPL through review of revised PDD /1/ confirms that the information included in the new form is materially the same as the information in the registered PDD.

The Validation team confirms the contractual relationship signed on 12/02/2019 in between the DOE, Carbon Check (India) Private Ltd., and the PP, Climate Protection Finance AG. The team assigned to the validation meets the CCIPL's internal procedures including the UNFCCC requirements for the team composition and competence. The validation team has conducted a thorough contract review as per UNFCCC and Carbon Check's procedures and requirements.

The report is based on the assessment of the revised PDD undertaken through application of standard auditing techniques including but not limited to document reviews and stakeholder interviews, review of the applicable/applied methodology and its underlying formulae and calculations.

This report contains the findings and resolutions from the validation and a validation opinion on the proposed post-registration changes thus confirming the revised project design as document is sound and reasonable and meets the stated requirements and identified criteria.

The validation confirms that the implementation of the post registration changes is in line with the applied methodology and all other applicable tools and guidance.

This report is the combined assessment opinion for all the changes that are proposed in the PDD and request is submitted for prior approval by CDM EB.

## SECTION B. Validation team, technical reviewer and approver

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### B.1. Validation team member

| No. | Role                             | Type of resource | Last name | First name   | Affiliation<br>(e.g. name of central or other office of DOE or outsourced entity) | Involvement in       |                    |            |                     |
|-----|----------------------------------|------------------|-----------|--------------|---|----------------------|--------------------|------------|---------------------|
|     |                                  |                  |           |              |   | Desk/document review | On-site inspection | Interviews | Validation findings |
| 1.  | Team Leader/<br>Technical Expert | IR               | Agarwalla | Sanjay Kumar | CCIPL   | X                    | X                  | X          | X                   |
| 2.  | Local Expert                     | IR               | Mehrani   | Neda         | CCIPL   |                      | X                  | X          |                     |

**B.2. Technical reviewer and approver of the validation report on PRCs**

| No. | Role                                   | Type of resource | Last name | First name   | Affiliation<br>(e.g. name of central or other office of DOE or outsourced entity) |
|-----|--|------------------|-----------|--------------|---|
| 1.  | Technical reviewer                     | IR               | Singh     | Vikash Kumar | CC IPL  |
| 2.  | Technical expert to Technical Reviewer | IR               | Nesari    | R V          | CC IPL  |
| 3.  | Approver                               | IR               | Anand     | Amit         | CC IPL  |

**SECTION C. Means of validation****C.1. Desk/document review**

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List of all documents reviewed or referenced during the validation is provided in Appendix-3 below.

**C.2. On-site inspection**

| Duration of on-site inspection: 06/01/2019 to 07/01/2019 |   |                         |                          |                                      |
|--|---|-------------------------|--------------------------|--------------------------------------|
| No.  | Activity performed on-site  | Site location           | Date                     | Team member                          |
| 1.   | An assessment of the implementation and operation of the registered project activity as per the registered PDD  | SPC plant, Shiraz, Iran | 06/01/2019 to 07/01/2019 | Sanjay Kumar Agarwalla, Neda Mehrani |
| 2.   | A review of information flows for generating, aggregating and reporting the monitoring parameters   | SPC plant, Shiraz, Iran | 06/01/2019 to 07/01/2019 | Sanjay Kumar Agarwalla, Neda Mehrani |
| 3.   | Interviews with relevant personnel to determine whether the operational and data collection procedures are implemented in accordance with the monitoring plan in the PDD  | SPC plant, Shiraz, Iran | 06/01/2019 to 07/01/2019 | Sanjay Kumar Agarwalla, Neda Mehrani |
| 4.   | A cross check between information provided in the monitoring report and data from other sources such as plant logbooks, inventories, purchase records or similar data sources   | SPC plant, Shiraz, Iran | 06/01/2019 to 07/01/2019 | Sanjay Kumar Agarwalla, Neda Mehrani |
| 5.   | A check of the monitoring equipment including calibration performance and observations of monitoring practices against the requirements of the PDD and the selected methodology and corresponding tool(s), where applicable | SPC plant, Shiraz, Iran | 06/01/2019 to 07/01/2019 | Sanjay Kumar Agarwalla, Neda Mehrani |
| 6.   | A review of calculations and assumptions made in determining the GHG data and emission reductions   | SPC plant, Shiraz, Iran | 06/01/2019 to 07/01/2019 | Sanjay Kumar Agarwalla, Neda Mehrani |
| 7.   | An identification of quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters   | SPC plant, Shiraz, Iran | 06/01/2019 to 07/01/2019 | Sanjay Kumar Agarwalla, Neda Mehrani |

**C.3. Interviews**

| No. | Interviewee |                 |                       | Date                     | Subject   | Team member                          |
|-----|-------------|-----------------|-----------------------|--------------------------|---|--------------------------------------|
|     | Last name   | First name      | Affiliation           |                          |   |                                      |
| 1.  | Ahadi       | Mohammad Sadegh | Mehr Renewable Energy | 06/01/2019 to 07/01/2019 | Project implementation and operation management, monitoring procedure, data and information flow, QA/QC | Sanjay Kumar Agarwalla, Neda Mehrani |

|     |               |                 |                       |                          |   |                                      |
|-----|---------------|-----------------|-----------------------|--------------------------|---|--------------------------------------|
|     |               |                 |                       |                          | Procedures CER calculation and completeness of monitoring report  |                                      |
| 2.  | Bazdar        | Elahe           | Mehr Renewable Energy | 06/01/2019 to 07/01/2019 | CER calculation and completeness of monitoring report   | Sanjay Kumar Agarwalla, Neda Mehrani |
| 3.  | Madadi        | Mohammad        | SPC                   | 06/01/2019 to 07/01/2019 | Project implementation and operation, monitoring procedure, data and information flow, QA/QC Procedures | Sanjay Kumar Agarwalla, Neda Mehrani |
| 4.  | Babak         | Dehghanpur      |                       | 06/01/2019 to 07/01/2019 | Project implementation and operation, monitoring procedure, data and information flow, QA/QC Procedures | Sanjay Kumar Agarwalla, Neda Mehrani |
| 5.  | Faramarzi     | Zarir           | SPC                   | 06/01/2019 to 07/01/2019 | Plant operation and maintenance   | Sanjay Kumar Agarwalla, Neda Mehrani |
| 6.  | Golab Fetoosh | Mohammad Hadi   | SPC                   | 06/01/2019 to 07/01/2019 | Operation and Maintenance of monitoring instrument including calibration                                | Sanjay Kumar Agarwalla, Neda Mehrani |
| 7.  | Karami        | Abdolmarim      | SPC                   | 06/01/2019 to 07/01/2019 | Operation and Maintenance of monitoring instrument including calibration                                | Sanjay Kumar Agarwalla, Neda Mehrani |
| 8.  | Ghanbari      | Darab           | SPC                   | 06/01/2019 to 07/01/2019 | Plant operation and maintenance   | Sanjay Kumar Agarwalla, Neda Mehrani |
| 9.  | Sherafati     | Keivan          | SPC                   | 06/01/2019 to 07/01/2019 | Plant operation and maintenance   | Sanjay Kumar Agarwalla, Neda Mehrani |
| 10. | Parisai       | Mohammad Sadegh | SPC                   | 06/01/2019 to 07/01/2019 | Plant operation and maintenance   | Sanjay Kumar Agarwalla, Neda Mehrani |
| 11. | Talebshokr    | Farzad          | SPC                   | 06/01/2019 to 07/01/2019 | Shift operator and log recording  | Sanjay Kumar Agarwalla, Neda Mehrani |

#### C.4. Sampling approach

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Not applicable.

