



**Monitoring report form  
(Version 04.0)**

*Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form" at the end of this form.*

**MONITORING REPORT**

|  |   |
|--|---|
| <b>Title of the project activity</b>   | Catalytic N <sub>2</sub> O destruction project in the tail gas of the Nitric Acid Plant of Abu Qir Fertilizer Co.                             |
| <b>Reference number of the project activity</b>  | 0490  |
| <b>Version number of the monitoring report</b>   | Version 1.1   |
| <b>Completion date of the monitoring report</b>  | 06/08/2014  |
| <b>Registration date of the project activity</b>   | 07/10/2006  |
| <b>Monitoring period number and duration of this monitoring period</b>   | Monitoring period number: 28<br>(monitoring period 1 of 2 <sup>nd</sup> crediting period)<br>Duration: 15/09/2013 – 30/06/2014                |
| <b>Project participant(s)</b>  | CARBON Egypt Ltd.;<br>KOMMUNALKREDIT PUBLIC CONSULTING GmbH;<br>Energie AG Oberösterreich;<br>RWE Power AG;<br>CARBON Climate Protection GmbH |
| <b>Host Party(ies)</b>   | Arab Republic of Egypt  |
| <b>Sectoral scope and selected methodology(ies), and where applicable, applied standardized baseline(s)</b>  | Sectoral scope 5: Chemical industries<br>Applied methodology: ACM0019 Version 02.0 ("N <sub>2</sub> O abatement from nitric acid production") |
| <b>Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD</b>           | 1,012,587 tCO <sub>2</sub> e (289 days)   |
| <b>Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period</b>                                      | 1,132,822 tCO <sub>2</sub> e (289 days)   |
| <b>Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period up to 31 December 2012 (if applicable)</b>       | NA  |
| <b>Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period from 1 January 2013 onwards (if applicable).</b> | 2,065,101 (546 days)  |

## SECTION A. Description of project activity

### A.1. Purpose and general description of project activity

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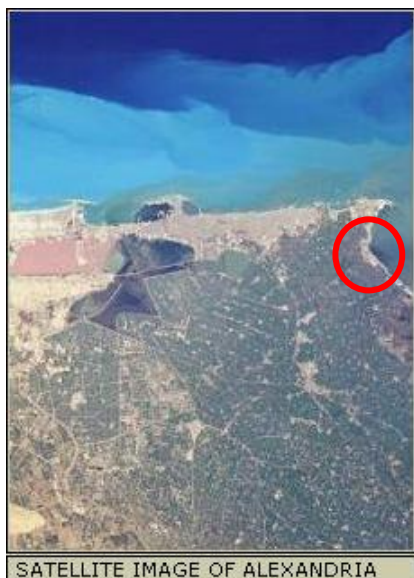
- (a) Carbon Egypt has implemented a project for GHG emission reduction by catalytic N<sub>2</sub>O destruction in Abu Qir, Egypt. The project is categorized as large scale project under sectoral scope 5: "Chemical Industry". The Host Party for the project activity is the Republic of Egypt. The Project Activity includes development, design, engineering, procurement, finance, construction, operation and maintenance of a system for catalytic reduction of N<sub>2</sub>O. The EnviNOx® process used in the Abu Qir II nitric acid plant is based on the catalytic reduction of NO<sub>x</sub> (NO and NO<sub>2</sub>) with ammonia (NH<sub>3</sub>) and of nitrous oxide (N<sub>2</sub>O) with a hydrocarbon. The hydrocarbon used is natural gas of which the main constituent is methane (CH<sub>4</sub>). The reactions take place over two iron zeolite catalyst beds.
- (b) In this project, CARBON Egypt installed the EnviNOx® system for catalytic reduction of NO<sub>x</sub> and N<sub>2</sub>O additionally to the equipment at the nitric acid manufacturing plant. The project activity reduces the GHG emissions, which would otherwise be released to the atmosphere, if the project was not implemented. The implementation of the N<sub>2</sub>O destruction project at Abu Qir Fertilizer Co. S.A.E. (furthermore called "AFC") involves that natural gas, a mixture of hydrocarbons of which the main constituent is methane (CH<sub>4</sub>), is employed as a reducing agent for N<sub>2</sub>O removal.
- (c) The EnviNOx® system was installed in September 2006 and the catalytic reduction process of N<sub>2</sub>O started its operation in October 2006. The N<sub>2</sub>O destruction unit is in continuous operation since its start-up and has only stopped for short periods due to planned and corrective maintenance works.
- (d) Throughout the 1<sup>st</sup> crediting period of the CDM Project Activity had been monitored continuously according to the approved CDM methodology AM0028 version 01. A Request for Renewal of Crediting Period and a new PDD under methodology ACM0019 version 02.0 were submitted by the Project Participants and the crediting period was renewed on January 31<sup>st</sup>, 2014.
- (e) Total emission reductions achieved in this monitoring period: **1,132,822 tCO<sub>2</sub>e**

### A.2. Location of project activity

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- (a) Host Party(ies): Arab Republic of Egypt
- (b) Province: Al-Iskandariyah Province (Alexandria Province)
- (c) Town: Abu Qir
- (d) GPS coordinates: N31.272513° E30.09755°

**Figure 1:** Satellite Image of Alexandria



AFC, the largest fertilizer company in Egypt, is located about 15 km east of downtown Alexandria, in a rural area, approximately 5 km outside the small town of Abu Qir. Abu Qir is situated north-east of Alexandria, bordering the suburbs of Alexandria. AFC is located on the shores of the Mediterranean Sea. The company has road and rail access as well as a nearby ship loading terminal.

### A.3. Parties and project participant(s)

| Party involved<br>((host) indicates<br>a host Party) | Private and/or public<br>entity(ies) project<br>participants<br>(as applicable)                              | Indicate if the Party involved<br>wishes to be considered as<br>project participant<br>(Yes/No) |
|--|--|---|
| Arab Republic of Egypt (Host)                        | CARBON Egypt Ltd.  | No  |
| Republic of Austria                                  | KOMMUNALKREDIT PUBLIC<br>CONSULTING GmbH;<br>Energie AG Oberösterreich;<br>CARBON Climate Protection<br>GmbH | No  |
| Federal Republic Germany                             | RWE Power AG   | No  |

**Project applicant, developer and sponsor** is **CARBON Egypt Ltd.** (furthermore called "CARBON"). CARBON Egypt Ltd. Is registered under the laws of the Arab Republic of Egypt. The company is a subsidiary of CARBON Projektentwicklung GmbH, Austria, and RWE Power AG, Germany.

CARBON Projektentwicklung GmbH was founded as a limited liability company located and registered in Austria under Austrian law in order to develop, finance and operate high quality JI/CDM Projects. CARBON Projektentwicklung GmbH has vast experience with CDM-Project development in Africa, Latin America and Asia and is specialized on the catalytic N<sub>2</sub>O destruction in the tail gas of nitric acid plants.

**Kommunalkredit Public Consulting GmbH** (KPC) was appointed for the Programme Management on behalf of the Austrian Ministry of Agriculture and Forestry, Environment & Water Management. The Programme is operational since August 2003.

**Energie AG Oberösterreich** (Energie AG) is the leading infrastructure group in the region of Upper Austria. Energie AG with its subsidiary companies works in the fields of energy, water and disposal, both in Austria and abroad.

**Carbon Climate Protection GmbH** (CARBON) is a limited liability company located and registered in Austria under Austrian law. CARBON is responsible for the project development. The company is an experienced financing and investment company, focussing on the development and

implementation of Greenhouse Gas reduction projects according to Article 6 of the Kyoto Protocol (Joint Implementation) and Article 12 of the Kyoto Protocol (Clean Development Mechanism).

The RWE Group is one of Europe's leading integrated electricity and gas companies. **RWE Power AG** is the continental power generation company within the RWE Group and Germany's biggest power producer. RWE Power has a diverse generation portfolio including lignite, hard coal, nuclear energy, gas and renewable sources such as hydro, wind and biomass. RWE invests and participates actively in projects under the Clean Development Mechanism and Joint Implementation. The RWE team combines a track record in global commodities and emissions trading as well as risk management with broad experience and a deep understanding of specific risks inherent in CDM and JI projects.

Host Country is the Arab Republic of Egypt. The Arab Republic of Egypt ratified the Kyoto Protocol in January 2005. The other Party involved in the Project at the time of registration is the Republic of Austria. Subsequent to the registration of the Project, Federal Republic Germany has been added as a Party involved in the Project.

#### **Focal point:**

The project participants agreed that CARBON Projektentwicklung GmbH, Austria serves as focal point of communication with the Executive Board and the UNFCCC Secretariat.

#### **A.4. Reference of applied methodology and standardized baseline**

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- (a) ACM0019 "N<sub>2</sub>O abatement from nitric acid production" (Version 02.0)<sup>1</sup>
- (b) Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion (Version 02)<sup>2</sup>
- (c) Tool to determine the mass flow of a greenhouse gas in a gaseous stream (Version 02.0.0)<sup>3</sup>

Please note that according to the applied methodology no standardized baselines are used.