#### C.5. Clarification requests (CLs), corrective action requests (CARs) and forward action requests (FARs) raised

| Areas of validation findings  | No. of CL | No. of CAR | No. of FAR |
|---|-----------|------------|------------|
| Compliance with PDD form  | -         | 04         | -          |
| Temporary deviations from the registered monitoring plan, applied methodologies or applied standardized baselines   | -         | -          | -          |
| Corrections   | -         | -          | -          |
| Changes to the start date of the crediting period   | -         | -          | -          |
| Inclusion of a monitoring plan  | -         | -          | -          |
| Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools | -         | -          | -          |
| Changes to the project design   | 04        | -          | -          |

|  |           |           |          |
|--|-----------|-----------|----------|
| Changes specific to afforestation and reforestation project activities | -         | -         | -        |
| Others (please specify)  | -         | -         | -        |
| <b>Total</b>   | <b>04</b> | <b>04</b> | <b>0</b> |

## SECTION D. Validation findings

### D.1. Compliance with PDD form

|                            |   |
|----------------------------|---|
| <b>Means of validation</b> | Document Review, Interview  |
| <b>Findings</b>            | CAR 01, CAR 02, CAR 03 and CAR 04 were raised and successfully resolved. Please refer Appendix 4 for further details.   |
| <b>Conclusion</b>          | <p>The revised PDD /1/ has been completed using the latest available template of CDM-PDD-FORM /B03-2/ and has been submitted in both track change and clean versions.</p> <p>Both the registered /B04/ and revised PDD /1/ were reviewed for the consistency of the information and it is confirmed that the information transferred from the previous template to the new template is materially the same as in the registered PDD /B04/ except the changes due to the proposed PRC.</p> <p>This confirms to the requirements of §278 and 279 of the VVS for project activities (version 02.0) /B01-1/.</p> <p>Furthermore, in accordance with §280 (a) of VVS for project activities (version 02.0) /B01-1/, the validation team confirms that:</p> <ul style="list-style-type: none"> <li>(i) The revised PDD /1/ is compliant with the valid version of the CDM-PDD-Form /B03-2/ and instructions therein; and</li> <li>(ii) The information transferred to the revised PDD /1/ is materially the same as that provided in the registered PDD /B04/.</li> </ul> |

### D.2. Temporary deviations from the registered monitoring plan, applied methodologies or applied standardized baselines

|                            |                |
|----------------------------|----------------|
| <b>Means of validation</b> | Not applicable |
| <b>Findings</b>            | Not applicable |
| <b>Conclusion</b>          | Not applicable |

### D.3. Corrections

|                            |                |
|----------------------------|----------------|
| <b>Means of validation</b> | Not applicable |
| <b>Findings</b>            | Not applicable |
| <b>Conclusion</b>          | Not applicable |

### D.4. Changes to the start date of the crediting period

|                            |                |
|----------------------------|----------------|
| <b>Means of validation</b> | Not applicable |
| <b>Findings</b>            | Not applicable |
| <b>Conclusion</b>          | Not applicable |

### D.5. Inclusion of a monitoring plan

|                            |                |
|----------------------------|----------------|
| <b>Means of validation</b> | Not applicable |
| <b>Findings</b>            | Not applicable |
| <b>Conclusion</b>          | Not applicable |

### D.6. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

|                            |                |
|----------------------------|----------------|
| <b>Means of validation</b> | Not applicable |
| <b>Findings</b>            | Not applicable |
| <b>Conclusion</b>          | Not applicable |

## D.7. Changes to the project design

|                     |   |
|---------------------|---|
| Means of validation | The changes in the project design have been validated by document review, on-site inspection visit, review of registered and revised PDD.   |
| Findings            | CL 01, CL 02, CL 03 and CL 04 were raised and successfully resolved. Please refer Appendix 4 for further details.   |
| Conclusion          | <p>The current project design involves changes compared to the project design in the registered project activity. The following project design changes are being proposed:</p> <p><b>1) The value of the ex-ante fixed parameter “Historical operating temperature range of the ammonia oxidation reactor” (<math>T_{g,hist}</math>), was stated as 840<sup>0</sup> C – 860<sup>0</sup> C in the registered PDD. PP proposes to change this value to 810<sup>0</sup> C – 885<sup>0</sup> C.</b></p> <p><u>Assessment by the validation team:</u></p> <p>In the registered PDD, the validated historical AOR temperature (for the period 21/03/2010 to 20/03/2011) was 840 – 860°C /B04/ /6/. PP has provided the AOR temperature records for the period 21/03/2010 to 20/11/2016 (i.e. for the pre DCS period) which shows the range from 840 – 862°C /2/, which is almost in the same range as in the registered PDD. However, PP has provided the data for the post DCS installation /3/, which was verified during the on-site visit by reviewing the plant records, showing the AOR temperature range from 862-874 °C for the period 20/01/2017 to 22/09/2018 /7/. It is observed that there is an average increase of about 1.7% in the AOR temperature post installation of DCS, although the operating conditions remains same. As clarified by the PP, the DCS records are deemed to be accurate and with the possibility of the pre DCS records having some error. In light of the above, PP has proposed PRC in the approach of determining the ex-ante fixed parameter “Historical operating temperature range of the ammonia oxidation reactor (<math>T_{g,hist}</math>)”.</p> <p>As per the applied methodology:<br/> <i>“in order to determine the permitted range of the operating temperature and pressure in the ammonia oxidation reactor, the project applicant has the obligation to determine the operating temperature and pressure range by:</i><br/> <i>(a) Firstly, data on historical temperature and pressure ranges; or, if no data on historical temperatures and pressures are available; then</i><br/> <i>(b) Secondly, by range of temperature and pressure stipulated in the operating manual for the existing equipment; or, if no operating manual is available or the operating manual gives insufficient information; then</i><br/> <i>(c) Thirdly, by literature reference (e.g. from Ullmanns Encyclopedia of Industrial Chemistry, Fifth, completely revised edition, Volume A 17, VCH, 1991, P. 298, Table 3. or other standard reference work or literature source)”</i></p> <p>In the registered PDD, PP had opted for the option (a). But as assessed above, the historical temperature of the AOR are proved to be erroneous, PP has opted for option (b) (from operating manual).</p> <p>In the revised PDD, PP has proposed this ex-ante parameter (<math>T_{g,hist}</math>) value based on option (b) of the methodology AM0028, version 05.1 which says <i>“Secondly, by range of temperature and pressure stipulated in the operating manual for the existing equipment”</i>. Accordingly PP has proposed the parameter value based on the prescribed operating AOR temperature range by the technology supplier /4/ and further adopted by the PP in its log sheets as 810 – 885°C /5/ which is deemed acceptable to the validation team.</p> <p>As per paragraph 309 (b) of the VVS for project activities, version 02.0 /B01-1/, the following are confirmed:</p> <p>- <i>When the changes occurred:</i> The design change was noted by the PP when the DCS monitoring system was installed.</p> |



- *Reasons for these changes taking place:* As stated above, PP could note this change once the DCS monitoring system was installed
- *Whether the changes would have been known prior to the registration of the CDM project activity:* PP had not known this change prior to the registration of the CDM project activity
- *How the changes would impact on the overall operation/ability of the CDM project activity to deliver emission reductions:* With the stated project design change (correct application of the ex-ante historical temperature range of AOR), the emission reductions will be correctly calculated as per the applied methodology
- *Whether the revised estimation of emission reductions due to the change takes into account the applicable limits in accordance with the "CDM project standard for project activities":* There is no revision in estimation of emission reductions due to the stated project design change. Furthermore, the project activity is a large scale project and there is no limit on emission reductions as per the CDM project standard for project activities.