#### **A.5. Crediting period of project activity**

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|  |                         |
|--|-------------------------|
| Type of the crediting period:                          | Renewable (3 x 7 years) |
| Starting date of the 2 <sup>nd</sup> crediting period: | 15/09/2013              |
| End date of the 2 <sup>nd</sup> crediting period:      | 14/09/2020              |

#### **A.6. Contact information of responsible persons/ entities**

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CARBON Climate Protection GmbH  
Ms. Sonja Bichler  
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Tel: +43 2734 32270-70  
Mobile: +43 676 6259415  
E-mail: [bichler@carbon-austria.com](mailto:bichler@carbon-austria.com)

<sup>1</sup> <http://cdm.unfccc.int/methodologies/DB/Y0S50SAZFK4FJOMZH2T7EN1I3HI8T0>

<sup>2</sup> <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/>

<sup>3</sup> <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/>

CARBON Climate Protection GmbH is a project participant. For further information please see Appendix 1.

## SECTION B. Implementation of project activity

### B.1. Description of implemented registered project activity

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#### (a) Information on the implementation status of the project activity

The EnviNOx® system was installed in September 2006 and the catalytic reduction process of N<sub>2</sub>O started its operation in October 2006 (first crediting period of CDM project activity). The project has been implemented and is operated as per the registered PDD with all physical features (technology, project equipment, and monitoring and metering equipment) in place, besides the equipment for measuring the volume flow of the gaseous stream for which a temporary deviation from September 15<sup>th</sup>, 2013 until April 1<sup>st</sup>, 2014 was submitted to UNFCCC (details please see paragraph B.2.1 of this document).

Monitoring is done according to the applied methodology (ACM0019 v02.0) and the registered monitoring plan.

#### (b) Description of the installed technology, technical processes and equipment

##### General Introduction:

Nitrous oxide (N<sub>2</sub>O) is an unwanted, invisible and previously neglected by-product of the manufacture of nitric acid. It is formed alongside the main, desired product nitric oxide (NO) during the catalytic oxidation of ammonia in air over noble metal gauzes. The production of nitric acid takes place in three main process steps as indicated by the following reactions:

1. Ammonia (NH<sub>3</sub>) combustion to form nitric oxide (NO)<sup>4</sup>:



Simultaneously nitrous oxide (N<sub>2</sub>O), nitrogen (N) and water (H<sub>2</sub>O) are formed as well, in accordance with the following equations:



NO yield mainly depends on pressure and temperature in the ammonia oxidation process and is usually in a range of 95% to 97%.

2. NO is oxidised to nitrogen dioxide (NO<sub>2</sub>):



3. (According to the technical process) Absorption of NO<sub>2</sub> in water to form nitric acid (HNO<sub>3</sub>):

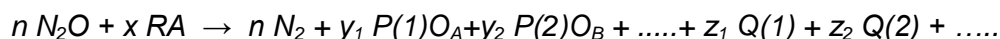


(NO is oxidised to NO<sub>2</sub> according to main reaction 2)

<sup>4</sup> Ammonia is reacted with air on noble metal catalyst in the oxidation section of nitric acid plants. Nitric oxide and water are formed in this process according to the above mentioned main equation.

Description of catalytic reduction process:

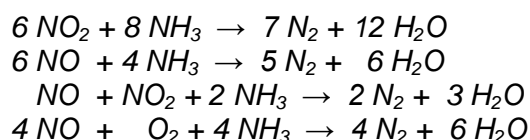
Although the term catalytic reduction nowadays has a more general definition in terms of the transfer of electrons, the following definition is sufficient for present purposes: catalytic reduction of  $N_2O$  occurs when reactions take place between  $N_2O$  and other substances in contact with a catalyst, such that the oxygen is removed from the  $N_2O$  molecule and forms one or more compounds with other species. The substance or substances that react with  $N_2O$  to remove oxygen are termed reducing agent. A general reaction equation for the catalytic reduction of  $N_2O$  can be given as:



where RA is a molecule of the reducing agent,  $P(1)O_A$ ,  $P(2)O_B$  are the compound formed by reaction with the oxygen of the  $N_2O$  and  $Q(1)$ ,  $Q(2)$  represent further products of the oxidation reaction,  $n$ ,  $x$ ,  $y_1$ ,  $y_2$ ,  $z_1$ ,  $z_2$  are the appropriate stoichiometric coefficients.

**Project Specific description:**Principles of the EnviNO<sub>x</sub>® process:

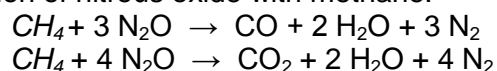
The reactions take place over two iron zeolite catalyst beds. The first bed contains an iron zeolite that is especially effective in catalysing the reduction of  $NO_x$  with ammonia according to such reactions as:



Effectively all the  $NO_x$  is removed. Furthermore some destruction of  $N_2O$  occurs.

Equations showing reduction  $N_2O$  with methane:

The second and main bed contains an iron zeolite that is particularly efficient in catalysing the reduction of nitrous oxide with methane.

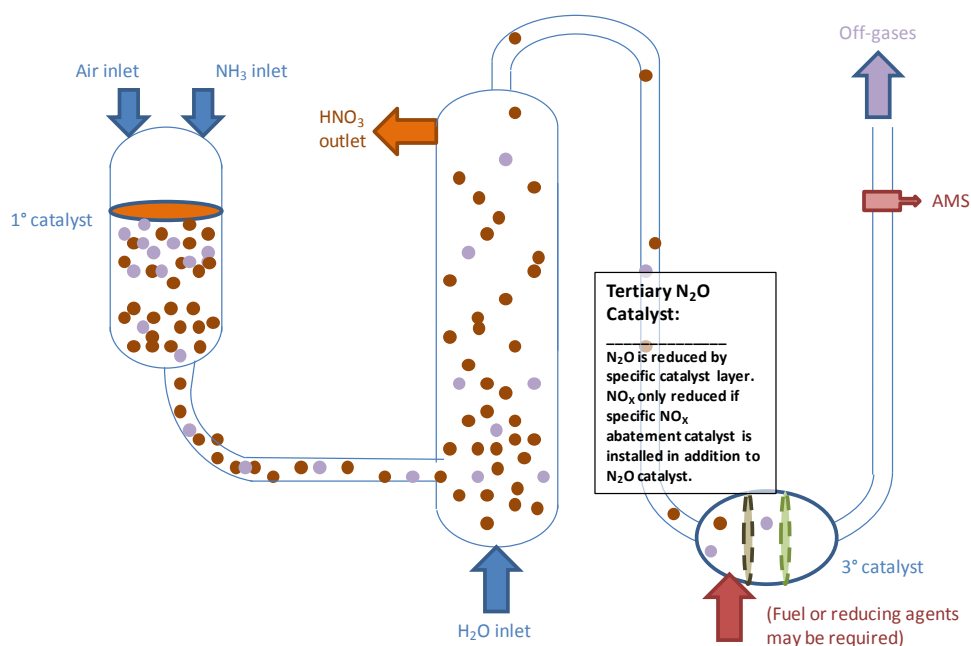
Technology employed by the project activity:

In this project, CARBON Egypt installed the EnviNO<sub>x</sub>® system for catalytic reduction of  $NO_x$  and  $N_2O$  additionally to the equipment at the nitric acid manufacturing plant. The project activity reduces the GHG emissions, which would otherwise be released to the atmosphere, if the project was not implemented. The implementation of the  $N_2O$  destruction project at AFC involves that natural gas, a mixture of hydrocarbons of which the main constituent is methane ( $CH_4$ ), is employed as a reducing agent for  $N_2O$  removal.

The EnviNO<sub>x</sub>®-Reactor (21R004) is located between tail gas heater IV (21E013) and the tail gas turbine (21MT02) which is the position with the highest tail gas temperature in the nitric acid production process at AFC.

The following figure shows the spatial extend of the project boundary.

**Figure 2:** Project boundary Abu Qir II



At Abu Qir II nitric acid plant, the EnviNO<sub>x</sub>®-Systems is installed between the tail gas heaters and the tail gas turbine. The DeNO<sub>x</sub>-unit was removed.

### (c) Information on the actual operation of the project activity

During the monitoring period under consideration several observations have been made. Those events have been analysed in detail as described hereunder.

#### Observations at Nitric Acid plant:

**Table 1:** Shutdown periods of Nitric Acid plant

| Start      |       | End        |       | Description                                  |
|------------|-------|------------|-------|--|
| Date       | Time  | Date       | Time  |  |
| 01/04/2014 | 22:00 | 03/04/2014 | 17:00 | Nitric Acid plant shutdown – Gauze Change    |
| 28/05/2014 | 21:00 | 29/05/2014 | 16:00 | Nitric Acid plant shutdown – Ammonia Leakage |

Relevant hours of nitric acid plant (and consequently EnviNO<sub>x</sub>®) shutdown periods as well as hours in which the abatement system was deemed to be bypassed, not working, underperform or failed have not been considered in overall calculations of Emission Reductions. For the respective hours no Emissions Reductions will be claimed. This approach ensures the most conservative way to determine Emissions Reductions.

#### Observations at EnviNO<sub>x</sub>® system:

**Table 2:** Observations at EnviNO<sub>x</sub>® system

| Start      |       | End        |       | Description                               |
|------------|-------|------------|-------|---|
| Date       | Time  | Date       | Time  |   |
| 12/12/2013 | 12:00 | 16/12/2013 | 14:00 | Analyser Quarterly Inspection (AT-218002) |

|            |       |            |       |   |
|------------|-------|------------|-------|---|
| 05/04/2014 | 21:00 | 07/04/2014 | 11:00 | Natural gas flow meter disconnected (FT-218002)   |
| 07/04/2014 | 10:00 | 07/04/2014 | 14:00 | Analyser Quarterly Inspection (AT-218002)         |
| 21/04/2014 | 09:00 | 21/04/2014 | 12:00 | Nitric acid flow meter incorrect range (FT-21411) |
| 21/04/2014 | 12:00 | 23/04/2014 | 08:00 | Nitric acid flow meter low flow (FT-21411)        |
| 23/04/2014 | 08:00 | 23/04/2014 | 10:00 | Nitric acid flow meter maintenance (FT-21411)     |
| 20/05/2014 | 11:00 | 21/05/2014 | 14:00 | Monthly check (FT-21492) & Ammonia Leakage        |
| 02/06/2014 | 08:00 | 02/06/2014 | 09:00 | Nitric acid flow meter maintenance (FT-21411)     |
| 22/06/2014 | 17:00 | 22/06/2014 | 19:00 | Nitric acid flow meter incorrect range (FT-21411) |
| 27/06/2014 | 11:00 | 27/06/2014 | 14:00 | Nitric acid flow meter maintenance (FT-21411)     |

For relevant hours a conservative calculation in accordance with the methodology was applied.

*Preventive Maintenance (Periodic Inspection Check) at analysers (12/12/2013 – 16/12/2013) & (06/04/2014 – 09/04/2014):*

The calibration and maintenance activities were carried out onsite by Carbon Egypt team and included (but not limited to) checking and cleaning the filter, checking the pressure regulator, checking the sample handling system, checking the solenoid valve, checking the analyser with internal diagnostic menus, leak test at sample system, cleaning sample lines with distilled water and manual calibration of the analyser.

The time, when the analyser was out of operation for maintenance, lasted for a number of hours during preventive maintenance days. On 13/12/2013, 14/12/2013, 06/04/2014 and 09/04/2014 Carbon Egypt checked the analyser system as a whole without taking the analyser out of operation.

The service report issued by Carbon Egypt is submitted for verification.

#### Calibration and Maintenance:

All measuring and analytical instruments are being calibrated as defined in the approved CDM PDD "Catalytic N<sub>2</sub>O destruction project in the tail gas of the Nitric Acid Plant of Abu Qir Fertilizers Co.", version 4.1 from September 11<sup>th</sup>, 2013. The plant operator AFC has a Quality Management System (ISO 9001:2008) where maintenance methods are incorporated. All relevant instruments like project relevant AOR instruments and EnviNO<sub>x</sub>® instruments have been calibrated accordingly.

As Carbon Egypt works continuously on improvements in terms of reliability, availability and maintainability of the EnviNO<sub>x</sub>® system together with its technology and service providers, a general check of the system was performed during the scheduled shutdown of the Abu Qir Nitric Acid plant.

**Table 3: Health and Inspection visits during the Monitoring Period 28**

| Date          | Action                                  | Service provider  |
|---------------|---|-------------------|
| October 2013  | Monthly health check, system diagnostic | Carbon Egypt Team |
| November 2013 | Monthly health check, system diagnostic | Carbon Egypt Team |
| December 2013 | Quarterly Inspection                    | Carbon Egypt Team |

|               |   |                   |
|---------------|---|-------------------|
| January 2014  | Monthly health check, system diagnostic           | Carbon Egypt Team |
| February 2014 | Monthly health check, system diagnostic           | Carbon Egypt Team |
| March 2014    | Monthly health check, system diagnostic           | Carbon Egypt Team |
| April 2014    | Quarterly Inspection                              | Carbon Egypt Team |
| April 2014    | Monthly calibration check (FT-21492)              | AFC               |
| May 2014      | Monthly health check, system diagnostic           | Carbon Egypt Team |
| May 2014      | Monthly calibration check (FT-21492)              | AFC               |
| June 2014     | Monthly health check, system diagnostic           | Carbon Egypt Team |
| June 2014     | Monthly calibration check (FT-21492) <sup>5</sup> | AFC               |

## B.2. Post registration changes

### B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

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The following temporary deviation from monitoring plan is valid for this monitoring period:

#### (a) Reason for Deviation

The 2<sup>nd</sup> crediting period of the CDM project activity started on September 15<sup>th</sup>, 2013. Project Participants duly organized the technical preparation for the 2<sup>nd</sup> crediting period in order to be consistent with all requirements of the applied methodology ACM0019 v02.0 from the start of the 2<sup>nd</sup> crediting period onwards. Special focus was on the procurement, engineering, installation and implementation of the new instruments for measuring and monitoring the project emissions, since during the 1<sup>st</sup> crediting period the volume flow of the tail gas was measured with a Venturi tube, which does not comply with the requirements of ACM0019 v02.0. All other instruments fully comply with the requirements of ACM0019 v02.0 and parameters can be measured and monitored with already implemented instruments, which were used during the 1<sup>st</sup> crediting period.

Based on the situation in Egypt during the summer of 2013, travel warnings were issued by the Austrian and German Federal Foreign Office in August 2013. Due to this official travel warnings the onsite visit of the service engineers, who were assigned with installing and integrating the new measurement equipment into the DCS system, had to be postponed.

#### (b) Duration of Deviation

Since Project Participants were not able to foresee, when finally the travel warnings will be lifted, and if the new instruments can be implemented during the scheduled shutdown in April 2014, October 31<sup>st</sup>, 2014 was chosen as end date of the temporary deviation. This date matches with the duration of gauze campaigns and hence with shutdowns of the plant.

As it was possible to implement the new instruments during the scheduled shutdown in April 2014, the actual duration of temporary deviation is from September 15<sup>th</sup>, 2013 until April 1<sup>st</sup>, 2014.

#### (c) Description of Deviation from Monitoring Plan

As long as it was not possible to attune the monitoring system to the requirements of ACM0019 v02.0 due to the reasons mentioned above, the following applied:

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<sup>5</sup> Monthly calibration check for June 2014 took place on July 2<sup>nd</sup>, 2014.

| Volume flow of tail gas |  |  |
|-------------------------|--|--|
|                         | AM0028 v01<br>(methodology of 1 <sup>st</sup> CP)  | ACM0019 v02.0<br>(methodology of 2 <sup>nd</sup> CP)   |
| Parameter               | <b>F_TG,i</b><br>Volume flow tail gas at N <sub>2</sub> O destruction facility   | <b>V<sub>t,db,n</sub></b><br>Volumetric flow of the gaseous stream in time interval t on a dry basis   |
| Measurement             | <b>Venturi tube</b> <ul style="list-style-type: none"> <li>FT-218003A/B – Differential pressure transmitters</li> <li>PT-218006A/B – Pressure transmitters</li> <li>TE-218005A/B – Temperature transmitters</li> </ul> | <b>Anubar</b> <ul style="list-style-type: none"> <li>FT-21492 – Differential pressure transmitter</li> </ul> <p><u>Please note:</u></p> <ol style="list-style-type: none"> <li>As long as it was not possible to attune the monitoring system to the requirements of ACM0019 v02.0, the volumetric flow of the gaseous stream (<math>V_{t,db,n}</math> under ACM0019 v02.0, which is equivalent to <math>F_{TG,i}</math> under AM0028 v01) was measured and monitored using the tail gas flow instruments, which were already installed during the 1<sup>st</sup> crediting period (FT-218003A/B, PT-218006A/B, TE-218005A/B).</li> <li>The monitoring system was attuned as soon as possible in order to comply with the requirement regarding the monitoring according to the European Norm 14181 (2004).</li> </ol> |

| N <sub>2</sub> O concentration of tail gas |   |  |
|--|---|--|
|  | AM0028 v01<br>(methodology of 1 <sup>st</sup> CP)   | ACM0019 v02.0<br>(methodology of 2 <sup>nd</sup> CP)   |
| Parameter                                  | <b>CO_N2O,i</b><br>N <sub>2</sub> O concentration at destruction facility outlet  | <b>V<sub>i,t,db</sub></b><br>Volumetric fraction of greenhouse gas i in a time interval t on a dry basis |
| Measurement                                | <b>Non-dispersive infrared (NDIR) photometry analyser</b> <ul style="list-style-type: none"> <li>AT 218002 – NDIR Analyser</li> </ul> <p><u>Please note:</u> The monitoring system was attuned as soon as possible in order to comply with the requirement regarding the monitoring of <math>v_{i,t,db}</math> according to the European Norm 14181 (2004).</p> |  |

| Moisture content of the gaseous stream |
|--|
|--|

|             | ACM0019 v02.0 (methodology of 2 <sup>nd</sup> CP)   |
|-------------|---|
| Parameter   | $C_{H_2O,t,db,n}$<br>Moisture content of the gaseous stream at normal conditions, in time interval t  |
| Measurement | <b>Measurements according to the USEPA CF42 method 4 – Gravimetric determination of water content</b><br><br>Please note:<br><br>1. The Project Participants were not able to measure the moisture content according to the USEPA CF42 method 4 as long as the travel warnings were valid, since no adequate institution was situated in Egypt that could do this measurement according to relevant norms and requirements.<br><br>2. As stated in the registered PDD the ex-ante determination of the moisture content at the measuring point according to process parameters shows a value of about 0.00157 kg H <sub>2</sub> O/m <sup>3</sup> dry gas. Since this value is far below the limit of 0.05 kg H <sub>2</sub> O/m <sup>3</sup> dry gas, the gas is considered to be dry. Hence, option A the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” is applicable. |

The HNO<sub>3</sub> production and all other parameters were measured and monitored as described in the PDD according to the applied methodology ACM0019 v02.0. Quality assurance and quality control procedures – as implemented for equipment operation and maintenance during 1<sup>st</sup> crediting period and which have been incorporated in the ISO 9001:2008 and ISO 14001:2009 procedures of AFC – were also applied during temporary deviation in order to assure reliability of collected data.