The validation team deemed this project design change for the fixed ex-ante parameter acceptable.

**2) As per the registered PDD, for the ex-ante estimation of emission reductions, "N<sub>2</sub>O concentration at the inlet of the N<sub>2</sub>O destruction facility" (C<sub>N<sub>2</sub>O,i</sub>) was assumed as 1,120 ppmv and "N<sub>2</sub>O concentration at destruction facility outlet" (C<sub>N<sub>2</sub>O,o</sub>) as 120 ppmv (i.e. 90% efficiency). Based on the actual monitored value, PP proposes to change the value of inlet concentration of N<sub>2</sub>O to 2,014.7 ppmv for the ex-ante estimation of emission reductions and outlet concentration as 201.47 ppmv (90% efficiency).**

Assessment by the validation team:

In the registered PDD, for the ex-ante estimation of emission reductions, PP had used the IPCC 2006 default value for N<sub>2</sub>O concentration as 1,120 ppmv in the tail gas (inlet to the DeN<sub>2</sub>O-DeNO<sub>x</sub> unit). This value was used in absence of any actual monitored data available at the time of PDD registration. However, post installation of the DeN<sub>2</sub>O-DeNO<sub>x</sub> unit and monitoring of N<sub>2</sub>O concentration in the tail gas, it is observed that its average value is 2,014.7 ppmv for the period 20/01/2017 to 22/09/2018 /7/. The monitored value was verified during the on-site visit document review by the validation team. Hence PP has proposed a PRC in this respect for values of inlet and outlet concentration of the N<sub>2</sub>O in the DeN<sub>2</sub>O-DeNO<sub>x</sub> unit as 2,014.7 ppmv and 201.47 ppmv (assuming 90% destruction of N<sub>2</sub>O) respectively for the ex-ante estimation of emission reductions. It is noted that in the registered PDD, page 9, also it was stated "*It is notable that the estimates of GHG emission reductions are made for reference purpose only and actual emission reductions will be based on monitored data and may differ from this estimate*". Hence the validation team deemed this change, based on the actual monitored data, to be more realistic and hence acceptable. The validation team has reviewed the revised emission reduction calculation /12/ and deemed the revision as acceptable which is based on actual monitored value. Due to this proposed PRC, the annual average ex-ante emission reductions have increased from 418,730 to 761,263 tCO<sub>2</sub>e.

As per paragraph 309 (b) of the VVS for project activities, version 02.0 /B01-1/, the following are confirmed:

- *When the changes occurred:* The design change was noted by the PP when the

DCS monitoring system was installed once the CDM project (DeN<sub>2</sub>O-DeNO<sub>x</sub> system) was commissioned and N<sub>2</sub>O concentration data in the tail gas was available.

- *Reasons for these changes taking place:* As stated above, PP could note this change once the DCS monitoring system was installed

- *Whether the changes would have been known prior to the registration of the CDM project activity:* PP had not known this change prior to the registration of the CDM project activity as there was no monitoring system at site for N<sub>2</sub>O concentration in the tail gas.

- *How the changes would impact on the overall operation/ability of the CDM project activity to deliver emission reductions:* With the stated project design change (application of more realistic value of N<sub>2</sub>O concentration in the tail gas for the purpose of ex-ante estimation of emission reductions), the ex-ante ERs in the PDD will be more realistic

- *Whether the revised estimation of emission reductions due to the change takes into account the applicable limits in accordance with the "CDM project standard for project activities":* The project activity is a large scale project and there is no limit on emission reductions as per the CDM project standard for project activities.

The validation team deemed this project design change acceptable.

### **3) Change in the AOR catalyst from "woven" to "knitted" type with its composition remaining same (90% Pt and 10% Rh)**

During the on-site visit interviews and document review /9/ it was confirmed that the composition of the catalyst being used in the AOR is 90% Pt and 10% Rh which is same as stated in the registered PDD /B04/. But it was noted that as per the recommendation of the catalyst supplier /9/, the catalyst type had been changed from "woven" to "knitted" in April 2018 /10/. The validation team based on its sectoral expertise confirms that this change in type of catalyst (without altering the composition of the catalyst, i.e. 90% Pt and 10% Rh), does not have any negative impact on the plant operation and rather may lead to better efficiency of HNO<sub>3</sub> production, i.e. decrease the N<sub>2</sub>O concentration in the tail gas. Hence this is deemed acceptable to the validation team. Further it was noted that in the registered PDD, section B.6.2 in the table for the parameter "G<sub>com,hist</sub>", PP had stated the catalyst composition as 90% Pt and 10% Pd and this typographical error has been corrected to 90% Pt and 10% Rh which is consistent with other sections of the PDD and also the evidence from the technology supplier. The validation team deemed the above change catalyst type from woven to knitted acceptable.

As per paragraph 309 (b) of the VVS for project activities, version 02.0 /B01-1/, the following are confirmed:

- *When the changes occurred:* The design change was done in April 2018.

- *Reasons for these changes taking place:* As stated above, the change in catalyst type (without altering in the composition) was done on the recommendation of the catalyst supplier for better efficiency of the nitric acid plant.

- *Whether the changes would have been known prior to the registration of the CDM project activity:* PP had not known this change prior to the registration of the CDM project activity.

- *How the changes would impact on the overall operation/ability of the CDM project activity to deliver emission reductions:* With the stated change in catalyst type, nitric acid production efficiency is expected to increase and thereby decreasing the concentration of N<sub>2</sub>O in the tail gas and thus emission reductions are expected to decrease.

- Whether the revised estimation of emission reductions due to the change takes into account the applicable limits in accordance with the "CDM project standard for project activities": The project activity is a large scale project and there is no limit on emission reductions as per the CDM project standard for project activities.

The validation team deemed this project design change acceptable.

Based on on-site visit inspection and document review, the verification team confirms that the above project design changes do not have any adversely impact on the compliance of the additionality, monitoring plan, the level of accuracy of the monitoring activity, the applied monitoring methodology including applicable tool(s) thereby complying paragraphs 303 and 309 of CDM VVS for project activities, version 02.0 /B01-1/.

Further in line with paragraph 303 of CDM VVS for project activities, version 02.0, the validation team has assessed the effect of the project design changes as below:

a) Additionality of the registered CDM project activity:

As per section B.5 of the registered PDD, "*Because the installation of a DeN2O unit (Tertiary measure) needs considerable investment, and has no economical/financial benefit except benefits related to CDM, Simple cost analysis (option I) is applied*". The above stated PRCs do not have any impact on project capital cost, operation cost and other terms which adversely affected project additionality.