#### (d) Justification on the Conservativeness of the Approach

The temporary deviation as described above has no impact on the estimation of the emissions reduction for the project activity according to the approved methodology ACM0019 v02.0 due to the following reasons:

1. Instrumentation: The tail gas flow devices and instruments, which were already installed and maintained during 1<sup>st</sup> crediting period under AM0028 v01, measure the required stream accordingly.
2. Continuous real-time measurements: Tail gas flow measurements were already carried out throughout the 1<sup>st</sup> crediting period of the CDM project activity in accordance with AM0028 v01.
3. Data recording and storage: Separate hourly average value based on 2 seconds (or shorter) interval reading that are recorded and stored electronically is fulfilled.
4. Check and calibration routines: Factory recalibrated instruments and inspection of the Venturi device is being carried out as per suppliers' recommendation.

Reference number of PRC: PRC-0490-001

Current status of PRC: Awaiting EB decision (since July 29<sup>th</sup>, 2014)

#### B.2.2. Corrections

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No corrections have been applied during this monitoring period, neither to any previous monitoring periods.

**B.2.3. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline**

&gt;&gt;

No permanent changes from the registered monitoring plan or applied methodology have been applied during this monitoring period, neither to any previous monitoring periods.

**B.2.4. Changes to project design of registered project activity**

&gt;&gt;

No changes to project design of the registered project activity have been applied during this monitoring period, neither to any previous monitoring periods.

**B.2.5. Changes to start date of crediting period**

&gt;&gt;

No changes to the start date of the crediting period have been applied during this monitoring period, neither to any previous monitoring periods.

**B.2.6. Types of changes specific to afforestation or reforestation project activity**

&gt;&gt;

Not applicable.

**SECTION C. Description of monitoring system**

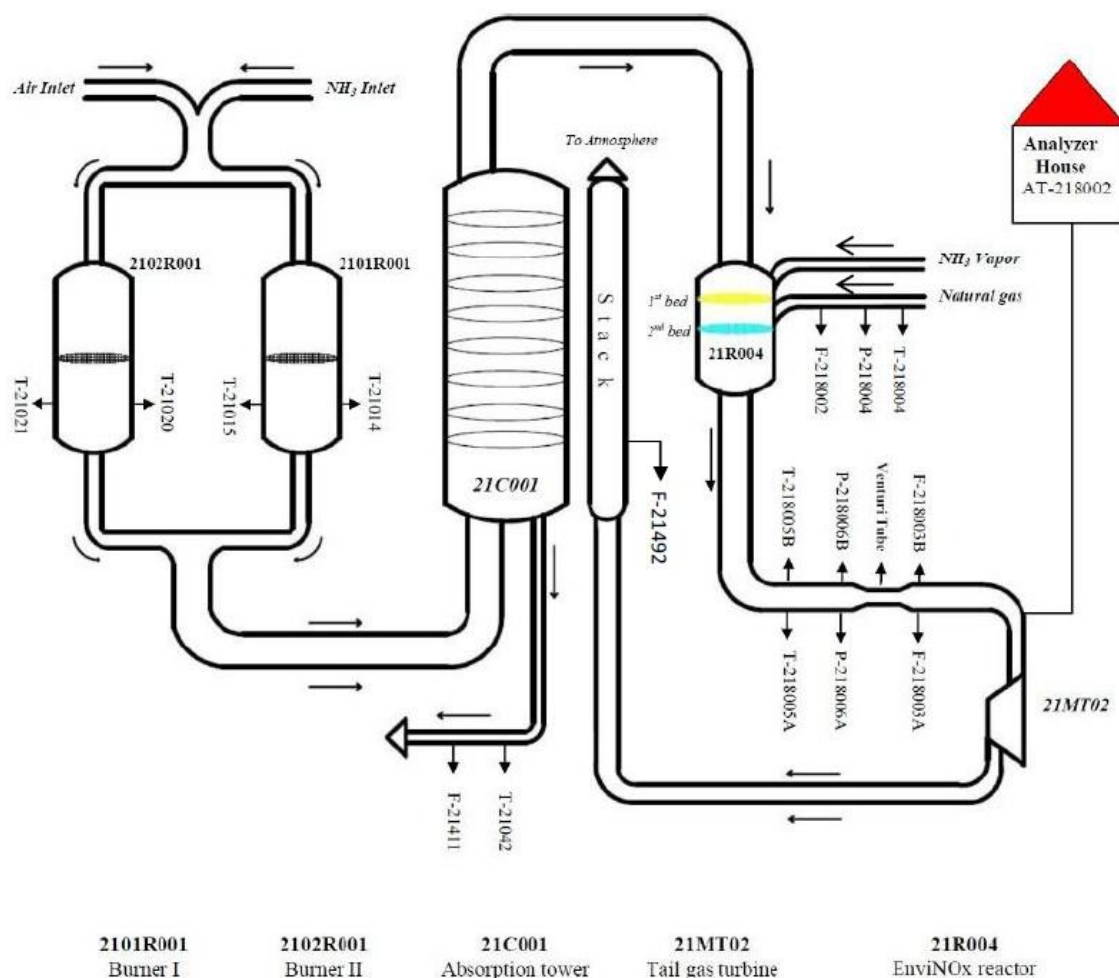
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**1. Information Flow / Data collection procedures**

The instruments transmitters continuously provide a 4 – 20 mA analogue signal according to range and units configured. These signals are transmitted to I/O cards (analogue input/output cards) and collected by the Delta V Processor. Resulting digital values are made available in the network to be further processed (e.g. in controller blocks, calculation of other variables) and are stored as 1 second raw data in the protected continuous historian server (CHS).

Modifications of the Delta V, which are protected by security levels by the supplier, are tracked by a Version Control Tool.

**Figure 3:** Line diagram showing all relevant monitoring points



The reporting module of the Delta V system automatically generates aggregated daily reports based on the stored raw data from the continuous historian server. Daily reports contain following kinds of data relevant for calculation of claimed emission reductions:

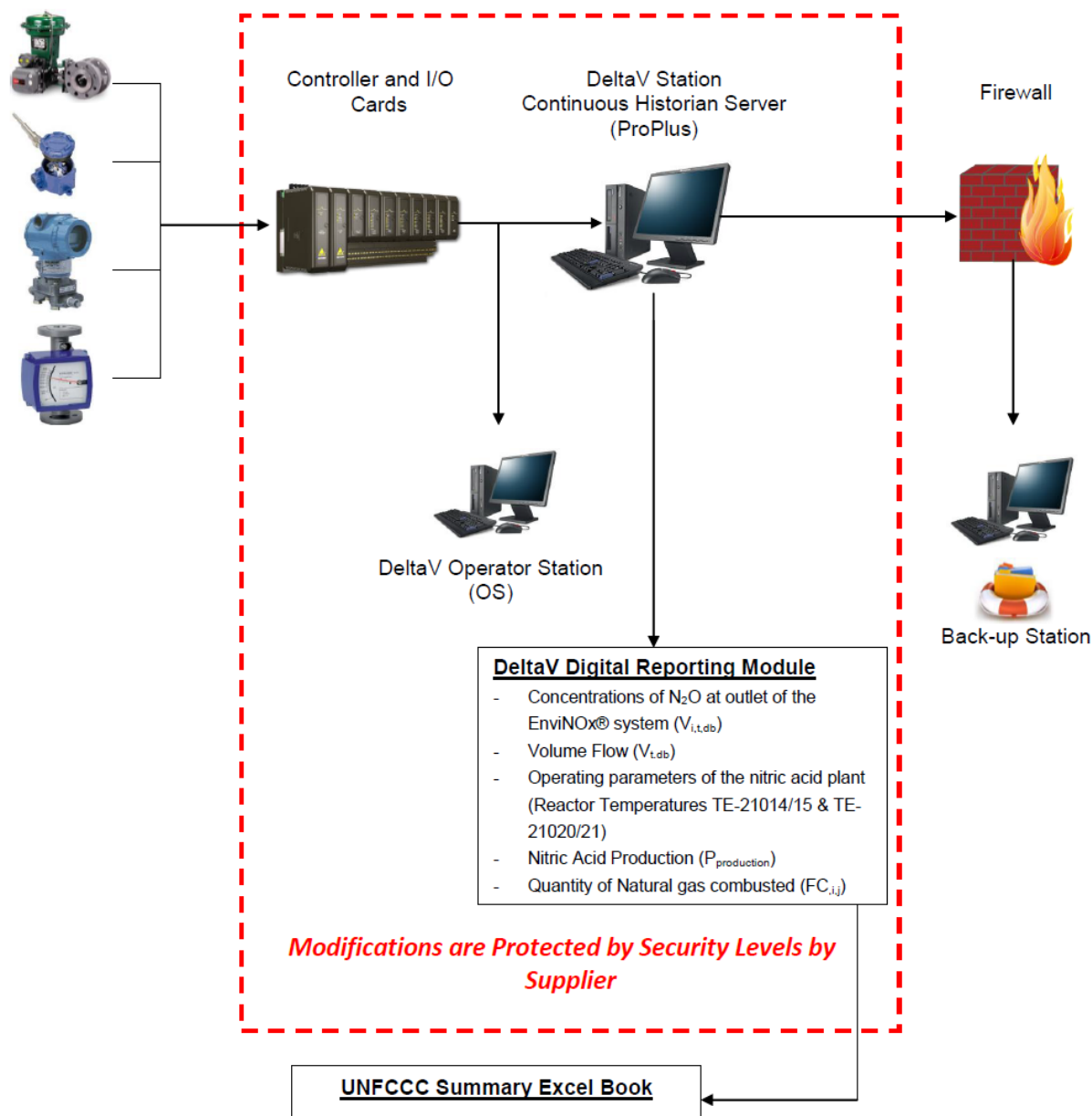
- Concentration of N<sub>2</sub>O at outlet of the EnviNOx® system ( $v_{i,t,db}$ )
- Volume Flow ( $V_{t,db,n}$ )
- Operating parameters of the nitric acid plant (reactor temperatures, etc.)
- Nitric Acid Production ( $P_{production,y}$ )
- Quantity of methane combusted in process ( $FC_{i,j,y}$ )

Relevant parameters as mentioned above are exported from the digitally available daily reports to excel sheets for presentation of required parameters and calculation of baseline emissions ( $BE_y$ ), project emissions ( $PE_y$ ,  $PE_{CO2,tertiary,y} = PE_{FF,y} = PE_{FC,j,y}$ ,  $PE_{N2O,y}$ ), and emission reductions ( $ER_y$ ) according to the formulae as required.

Daily production of the nitric acid plant ( $P_{production,y}$ ) is obtained from AFC records and their respective log sheets and transferred to these excel sheets, which are attached as *Appendix 3* to this monitoring report. Details on source of data can be found directly at the respective parameter tables in *Section D*.

**Figure 4:** Information flow diagram

## Monitoring Instruments



This approach and all implemented formulae in the Delta V system fully comply with the approved Monitoring Methodology ACM0019 v02.0 “ $N_2O$  abatement from nitric acid production” and the registered project documentation (Monitoring Plan and respective PDD), considering additional guidance by the CDM Issuance Team.

## 2. Roles and responsibilities of personnel

Project Operator is Abu Qir Fertilizer Co. S.A.E., the biggest fertilizer company in Africa. AFC was founded as a joint stock company located and registered in the Alexandria Province under Egyptian law in 1976 and is the market leader with a market share of close to 70% of the local Egyptian fertilizer market. With nearly to 3,000 employees AFC is among the major job providers in Alexandria area. The company is ISO 9001:2008 and ISO 14001:2009 certified and one of the most important companies of the Egyptian industry. The EnviNOx® system is incorporated into AFC’s ISO 9001:2008 and ISO 14001:2009 standards.

The operating personnel of the EnviNO<sub>x</sub>® system has been trained by the technology provider UHDE and the supplier of the digital process control system (Delta V, EMERSON process management).

Carbon Egypt is responsible for monitoring and reporting of data under the CDM Project. In terms of performing general supervision and cross-checks of monitoring and reporting data Carbon Austria (=CARBON Climate Protection GmbH) supports Carbon Egypt. Carbon Austria gives their final approval on the supporting documents as well as the CDM-MR before submitting to the respective DOE for verification.

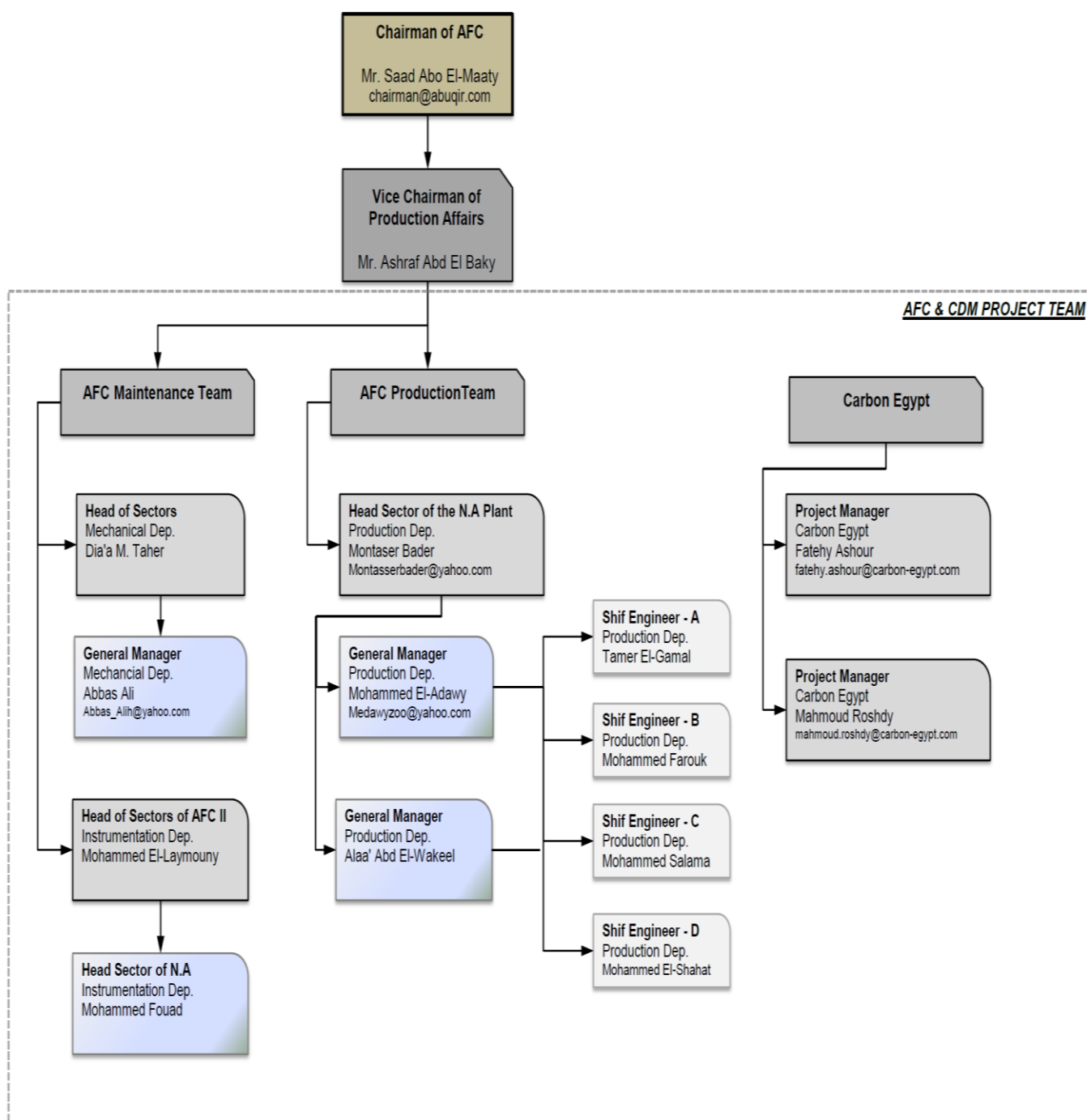
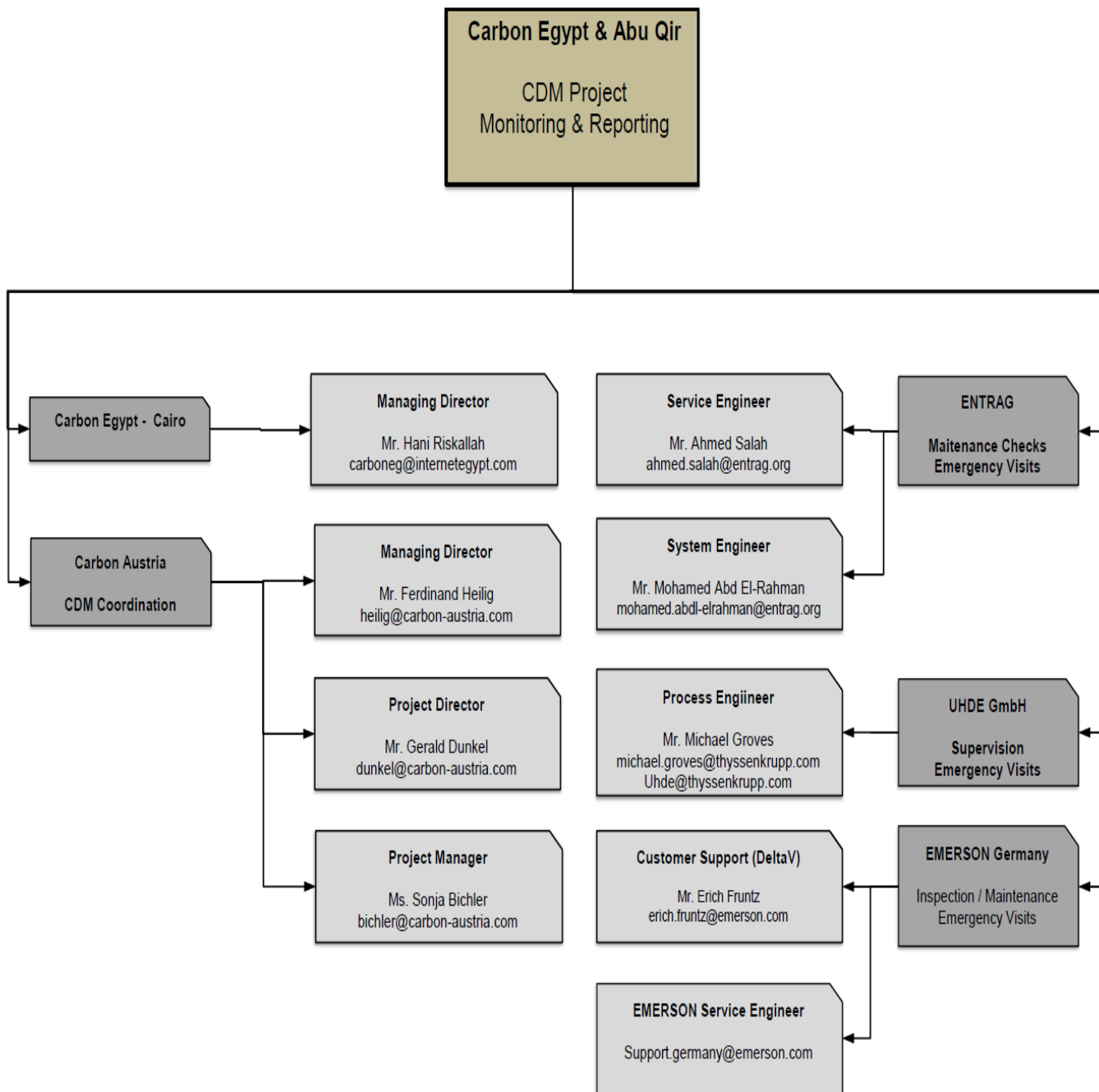