Thus the verification team confirms that the project design changes do not adversely affects the additionality of the project activity and the project activity still remains additional.

b) Scale of the registered CDM project activity:

The project is a large scale project activity and the project design changes do not adversely affect the scale of the project activity,

c) Applicability and application of the applied methodology under which the CDM project activity has been registered;

The applicability conditions of the applied methodology AM0028, version 05.1.0 are demonstrated as below:

| Applicability Criteria   | Justification / Assessment   |
|--|--|
| The applicability is limited to the existing production capacity measured in tonnes of nitric acid or caprolactam, where the commercial production had began no later than 31 December 2005. The definition of "existing" production capacity is applied for the process with the existing ammonia oxidization reactor where N <sub>2</sub> O is generated and not for the process with new ammonia oxidizer. Existing production "capacity" is defined as the | SPC has only one nitric acid plant commissioned in 1986 with the capacity of 600t/d ( x 330 d/yr = 198,000ton/yr) and this capacity has not been changed since then. Thus this condition is satisfied. |

|   |  |  |
|---|--|--|
|   | designed capacity, measured in tonnes of nitric acid or caprolactam per year;  |  |
|   | 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;   | This condition is not applicable to the project because it is a nitric acid production plant.  |
|   | The project activity will not result in shut down of an existing N <sub>2</sub> O destruction or abatement facility at the nitric acid or caprolactam production plant;  | SPC has no N <sub>2</sub> O destruction or abatement facility currently.<br>This criterion is still applicable.  |
|   | The project activity shall not affect the nitric acid or caprolactam production level;   | The applied technology targets the tail gas, therefore has no influence on the nitric acid production.<br>In case of market demand for nitric acid or ammonium nitride, SPC may increase the production, however the reason is not due to this project.<br>This criterion is still applicable.   |
|   | The project activity will not cause an increase in NO <sub>x</sub> emissions;  | Even though there is no adverse effect of the applied DeN <sub>2</sub> O technology on NO <sub>x</sub> emission of the plant, the unit works as DeNO <sub>x</sub> as well, thus NO <sub>x</sub> emissions will distinctively decreased.<br>Nevertheless SPC currently and without any DeNO <sub>x</sub> unit, is in compliance with the NO <sub>x</sub> regulation in Iran.<br>This criterion is still applicable. |
|   | In case a DeNO <sub>x</sub> unit is already installed prior to the start of the project activity, the installed De-NO <sub>x</sub> is a Selective Catalytic Reduction (SCR) De-NO <sub>x</sub> unit;   | Until now, no any DeNO <sub>x</sub> unit has been installed in nitric acid plant of SPC.<br>This criterion is still applicable.  |
|   | The N <sub>2</sub> O concentration in the flow at the inlet and the outlet of the catalytic N <sub>2</sub> O destruction facility is measurable. Furthermore, for a caprolactam plant using the HPO® process, the N <sub>2</sub> O concentration in the gas flow between the ammonia oxidation reactor and the absorption column is also measurable, and the N <sub>2</sub> O in the product flow from the absorption column to the HPO® process area is quantifiable. | The project activity will be equipped to the real time measurement systems at the upstream and downstream of the DeN <sub>2</sub> O unit. Thus the N <sub>2</sub> O concentration in the flow at the inlet and outlet of the system will be measured.<br>The project activity is not aimed at the caprolactam production plant.<br>This criterion is still applicable.   |
| <p>Hence it is confirmed that the project design changes (do not adversely affect the methodology and the applicable tools applicability criteria.</p> <p>d) The compliance of the monitoring plan with the applied monitoring methodology:</p> <p>The verification team confirms that due to the project design change, there is no change in the monitoring plan of the registered PDD and the monitoring</p> |  |  |

|  |  |
|--|--|
|  | <p>methodology.</p> <p>The verification team further confirms that due to the stated project design changes, there will not be any adverse impact on the project boundary and any associated leakages; the level of accuracy of the monitoring compared with the requirements contained in the registered monitoring plan and thus complying paragraph 309 of VVS for project activities, version 02.0 /B01-1/.</p> <p>The verification team confirms that the proposed project design changes comply with the requirements of the Project Standard for project activities, version 02.0 /B01-2/ thereby complying paragraph 308 of VVS for project activities, version 2.0 /B01-1/.</p> |
|--|--|

#### D.8. Changes specific to afforestation and reforestation project activities

|                            |                            |
|----------------------------|----------------------------|
| <b>Means of validation</b> | Document Review, Interview |
| <b>Findings</b>            | NA                         |
| <b>Conclusion</b>          | NA                         |

#### SECTION E. Internal quality control

>>

The final validation report passed a technical review before being submitted to the UNFCCC Executive Board. A technical reviewer qualified in accordance with the CCIPL's qualification scheme for CDM validation and verification performed the technical review.

#### SECTION F. Validation opinion

>>

Carbon Check (India) Private Ltd. (CC IPL) has performed the validation of the post-registration changes for the registered CDM Project Activity "Catalytic abatement of N<sub>2</sub>O in Nitric Acid Plant of Shiraz Petrochemical Company" having UNFCCC reference number 8249. During the validation of the post-registration changes to the project activity, project design changes have been identified. The post registration changes (PRC) to registered project activity has been validated in line with the requirements of CDM PCP for project activities (version 02.0) /B01-3/, CDM PS for project activities (version 02.0) /B01-2/ and CDM VVS for project activities (version 02.0) /B01-1/. In line with §308 of CDM VVS for project activities (version 02.0), CCIPL confirms that the post registration changes information in the revised PDD (version 09, Dated 07/03/2019) /1/ reflects post-registration changes related to the registered PDD /B04/.

The validation was performed on the basis of rules and requirements defined by UNFCCC for the CDM project activities. The review of the revised PDD /1/, supporting documentation and subsequent follow-up actions (including interviews), have provided CCIPL with sufficient evidence to determine the fulfilment of stated criteria.


The description in the revised PDD /1/ meets all relevant UNFCCC requirements for the CDM and correctly applies the selected baseline and monitoring methodology.

This report is the assessment opinion for the changes that are proposed in the revised PDD /1/ and request is submitted for acceptance of the Board as a part of prior approval request.