Figure 5: Organizational Chart 1: Structure onsite at Abu Qir



**Figure 6:** Organizational Chart 2: Carbon structure and technology providers

### 3. Back up plans / Emergency procedures for monitoring system

#### a) Back Up Plans for measuring systems / Periodically observation of the automated monitoring system

- EnviNO<sub>x</sub>® – automatic DCS system:  
The EnviNO<sub>x</sub>® system is designed for automatic operation, so that activities by the operation personnel are not required during normal operation. However, all alarms and any action taken by the operating personnel (events) are automatically logged at the engineering and the operation station (Alarm & Event List) of the DCS system. All log sheets for Alarm & Events are exported and therefore digital available (Excel Files) and can easily be analysed and evaluated.

Malfunction of system components is indicated on the operator (AFC) console in the control room as an alarm. Occurrence of such an alarm requires the operator to immediately take measures to remedy the problem. This is done by informing AFC instrument department and Carbon Egypt. It is then decided whether the problem can be fixed immediately by AFC or Carbon Egypt, or whether external support from ENTRAG / EMERSON Germany / UHDE is required (please refer also to above).

- **Back Up – EnviNO<sub>x</sub>® support:**

In addition to the quality control and quality assurance procedures according to AFC quality management system and in order to avoid possible failures of the automated monitoring system several procedures are implemented for the project activity.

EMERSON Germany has been contracted to execute periodic onsite inspection visits. Furthermore, a 24 hours emergency service and the Delta V Guardian Support are covered by the contract.

The monthly health checks and the periodic inspection visits are to conduct observation of the EnviNO<sub>x</sub>® system, the monitoring equipment required for the CDM project and the automated monitoring system. The system components, measurement devices, calibration works and the automated monitoring system required for the monitoring of the CDM project are covered by the contract. Health check reports and inspection visit reports are available.

The responsible project managers of Carbon Egypt are carrying out onsite inspections on a daily basis and AFC is carrying out a site check of the EnviNO<sub>x</sub>® system once per shift.

Furthermore, the AFC maintenance department is performing weekly inspection including an onsite check of the EnviNO<sub>x</sub>® system.

Supervision is done based on the daily reports by the technology provider UHDE Germany.

- **Back Up – Spare Parts on Stock Onsite:**

As a further important part of the back-up plan to deal with events like measuring equipment out of service Carbon Egypt stocks a comprehensive range of spare part devices onsite. The spare part stock consists basically of 6-month consumables and for two year operation as recommended by the supplier.

- **Back Up – Certified standard gases:**

Pressure levels of standard gases used for the regular, automatic calibration of the inlet and outlet analysers are constantly monitored during the regular inspection by AFC. Spare bottles of standard gases are purchased in proper time. Specifications of standard gases are available and submitted to the DOE for verification.

- **Back Up – Procedures:**

In addition to the quality control and quality assurance procedures according to AFC quality management system and in order to avoid possible failures of the automated monitoring system several procedures are implemented for the project activity. The approach by Carbon Egypt was to ensure immediate response to such alarms/malfunctions respectively in the system (*"Procedures for Carbon Egypt CDM Project"*).

The following table summarizes the periodically observations of the AMS.

**Table 4: AMS observation overview**

| Organization    | Action                          | Frequency          | Output   |
|-----------------|---------------------------------|--------------------|--|
| Delta V         | Alarm & Event List              | Continuously       | Txt files, Excel files                               |
| AFC             | Shift inspection                | Max. 3 times a day | Plant Check  |
| CARBON Egypt    | Inspection                      | Daily              | EnviNO <sub>x</sub> ® Journal                        |
| AFC             | Inspection                      | Weekly             | AFC Report   |
| CARBON Egypt    | Health check, System diagnostic | Monthly            | Health Check Report on AMS and EnviNO <sub>x</sub> ® |
| EMERSON Germany | Inspection visit                | Periodically       | Inspection Report on AMS and EnviNO <sub>x</sub> ®   |

|              |             |           |                                       |
|--------------|-------------|-----------|---------------------------------------|
| CARBON Egypt | Inspection  | Quarterly | Inspection Report on AMS and EnviNOx® |
| UHDE         | Supervision | Daily     | Plausibility Check of Daily Reporting |

All resulting documents are analysed and evaluated by Carbon Egypt. In case of any upcoming problem or failure of the EnviNOx® system and/or the automated monitoring system Carbon Egypt immediately takes measures to remedy the problem. The provider of the automated monitoring system is available 24 hours a day via Hotline.

#### b) Systematic measures for QA for monitoring data during analyser down times

- Back Up Plans (please refer to the above)
- Check against operating parameters:  
In order to ensure the quality of the monitored data during analyser downtimes Carbon Egypt contracted EMERSON Germany for regular maintenance and calibration services and applied the CDM/QA procedure according to the Project Design Document of "Catalytic N<sub>2</sub>O Destruction Project in the Tail Gas of the Nitric Acid Plant of Abu Qir Fertilizer Co.". Furthermore, Carbon Egypt was trained by EMERSON Germany (system supplier) in order to be able to fulfil required QA procedures.

The procedure how to proceed in cases of analyser downtimes is a four-step approach:

- Nitric Acid plant in normal operation: If there is a downtime of concentration measurements Carbon Egypt provides suitable operating parameters to demonstrate that the nitric acid plant is operating under normal conditions (e.g. Ammonia Oxidation Reactors temperature –  $t_y$ ) and that the abatement system is working properly and not being bypassed, underperforming or failing.
- EnviNOx® system in normal operation: Carbon Egypt provides suitable operating parameters to demonstrate that the EnviNOx® system is operating under normal conditions and has reached normal efficiency and hence is working properly and not being bypassed, underperforming or failing.
- Recalculation: In order to ensure a conservative determination of emission reductions for hours with analyser downtimes, recalculation is done according to the applied methodology ACM0019 v02.0: *If data for the N<sub>2</sub>O concentration is not available for more than 1/3 of any hour while the plant was in operation, the value for that hour shall be replaced with the maximum value of N<sub>2</sub>O concentration observed during the monitoring period. Values observed during five operating hours before and after a plant start-up and shut-down shall not be used for the determination of the maximum.*
- Check parameters before and after analyser down time: Operating parameters are compared with values prior and after the analyser was out of operation or out for maintenance to ensure that those values are within the same range.

This approach guarantees a conservative estimation of emissions reductions during AMS downtimes.

## SECTION D. Data and parameters

### D.1. Data and parameters fixed ex ante or at renewal of crediting period

| Data / Parameter   | Operating pressure  |
|--------------------|---|
| Unit               | kPa   |
| Description        | Operating pressure of the ammonia burner  |
| Source of data     | Manufacturer's specifications   |
| Value(s) applied   | <b>383</b> (equivalent to 3.83 barg)  |
| Purpose of data    | The parameter is used to determine whether the nitric acid plant operates at a low, medium or high pressure |
| Additional comment | N/A   |

| Data / Parameter   | EF <sub>historical</sub>  |
|--------------------|---|
| Unit               | kg N <sub>2</sub> O/t HNO <sub>3</sub>                                      |
| Description        | Historical baseline emission factor of the nitric acid plant                |
| Source of data     | Historical information from issuance reports of CDM-PDD documents           |
| Value(s) applied   | <b>7.23</b>   |
| Purpose of data    | Calculation of baseline emissions   |
| Additional comment | This value will remain constant over the second and third crediting period. |

| Data / Parameter   | EF <sub>default,y</sub>   |      |                                    |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |   |
|--------------------|---|------|------------------------------------|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|---|
| Unit               | kg N <sub>2</sub> O/t HNO <sub>3</sub>  |      |                                    |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |   |
| Description        | Default emission factor according to the operating pressure of the ammonia burner in year y (related to 100 per cent pure acid)   |      |                                    |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |   |
| Source of data     | According to PDD and methodology ACM0019 v02.0  |      |                                    |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |   |
| Value(s) applied   | <table border="1"> <thead> <tr> <th>Year</th><th>Medium pressure<br/>(200 – 600 kPa)</th></tr> </thead> <tbody> <tr><td>2013</td><td>8.4</td></tr> <tr><td>2014</td><td>8.2</td></tr> <tr><td>2015</td><td>8.0</td></tr> <tr><td>2016</td><td>7.8</td></tr> <tr><td>2017</td><td>7.6</td></tr> <tr><td>2018</td><td>7.4</td></tr> <tr><td>2019</td><td>7.2</td></tr> <tr><td>2020</td><td>7</td></tr> </tbody> </table> | Year | Medium pressure<br>(200 – 600 kPa) | 2013 | 8.4 | 2014 | 8.2 | 2015 | 8.0 | 2016 | 7.8 | 2017 | 7.6 | 2018 | 7.4 | 2019 | 7.2 | 2020 | 7 |
| Year               | Medium pressure<br>(200 – 600 kPa)  |      |                                    |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |   |
| 2013               | 8.4   |      |                                    |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |   |
| 2014               | 8.2   |      |                                    |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |   |
| 2015               | 8.0   |      |                                    |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |   |
| 2016               | 7.8   |      |                                    |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |   |
| 2017               | 7.6   |      |                                    |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |   |
| 2018               | 7.4   |      |                                    |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |   |
| 2019               | 7.2   |      |                                    |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |   |
| 2020               | 7   |      |                                    |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |   |
| Purpose of data    | Calculation of baseline emissions   |      |                                    |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |   |
| Additional comment | The decrease in the value for the baseline emission factor over time is to reflect the technological development.   |      |                                    |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |   |

| Data / Parameter   | EF <sub>new,y</sub>   |      |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|--------------------|---|------|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Unit               | kg N <sub>2</sub> O/t HNO <sub>3</sub>  |      |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Description        | Baseline N <sub>2</sub> O emission factor for nitric acid production in year y (related to 100 per cent pure acid)  |      |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Source of data     | According to PDD  |      |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Value(s) applied   | <table border="1"> <thead> <tr> <th>Year</th><th>Emission factor (kg N<sub>2</sub>O/t HNO<sub>3</sub>)</th></tr> </thead> <tbody> <tr><td>2013</td><td>3.70</td></tr> <tr><td>2014</td><td>3.50</td></tr> <tr><td>2015</td><td>3.40</td></tr> <tr><td>2016</td><td>3.20</td></tr> <tr><td>2017</td><td>3.00</td></tr> <tr><td>2018</td><td>2.80</td></tr> <tr><td>2019</td><td>2.70</td></tr> <tr><td>2020</td><td>2.50</td></tr> </tbody> </table> | Year | Emission factor (kg N <sub>2</sub> O/t HNO <sub>3</sub> ) | 2013 | 3.70 | 2014 | 3.50 | 2015 | 3.40 | 2016 | 3.20 | 2017 | 3.00 | 2018 | 2.80 | 2019 | 2.70 | 2020 | 2.50 |
| Year               | Emission factor (kg N <sub>2</sub> O/t HNO <sub>3</sub> )   |      |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 2013               | 3.70  |      |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 2014               | 3.50  |      |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 2015               | 3.40  |      |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 2016               | 3.20  |      |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 2017               | 3.00  |      |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 2018               | 2.80  |      |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 2019               | 2.70  |      |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 2020               | 2.50  |      |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Purpose of data    | Calculation of baseline emissions   |      |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Additional comment | The decrease in the value for the baseline emission factor over time is to reflect the technological development.   |      |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |

| Data / Parameter   | P <sub>product,max</sub>  |
|--------------------|---|
| Unit               | t HNO <sub>3</sub>  |
| Description        | Design capacity of nitric acid production during the first crediting period |
| Source of data     | Manufacture's specifications  |
| Value(s) applied   | <b>700,800</b>  |
| Purpose of data    | Calculation of baseline emissions   |
| Additional comment | This parameter is only for project activities applying case 1.              |

| Data / Parameter   | GWP <sub>N<sub>2</sub>O</sub>   |
|--------------------|---|
| Unit               | t CO <sub>2</sub> e/t N <sub>2</sub> O  |
| Description        | Global warming potential of N <sub>2</sub> O valid for the commitment period  |
| Source of data     | Relevant decisions by the CMP, according to PDD and methodology ACM0019 v02.0 |
| Value(s) applied   | <b>298</b>  |
| Purpose of data    | Calculation of baseline and project emissions                                 |
| Additional comment | N/A   |

Parameters from the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 02.0.0)

| Data / Parameter:    | R <sub>u</sub>  |
|----------------------|---|
| Data unit:           | Pa.m <sup>3</sup> /kmol.K   |
| Description:         | Universal ideal gases constant  |
| Source of data used: | "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 02.0.0)            |
| Value applied:       | <b>8,314</b>  |
| Purpose of data      | Determining the mass flow of a greenhouse gas in a gaseous stream<br>Calculation of project emissions |
| Additional comment   | N/A   |

| Data / Parameter: | MM <sub>i</sub> |
|-------------------|-----------------|
|-------------------|-----------------|

|                      |   |                  |                                 |
|----------------------|---|------------------|---------------------------------|
| Data unit:           | kg/kmol   |                  |                                 |
| Description:         | Molecular mass of greenhouse gas i  |                  |                                 |
| Source of data used: | "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 02.0.0)            |                  |                                 |
| Value applied:       | <b>Compound</b>   | <b>Structure</b> | <b>Molecular mass (kg/kmol)</b> |
|                      | Nitrous oxide   | N <sub>2</sub> O | 44.02                           |
| Purpose of data      | Determining the mass flow of a greenhouse gas in a gaseous stream<br>Calculation of project emissions |                  |                                 |
| Additional comment   | N/A   |                  |                                 |

|                          |   |
|--------------------------|---|
| <b>Data / Parameter:</b> | <b>P<sub>n</sub></b>  |
| Data unit:               | Pa  |
| Description:             | Total pressure at normal conditions   |
| Source of data used:     | "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 02.0.0)            |
| Value applied:           | <b>101,325 Pa</b>   |
| Purpose of data          | Determining the mass flow of a greenhouse gas in a gaseous stream<br>Calculation of project emissions |
| Additional comment       | N/A   |

|                          |   |
|--------------------------|---|
| <b>Data / Parameter:</b> | <b>T<sub>n</sub></b>  |
| Data unit:               | K   |
| Description:             | Temperature at normal conditions  |
| Source of data used:     | "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 02.0.0)            |
| Value applied:           | <b>273.15 K</b>   |
| Purpose of data          | Determining the mass flow of a greenhouse gas in a gaseous stream<br>Calculation of project emissions |
| Additional comment       | N/A   |

## D.2. Data and parameters monitored

"Annual" or "Yearly" is sometimes mentioned as the "Recording frequency", as it is defined in the methodology (ACM0019 version v02.0) and the Monitoring Plan and meaning the respective parameter during or related to a year "y". It shall be considered, that "Annual", "Yearly" and the year "y" is understood as the monitoring period covered by this report (15/09/2013 to 30/06/2014), unless otherwise described.