## Appendix 1. Abbreviations

| Abbreviations     | Full texts  |
|-------------------|---|
| CAR               | Corrective Action Request                             |
| CC IPL            | Carbon Check (India) Private Ltd.                     |
| CDM               | Clean Development Mechanism                           |
| CER               | Certified Emission Reduction                          |
| CL                | Clarification Request                                 |
| CO <sub>2</sub>   | Carbon Dioxide  |
| CO <sub>2</sub> e | Carbon Dioxide Equivalent                             |
| DR                | Document review                                       |
| DOE               | Designated Operational Entity                         |
| EB                | CDM Executive Board                                   |
| EF                | Emission Factor                                       |
| EI                | External individual                                   |
| FAR               | Forward Action Request                                |
| FVR               | Final verification Report                             |
| GHG               | Greenhouse gas(es)                                    |
| I                 | Interview   |
| IPCC              | Intergovernmental Panel on Climate Change             |
| IR                | Internal resource                                     |
| MRE               | Mehr Renewable Energies                               |
| PDD               | Project Design Document                               |
| PP                | Project Participant                                   |
| OSV               | On Site Visit   |
| QC/QA             | Quality control/Quality assurance                     |
| RMP               | Revised Monitoring Plan                               |
| SPC               | Shiraz Petrochemical Company                          |
| TA                | Technical Area  |
| TR                | Technical Review                                      |
| UNFCCC            | United Nations Framework Convention on Climate Change |
| VVS               | Validation and Verification Standard                  |

## Appendix 2. Competence of team members and technical reviewers



**Carbon Check (India) Private Ltd.**

**Sanjay Agarwalla**

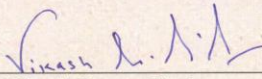
has been qualified as per CCIPL's internal qualification procedures, in accordance with requirements of Accreditation Standard (version 06.0):

*For following functions:*

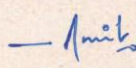
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|-----------|-------------------------------------|------------------|-------------------------------------|---------------------------|-------------------------------------|
| Validator | <input checked="" type="checkbox"/> | Team Leader      | <input checked="" type="checkbox"/> | Technical reviewer        | <input checked="" type="checkbox"/> |
| Verifier  | <input checked="" type="checkbox"/> | Technical Expert | <input checked="" type="checkbox"/> | Local Expert <sup>1</sup> | <input checked="" type="checkbox"/> |

*In the following Technical Areas:*

|        |                                     |        |                                     |        |                                     |         |                                     |         |                          |
|--------|-------------------------------------|--------|-------------------------------------|--------|-------------------------------------|---------|-------------------------------------|---------|--------------------------|
| TA 1.1 | <input checked="" type="checkbox"/> | TA 3.1 | <input checked="" type="checkbox"/> | TA 5.2 | <input checked="" type="checkbox"/> | TA 9.2  | <input checked="" type="checkbox"/> | TA 13.2 | <input type="checkbox"/> |
| TA 1.2 | <input checked="" type="checkbox"/> | TA 4.1 | <input checked="" type="checkbox"/> | TA 8.1 | <input type="checkbox"/>            | TA 10.1 | <input type="checkbox"/>            | TA 14.1 | <input type="checkbox"/> |
| TA 2.1 | <input checked="" type="checkbox"/> | TA 5.1 | <input checked="" type="checkbox"/> | TA 9.1 | <input checked="" type="checkbox"/> | TA 13.1 | <input checked="" type="checkbox"/> |         |                          |



Mr. Vikash Kumar Singh  
Compliance Officer



Mr. Amit Anand  
CEO

**Date of Approval**  
24/12/2017

**Valid Till**  
23/12/2018

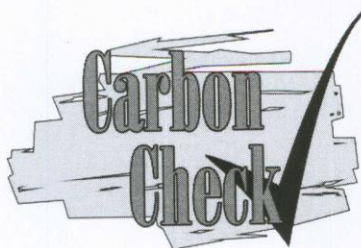
**Revision History of the Document**

|            |  |
|------------|--|
| 26/12/2014 | Initial Adoption                           |
| 24/12/2015 | Annual Revision                            |
| 20/01/2016 | Interim Revision for office address change |
| 23/12/2017 | Annual Revision                            |
| 24/12/2017 | Annual Revision                            |

<sup>1</sup>India

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 Verifier ☒ Technical Expert ☒ Local Expert<sup>1</sup> ☒

In the following Technical Areas:

TA 1.1 ☒ TA 3.1 ☒ TA 5.2 ☐ TA 9.2 ☐ TA 13.2 ☒  
 TA 1.2 ☒ TA 4.1 ☒ TA 8.1 ☐ TA 10.1 ☐ TA 14.1 ☐  
 TA 2.1 ☐ TA 5.1 ☐ TA 9.1 ☐ TA 13.1 ☒

Mr. Amit Anand  
CEO

Date of Approval  
24/12/2018

Valid Till  
23/12/2019

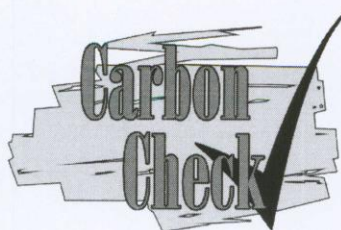
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| 24/12/2017 | Annual Revision                            |
| 24/12/2018 | Annual Revision                            |

<sup>1</sup> India, South Africa

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 Verifier ☐ Technical Expert ☒ Local Assessor<sup>1</sup> ☒

In the following Technical Areas:

TA 1.1 ☒ TA 3.1 ☒ TA 5.2 ☒ TA 9.2 ☒ TA 13.2 ☐  
 TA 1.2 ☒ TA 4.1 ☒ TA 8.1 ☐ TA 10.1 ☒ TA 14.1 ☐  
 TA 2.1 ☐ TA 5.1 ☒ TA 9.1 ☒ TA 13.1 ☒

Mr. Vikash Kumar Singh  
Compliance Officer

Mr. Amit Anand  
CEO

Date of Approval  
24/12/2018

Valid Till  
23/12/2019

#### Revision History of the Document

|            |  |
|------------|--|
| 26/12/2014 | Initial Adoption                           |
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| 23/12/2016 | Annual Revision                            |
| 24/12/2017 | Annual Revision                            |
| 24/12/2018 | Annual Revision                            |

<sup>1</sup> India

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 e-mail: [info@carboncheck.co.in](mailto:info@carboncheck.co.in)

### Appendix 3. Documents reviewed or referenced

| No. | Author                             | Title   | References to the document                                  | Provider |
|-----|------------------------------------|---|---|----------|
| 1   | MRE                                | Revised PDD (in track change and clean mode)  | Version 09, dated 07/03/2019                                | PP       |
| 2   | SPC                                | Evidence No.1_Daily Data-AOR Tem., Pres., Ammonia Flow and Acid_2010-2018   | -   | PP       |
| 3   | SPC                                | Evidence No. 2_SPC DCS Installation NOM   | -   | PP       |
| 4   | Heurtey Industries                 | Evidence No. 3_AOR Temperature Range by Manufacture_3100-NN-03 SH 3   | -   | PP       |
| 5   | SPC                                | Evidence No. 4_SPC ISO document, Form No. QF-NIA-001.6, log-sheet for daily operating data recording (810-885° C)   | -   | PP       |
| 6   | SPC                                | Evidence No. 5_Daily AOR T&P_ PDD Data_21.03.2010-20.03.2011  | -   | PP       |
| 7   | SPC                                | Evidence No. 6_Daily AOR_Monitored Data_20.01.2017-22.09.2018   | -   |          |
| 8   | SPC                                | Evidence No. 7_Daily CDM Plant Logsheet_21.03.2017-22.09.2018   | -   | PP       |
| 9   | Hindustan Platinum Private Limited | Evidence No. 8_AOR Catalyst_Knitted Specification_by supplier   | -   | PP       |
| 10  | SPC                                | Evidence No. 9_SPC NA R&M Report_Knitted Catalyst Replaced_28.04.2018   | -   | PP       |
| 11  | SPC                                | Evidence No. 10_Daily Normalized Data-AOR Catalyst replacement Impact_20.01.2017-22.09.2018   | -   | PP       |
| 12  | MRE                                | Revised Emission reduction calculation spread sheet   | Dated 07/03/2019  | PP       |
| B01 | UNFCCC                             | 1. Validation and Verification Standard for project activities, version 02.0<br>2. Project Standard for project activities, version 02.0<br>3. Project Cycle Procedure for project activities, version 02.0 | <a href="http://cdm.unfccc.int/">http://cdm.unfccc.int/</a> | Others   |
| B02 | UNFCCC                             | Applied baseline and monitoring methodology, AM0028 / version 05.1.0<br>"Catalytic N2O destruction in the tail gas of nitric acid or caprolactam production plants"   | <a href="http://cdm.unfccc.int/">http://cdm.unfccc.int/</a> | Others   |

**CDM-PRCV-FORM**

|     |           |   |   |        |
|-----|-----------|---|---|--------|
| B03 | UNFCCC    | 1. CDM PRCV FORM and Instructions for filling out the PRC Validation form, version 02.0<br>2. CDM PDD FORM and Instruction for filling the form, version 10.1 | <a href="http://cdm.unfccc.int/">http://cdm.unfccc.int/</a> | Others |
| B04 | UNFCCC    | Registered PDD (version 08 dated 16/09/2012) and corresponding validation reports.  | <a href="http://cdm.unfccc.int/">http://cdm.unfccc.int/</a> | Others |
| B05 | Web sites | Websites:<br>1. <a href="http://cdm.unfccc.int/">http://cdm.unfccc.int/</a>   | -   | Others |

## Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 1. CLs from this validation

| CL ID   | 01 | Section no. | D.7 | Date: | 03/03/2019              |
|---|----|-------------|-----|-------|-------------------------|
| <b>Description of CL</b>  |    |             |     |       |                         |
| In the registered PDD, the value for the ex-ante parameter “Historical operating temperature range of the ammonia oxidation reactor” ( $T_{g,hist}$ ) was taken as 840 – 860°C. This value was based on the historical plant date from 21 Mar 2010 – 20 Mar 2011. In the proposed PRC, this value is being changed. PP needs to justify the reason for this change and also clarify how does this meets the requirements of the applied methodology, AM0028, version 05.1.0 along with proper evidence.   |    |             |     |       |                         |
| <b>PP's response</b>  |    |             |     |       | <b>Date:</b> 14/03/2019 |
| <p>In parallel to De-N<sub>2</sub>O plant installation, the DCS system also installed in SPC Nitric Acid plant (20 December 2016- <u>See evidence No.2</u>), which records accurate data and removed human error in data recording. The overview of temperature trend after installing DCS system shows an increase of 1.7% in average temperature in comparison to historical data before installing DCS, although all operating conditions remaining as same. (See evidence No. 1, sheet before DCS). It is observed that before installing DCS system, The quantile of the sample distribution ( 2.5%-97.5%) for temperature time series data was in range of 840-862 °C for the period of 21/03/2010-20/11/2016 (See evidence No. 1) . While it raised to range of 862-874 °C<sup>1</sup> after installing DCS system. On the other hand, in plant operation manual, which provided by technology supplier, the normal operating temperature for AOR reactor is 880 °C (See <u>evidence No. 3</u>). Hence project participants have the opinion that the AOR temperature was having an error about 1.7% in comparison to pre-DCS period, giving lower readings.</p> <p>Therefore project participants is proposing a Post Registration Changes (PRC) in the ex-ante value of historical AOR temperature by selecting second option i.e. technical data, which provided by the methodology AM0028, version 05.1.0. According to Nitric Acid Operation Manual, it is recommended that the plant operates between 750-910 °C (See <u>evidence No. 3</u>), while the plant owner (SPC), sets the normal permitted operation range of temperature between 810-885 °C (See <u>evidence No. 4</u>) for AOR reactor, for saving the catalyst lifetime. Therefore, project participants based on technical data, request to change the ex-ante value of permitted operating temperature range from 840-860 °C to 810-885 °C.</p> |    |             |     |       |                         |
| <b>Documentation provided by CME</b>  |    |             |     |       |                         |
| Evidence No.1_Daily Data-AOR Tem.,Pres., Ammonia Flow and Acid_2010-2018.<br>Evidence No. 2_SPC DCS Installation NOM<br>Evidence No. 3_AOR Temperature Range by Manufacture_3100-NN-03 SH 3<br>Evidence No. 4_SPC ISO document, Form No. QF-NIA-001.6, log-sheet for daily operating data recording<br>Evidence No. 5_Daily AOR T&P_ PDD Data_21.03.2010-20.03.2011<br>Evidence No. 6_Daily AOR_Monitored Data_20.01.2017-22.09.2018<br>Evidence No. 7_Daily CDM Plant Logsheet_21.03.2017-22.09.2018   |    |             |     |       |                         |
| <b>DOE assessment</b>   |    |             |     |       | <b>Date:</b> 30/03/2019 |
| In the registered PDD, the validated historical AOR temperature (for the period 21/03/2010 to 20/03/2011) was 840 – 860°C. PP has provided the AOR temperature records for the period 21/03/2010 to 20/11/2016 (i.e. for the pre DCS period) which shows the range from 840 – 862°C, which is almost in the same range as in the registered PDD. However, PP has provided the data for the post DCS installation, which was verified during the on-site visit by reviewing the plant records, showing the AOR temperature range from 862-874 °C for the period 20/01/2017 to 22/09/2018. It is observed that there is an average increase of about 1.7% in the AOR temperature post installation of DCS, although the operating conditions remaining same. As clarified by the PP, the DCS records are deemed to be accurate and with the possibility of the pre DCS records having some error. In light of the above, PP has proposed PRC in the approach of determining the ex-ante fixed parameter “Historical operating temperature range of the ammonia oxidation reactor ( $T_{g,hist}$ )”. In the revised PDD, PP has proposed this ex-ante parameter ( $T_{g,hist}$ ) value based on option (b) of the methodology AM0028, version 05.1 which says " <i>Secondly, by range of temperature and pressure stipulated in the operating manual for the existing equipment</i> ". Accordingly PP has proposed the parameter value based on the prescribed operating AOR temperature range by the technology supplier and further adopted by the PP in its log sheets as 810 – 885°C which is deemed acceptable to the   |    |             |     |       |                         |

<sup>1</sup> Reference: Daily AOR\_Monitored Data\_20.01.2017-22.09.2018

|   |
|---|
| validation team.<br>Hence the CL is closed. |
|---|

|  |    |                    |     |                         |
|--|----|--------------------|-----|-------------------------|
| <b>CL ID</b>   | 02 | <b>Section no.</b> | D.7 | <b>Date:</b> 03/03/2019 |
| <b>Description of CL</b>   |    |                    |     |                         |
| The arithmetic difference of baseline emissions and projects emissions does not provide the emission reductions as stated in the PDD.  |    |                    |     |                         |
| <b>PP's response</b>   |    |                    |     | <b>Date:</b> 14/03/2019 |
| It has been corrected in ex-ante emission reduction sheet and also relevant part of PDD. For Conservative approaches, the baseline emission has been round-down, while project emission has been rounded-up. |    |                    |     |                         |
| <b>Documentation provided by CME</b>   |    |                    |     |                         |
| Ex-ante Emission Reduction spreadsheet and revised PDD.  |    |                    |     |                         |
| <b>DOE assessment</b>  |    |                    |     | <b>Date:</b> 30/03/2019 |
| PP has provided revised ER spread sheet with correct ER values. CL is closed.  |    |                    |     |                         |

|   |    |                    |     |                         |
|---|----|--------------------|-----|-------------------------|
| <b>CL ID</b>  | 03 | <b>Section no.</b> | D.7 | <b>Date:</b> 03/03/2019 |
| <b>Description of CL</b>  |    |                    |     |                         |
| PP has proposed a change in value of the monitoring parameter "N <sub>2</sub> O concentration at the inlet of the N <sub>2</sub> O destruction facility" (C <sub>N<sub>2</sub>O,i</sub> ) and "N <sub>2</sub> O concentration at destruction facility outlet" (C <sub>N<sub>2</sub>O,o</sub> ) used for ex-ante estimation of emission reductions. PP is requested to provide justification for this change along with proper evidence.   |    |                    |     |                         |
| <b>PP's response</b>  |    |                    |     | <b>Date:</b> 14/03/2019 |
| <p>In SPC Nitric Acid Plant, before implementation of De-N<sub>2</sub>O plant, there was not any N<sub>2</sub>O concentration measurement instrument and also measured data on N<sub>2</sub>O concentration in tail gas, So the project participants, for ex-ante emission reduction estimation, have been used IPCC 2006 Default Value for determining N<sub>2</sub>O Concentration (emission factor of 7 kg N<sub>2</sub>O/ ton of Nitric Acid, which is equal to 1,120 ppm N<sub>2</sub>O). After installing N<sub>2</sub>O measurement instruments, the measured N<sub>2</sub>O concentration in tail gas shows higher value in comparison to IPCC default value. So for reducing the inconsistency between actual and ex-ante emission reduction, the project participants decided to revised default N<sub>2</sub>O emission factor for ex-ante emission reduction and use actual data instead of default IPCC value.</p> <p>Therefore, we used the average daily measured N<sub>2</sub>O concentration in monitoring period (20/01/2017-22/09/2018) for ex-ante emission reduction calculation. The result shows that for this period the average of daily average N<sub>2</sub>O concentration in tail gas of AOR is 2,014.7 ppm (Please see the daily AOR monitored data in evidence No. 6). So the default IPCC N<sub>2</sub>O concentration in PDD for ex-ante emission reduction calculation (1.120 ppm), has been replaced by measured value.</p> <p>The average measured value for N<sub>2</sub>O concentration ( 2014.7 ppm~14 Kg N<sub>2</sub>O/ ton Nitric Acid) is rationale, because the report on survey of CDM and JI N<sub>2</sub>O projects which published by Öko-Institut e.V., shows that the N<sub>2</sub>O emission factor for registered CDM project until 2012 is between 3.5-37 Kg N<sub>2</sub>O/ton Acid, which SPC value is in range. (Reference: "Options for continuing GHG abatement from CDM and JI industrial gas projects", Öko-Institut e.V. Institute for Applied Ecology, May 2014<br/> <a href="https://www.oeko.de/oekodoc/2030/2014-614-en.pdf">https://www.oeko.de/oekodoc/2030/2014-614-en.pdf</a><br/> Please See page 14, Table 2.)</p> |    |                    |     |                         |
| <b>Documentation provided by CME</b>  |    |                    |     |                         |
| Evidence No. 6_ Daily AOR_Monitored Data_20.01.2017-22.09.2018 cell no. J612), and Öko-Institut e.V report on "Options for continuing GHG abatement from CDM and JI industrial gas projects", which is available at <a href="https://www.oeko.de/oekodoc/2030/2014-614-en.pdf">https://www.oeko.de/oekodoc/2030/2014-614-en.pdf</a>   |    |                    |     |                         |
| <b>DOE assessment</b>   |    |                    |     | <b>Date:</b> 30/03/2019 |
| <p>In the registered PDD, for the ex-ante estimation of emission reductions, PP had used the IPCC 2006 default value for N<sub>2</sub>O concentration as 1,120 ppmv in the tail gas (inlet to the DeN<sub>2</sub>O-DeNO<sub>x</sub> unit). This value was used in absence of any actual monitored data available at the time of PDD registration. However, post installation of the DeN<sub>2</sub>O-DeNO<sub>x</sub> unit and monitoring of N<sub>2</sub>O concentration in the tail gas, it is observed that its average value is 2,014.7 ppmv for the period 20/01/2017 to 22/09/2018. The monitored value was verified during the on-site visit document review by the validation team. Hence PP has proposed a PRC in this respect for values of inlet and outlet concentration of the N<sub>2</sub>O in the DeN<sub>2</sub>O-DeNO<sub>x</sub> unit as 2,014.7 ppmv and 201.47 ppmv (assuming 90% destruction of N<sub>2</sub>O) respectively for the ex-ante estimation of emission reductions. The validation team has reviewed the revised emission reduction calculation and deemed the revision as acceptable which is based on actual monitored value. Due to this proposed PRC, the annual average ex-ante emission reductions have increased from 418,730 to 761,263 tCO<sub>2</sub>e. The CL is closed.</p>   |    |                    |     |                         |

|  |    |                    |     |                         |
|--|----|--------------------|-----|-------------------------|
| <b>CL ID</b>   | 04 | <b>Section no.</b> | D.7 | <b>Date:</b> 03/03/2019 |
| <b>Description of CL</b>   |    |                    |     |                         |
| During the on-site visit it was confirmed that the catalyst composition for the AOR unit is Pt 90%, Rh 10% which is same as stated in the registered PDD. But in the PDD the type of this catalyst is stated as “woven” whereas it has been changed to “knitted” after the registration of the PDD. Clarification is requested on this change.   |    |                    |     |                         |
| <b>PP's response</b>   |    |                    |     | <b>Date:</b> 14/03/2019 |
| The plant operator for improvement the Ammonia conversion efficiency and reducing catalyst loss, changed the type of catalyst from Woven to Knitted type with same composition (90% Pt., 10 Rh., 0% Pd.), based on catalyst supplier recommendation (Please see evidence from catalyst supplier-Evidence No.8).<br>The new type of Gauze has been installed on 28/04/2018, 15 <sup>th</sup> months after starting data monitoring in the CDM plant. The overview of operation parameters in the plant reveals that the changes in Gauze type, not only have any negative impact in plant operation, but also reduced the N <sub>2</sub> O concentration in AOR tail gas. (See evidence No.10: Daily normalized data).<br>Also based on AM0028 version 05.1.0, section “ <i>Procedures used to determine the permitted operating conditions of the nitric acid or caprolactam production plant in order to avoid overestimation of emission reductions</i> ”, The plant operator is allowed “ <i>to use compositions of ammonia oxidation catalysts that are common practice in the region or have been used in the nitric acid or caprolactam production plant during the last three years without limitation of N<sub>2</sub>O baseline emissions</i> ”, while the changes in plant catalyst is not catalyst composition changes and catalyst is same as registered PDD. So it does not have any impact on methodology application or additionality of the project. |    |                    |     |                         |
| <b>Documentation provided by CME</b>   |    |                    |     |                         |
| Evidence No. 8_AOR Catalyst_Knitted Specification_by supplier<br>Evidence No. 9_SPC NA R&M Report_Knitted Catalyst Replaced_28.04.2018<br>Evidence No. 10_Daily Normalized Data-AOR Catalyst replacement Impact_20.01.2017-22.09.2018  |    |                    |     |                         |
| <b>DOE assessment</b>  |    |                    |     | <b>Date:</b> 30/03/2019 |
| During the on-site visit interviews it was confirmed that the composition of the catalyst being used in the AOR is 90% Pt and 10% Rh which is same as stated in the registered PDD. But it was noted that as per the recommendation of the catalyst supplier, the catalyst type had been changed from “woven” to “knitted” in April 2018. The validation team based on its sectoral expertise confirms that this change in type of catalyst (without altering the composition of the catalyst, i.e. 90% Pt and 10% Rh), does not have any negative impact on the plant operation and rather may lead to better efficiency of HNO <sub>3</sub> production, i.e. decrease the N <sub>2</sub> O concentration in the tail gas. Hence this is deemed acceptable to the validation team. Further it was noted that in the registered PDD, section B.6.2 in the table for the parameter “G <sub>com,hist</sub> ”, PP had stated the catalyst composition as 90% Pt and 10% Pd and this typographical error has been corrected to 90% Pt and 10% Rh which is consistent with other sections of the PDD and also the evidence from the technology supplier. The CL is closed.  |    |                    |     |                         |

Table 2. CARs from this validation

|   |    |                    |     |                         |
|---|----|--------------------|-----|-------------------------|
| <b>CAR ID</b>   | 01 | <b>Section no.</b> | D.1 | <b>Date:</b> 03/03/2019 |
| <b>Description of CAR</b>   |    |                    |     |                         |
| PP needs to ensure that all the changes with respect to the registered PDD are reflected in track change mode in the revised PDD.               |    |                    |     |                         |
| <b>PP's response</b>  |    |                    |     | <b>Date:</b> 14/03/2019 |
| We insert all changes with respect to registered PDD in track change mode. Please see the pages 1, 7, 8, 30, 32 and other pages in revised PDD. |    |                    |     |                         |
| <b>Documentation provided by CME</b>  |    |                    |     |                         |
| Revised PDD   |    |                    |     |                         |
| <b>DOE assessment</b>   |    |                    |     | <b>Date:</b> 30/03/2019 |
| PP has submitted revised PDD in track changes with respect to the registered PDD. The CAR is closed.  |    |                    |     |                         |

|  |    |                    |     |                         |
|--|----|--------------------|-----|-------------------------|
| <b>CAR ID</b>  | 02 | <b>Section no.</b> | D.1 | <b>Date:</b> 03/03/2019 |
| <b>Description of CAR</b>  |    |                    |     |                         |
| Section A.6 of the revised PDD has not been filled as per the PDD completing guidelines.                           |    |                    |     |                         |
| <b>PP's</b>  |    |                    |     | <b>Date:</b> 14/03/2019 |
| The section A.6 has revised according to PDD completing guidelines. Please see section A.6, page 8 of revised PDD. |    |                    |     |                         |

|   |                         |
|---|-------------------------|
| <b>Documentation provided by CME</b>  |                         |
| Section A.6, Page 8 of revised PDD.   |                         |
| <b>DOE assessment</b>   | <b>Date:</b> 30/03/2019 |
| PP has submitted revised PDD with correction in section A.6. The CAR is closed. |                         |

|   |    |                    |     |                         |
|---|----|--------------------|-----|-------------------------|
| <b>CAR ID</b>   | 03 | <b>Section no.</b> | D.1 | <b>Date:</b> 03/03/2019 |
| <b>Description of CAR</b>   |    |                    |     |                         |
| PP needs to ensure that the information transferred to the later valid version of the form is materially the same as that in the registered PDD (e.g. the content of section B.7.2 of the older PDD has not been covered in the revised PDD, etc.). Please refer paragraph 279 of CDM VVS for project activities, version 02. |    |                    |     |                         |
| <b>PP's</b>   |    |                    |     | <b>Date:</b> 14/03/2019 |
| The section B.7.2 of registered PDD has been inserted in section B.7.3 of revised PDD. Please See section B.7.3, page 46 of revised PDD.  |    |                    |     |                         |
| <b>Documentation provided by CME</b>  |    |                    |     |                         |
| Section B.7.3, Page 46 of revised PDD.  |    |                    |     |                         |
| <b>DOE assessment</b>   |    |                    |     | <b>Date:</b> 30/03/2019 |
| It is confirmed that the information transferred to the revised PDD submitted for PRC is materially the same as in the registered PDD. The CAR is closed.   |    |                    |     |                         |

|   |    |                    |     |                         |
|---|----|--------------------|-----|-------------------------|
| <b>CAR ID</b>   | 04 | <b>Section no.</b> | D.1 | <b>Date:</b> 03/03/2019 |
| <b>Description of CAR</b>   |    |                    |     |                         |
| PP needs to clearly specify the category in which each of the proposed post registration changes fall (please refer section 8.2 of the CDM PS for project activities, version 02). Also referring the paragraph 242 of the CDM PS, for project design change, PP shall report in the revised PDD the impacts of the proposed or actual changes to the registered CDM project activity on the following:<br>(a) The applicability and application of the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents with which the project activity has been registered;<br>(b) The compliance of the monitoring plan with the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents;<br>(c) The level of accuracy and completeness in the monitoring of the project activity compared with the requirements contained in the registered monitoring plan;<br>(d) The additionality of the project activity;<br>(e) The scale of the project activity. |    |                    |     |                         |
| <b>PP's</b>   |    |                    |     | <b>Date:</b> 14/03/2019 |
| The type and reason for changes and also the PRC falls in which category are describe in Appendix 7 of revised PDD.   |    |                    |     |                         |
| <b>Documentation provided by CME</b>  |    |                    |     |                         |
| Appendix 7, Page 61 of revised PDD.   |    |                    |     |                         |
| <b>DOE assessment</b>   |    |                    |     | <b>Date:</b> 30/03/2019 |
| In the revised PDD, PP has stated the category of the proposed changes as per CDM PS for project activities, version 02. Also the impacts of the proposed changes have been clarified in the PDD. The CAR is closed.  |    |                    |     |                         |

Table 3. FARs from this validation

|  |    |                    |  |                         |
|--|----|--------------------|--|-------------------------|
| <b>FAR ID</b>  | xx | <b>Section no.</b> |  | <b>Date:</b> DD/MM/YYYY |
| <b>Description of FAR</b>                            |    |                    |  |                         |
| -  |    |                    |  |                         |
| <b>Project participant response</b>                  |    |                    |  | <b>Date:</b> DD/MM/YYYY |
| -  |    |                    |  |                         |
| <b>Documentation provided by project participant</b> |    |                    |  |                         |
| -  |    |                    |  |                         |
| <b>DOE assessment</b>                                |    |                    |  | <b>Date:</b> DD/MM/YYYY |
| -  |    |                    |  |                         |

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Document information

| Version   | Date            | Description  |
|---|-----------------|--|
| 02.0  | 31 October 2017 | Revision to align with the requirements in the “CDM validation and verification standard for project activities” (version 01.0). |
| 01.0  | 23 March 2015   | Initial publication.   |
| Decision Class: Regulatory  |                 |  |
| Document Type: Form   |                 |  |
| Business Function: Registration   |                 |  |
| Keywords: post-registration change, project activities, validation report |                 |  |