|                                       |  |
|---------------------------------------|--|
| <b>Data / Parameter:</b>              | <b>P<sub>production,y</sub></b>  |
| Unit:                                 | tHNO <sub>3</sub>  |
| Description:                          | Nitric acid produced in year y   |
| Measured/<br>Calculated /<br>Default: | Measured   |
| Source of data:                       | Production reports<br><br>The actual nitric acid production is measured according to the installed instruments. The instrument signals are recorded in the control room.<br><br>The nitric acid flow is measured using electromagnetic flow meter while the nitric acid temperature is measured using temperature transmitter where the hourly data is recorded automatically by AFC DCS system in log sheet no. 409/1/2/3A/F5. The nitric acid concentration is logged in |

|   |  |       |                     |                 |        |                        |  |                                |   |                            |            |   |                                 |                      |            |                |         |                        |            |                      |            |           |            |       |                         |                 |   |                        |         |
|---|--|-------|---------------------|-----------------|--------|------------------------|--|--------------------------------|---|----------------------------|------------|---|---------------------------------|----------------------|------------|----------------|---------|------------------------|------------|----------------------|------------|-----------|------------|-------|-------------------------|-----------------|---|------------------------|---------|
|   | <p>reporting sheet 410/3/3/F1. Those recordings are prepared in accordance with AFC's quality management system ISO 9001:2008.</p> <p>This data is transferred by Carbon Egypt to an excel book according to the "Procedures for Carbon Egypt CDM Project" in order to calculate the HNO<sub>3</sub> production on a 0 – 24h basis.</p> <p>The daily HNO<sub>3</sub> production and the daily average concentration are recorded in sheet no. 409/1/2/3 F1 by AFC. This data is used for cross-check purpose only.</p> <p>The excel book for presentation of data as required by ACM0019 v02.0 including the total hourly HNO<sub>3</sub> production and automatic checks is attached as Appendix 3 to this Monitoring Report.</p>   |       |                     |                 |        |                        |  |                                |   |                            |            |   |                                 |                      |            |                |         |                        |            |                      |            |           |            |       |                         |                 |   |                        |         |
| Value(s) of monitored parameter:              | <b>530,300 tHNO<sub>3</sub></b>  |       |                     |                 |        |                        |  |                                |   |                            |            |   |                                 |                      |            |                |         |                        |            |                      |            |           |            |       |                         |                 |   |                        |         |
| Monitoring equipment:                         | <p><b>Meter location:</b> Located in the nitric acid line, downstream of the absorption tower. Please refer also to <i>Section C – 1 (Line diagram)</i> of this Monitoring Report.</p> <p><b>FT 21411</b></p> <table> <tr> <td>Type:</td><td>Magnetic flow meter</td></tr> <tr> <td>Accuracy class:</td><td>±0.25%</td></tr> <tr> <td>Calibration frequency:</td><td>Instrument applied requires no regular calibration after factory calibration</td></tr> <tr> <td>General maintenance frequency:</td><td>2 years from commissioning or latest general maintenance (meter verification)</td></tr> </table> <p><u>Meter Verification has been performed by AFC's instrumentation department in cooperation with Carbon Egypt team for this instrument during shutdown of nitric acid plant from 02/09/2013 – 05/09/2013:</u></p> <table> <tr> <td>Serial number (Installed):</td><td>0870188456</td></tr> <tr> <td>Date of last general maintenance (Installed):</td><td>03/09/2013 (meter verification)</td></tr> <tr> <td>Validity (Installed)</td><td>02/09/2015</td></tr> </table> <p><u>New factory calibrated instrument has been installed temporarily by AFC's instrumentation department in cooperation with Carbon Egypt team during shutdown of nitric acid plant from 01/04/2014 – 03/04/2014:</u></p> <table> <tr> <td>Serial number:</td><td>0252528</td></tr> <tr> <td>Date of commissioning:</td><td>03/04/2014</td></tr> <tr> <td>Date of calibration:</td><td>17/10/2013</td></tr> <tr> <td>Validity:</td><td>02/04/2016</td></tr> </table> <p><b>TE 21042</b></p> <p><u>New factory calibrated instrument has been installed by AFC's instrumentation department in cooperation with Carbon Egypt team during shutdown of nitric acid plant from 01/04/2014 – 03/04/2014:</u></p> <table> <tr> <td>Type:</td><td>Temperature transmitter</td></tr> <tr> <td>Accuracy class:</td><td>±0.15°C digital accuracy in accordance with IEC 751</td></tr> <tr> <td>Calibration frequency:</td><td>2 years</td></tr> </table> | Type: | Magnetic flow meter | Accuracy class: | ±0.25% | Calibration frequency: | Instrument applied requires no regular calibration after factory calibration | General maintenance frequency: | 2 years from commissioning or latest general maintenance (meter verification) | Serial number (Installed): | 0870188456 | Date of last general maintenance (Installed): | 03/09/2013 (meter verification) | Validity (Installed) | 02/09/2015 | Serial number: | 0252528 | Date of commissioning: | 03/04/2014 | Date of calibration: | 17/10/2013 | Validity: | 02/04/2016 | Type: | Temperature transmitter | Accuracy class: | ±0.15°C digital accuracy in accordance with IEC 751 | Calibration frequency: | 2 years |
| Type:   | Magnetic flow meter  |       |                     |                 |        |                        |  |                                |   |                            |            |   |                                 |                      |            |                |         |                        |            |                      |            |           |            |       |                         |                 |   |                        |         |
| Accuracy class:                               | ±0.25%   |       |                     |                 |        |                        |  |                                |   |                            |            |   |                                 |                      |            |                |         |                        |            |                      |            |           |            |       |                         |                 |   |                        |         |
| Calibration frequency:                        | Instrument applied requires no regular calibration after factory calibration   |       |                     |                 |        |                        |  |                                |   |                            |            |   |                                 |                      |            |                |         |                        |            |                      |            |           |            |       |                         |                 |   |                        |         |
| General maintenance frequency:                | 2 years from commissioning or latest general maintenance (meter verification)  |       |                     |                 |        |                        |  |                                |   |                            |            |   |                                 |                      |            |                |         |                        |            |                      |            |           |            |       |                         |                 |   |                        |         |
| Serial number (Installed):                    | 0870188456   |       |                     |                 |        |                        |  |                                |   |                            |            |   |                                 |                      |            |                |         |                        |            |                      |            |           |            |       |                         |                 |   |                        |         |
| Date of last general maintenance (Installed): | 03/09/2013 (meter verification)  |       |                     |                 |        |                        |  |                                |   |                            |            |   |                                 |                      |            |                |         |                        |            |                      |            |           |            |       |                         |                 |   |                        |         |
| Validity (Installed)                          | 02/09/2015   |       |                     |                 |        |                        |  |                                |   |                            |            |   |                                 |                      |            |                |         |                        |            |                      |            |           |            |       |                         |                 |   |                        |         |
| Serial number:                                | 0252528  |       |                     |                 |        |                        |  |                                |   |                            |            |   |                                 |                      |            |                |         |                        |            |                      |            |           |            |       |                         |                 |   |                        |         |
| Date of commissioning:                        | 03/04/2014   |       |                     |                 |        |                        |  |                                |   |                            |            |   |                                 |                      |            |                |         |                        |            |                      |            |           |            |       |                         |                 |   |                        |         |
| Date of calibration:                          | 17/10/2013   |       |                     |                 |        |                        |  |                                |   |                            |            |   |                                 |                      |            |                |         |                        |            |                      |            |           |            |       |                         |                 |   |                        |         |
| Validity:                                     | 02/04/2016   |       |                     |                 |        |                        |  |                                |   |                            |            |   |                                 |                      |            |                |         |                        |            |                      |            |           |            |       |                         |                 |   |                        |         |
| Type:   | Temperature transmitter  |       |                     |                 |        |                        |  |                                |   |                            |            |   |                                 |                      |            |                |         |                        |            |                      |            |           |            |       |                         |                 |   |                        |         |
| Accuracy class:                               | ±0.15°C digital accuracy in accordance with IEC 751  |       |                     |                 |        |                        |  |                                |   |                            |            |   |                                 |                      |            |                |         |                        |            |                      |            |           |            |       |                         |                 |   |                        |         |
| Calibration frequency:                        | 2 years  |       |                     |                 |        |                        |  |                                |   |                            |            |   |                                 |                      |            |                |         |                        |            |                      |            |           |            |       |                         |                 |   |                        |         |

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|  | Serial number (old): 2304657<br>Date of calibration check (old): 03/09/2013<br>Validity (old): 02/09/2015<br><br>Serial number (new): 2551332<br>Date of commissioning (new): 03/04/2014<br>Date of calibration (new): 28/10/2013<br>Validity (new): 27/10/2015  |
| Measuring/<br>Reading/<br>Recording frequency: | Measuring: Continuously<br>Reading: Hourly<br>Recording: Hourly  |
| Calculation method<br>(if applicable):         | -  |
| QA/QC procedures:                              | <p>In order to prove plausibility of HNO<sub>3</sub> production, cross-checks will be performed (conversion efficiency).</p> <p>The quality assurance and quality control procedures, in terms of equipment operations and maintenance, have been incorporated in the ISO 9001:2008 and ISO 14001:2009 procedures of AFC.</p> <p>Please refer also to <i>Section C – 3. Back Up plans / Emergency procedures for monitoring system</i> of this Monitoring Report and respective sub items <i>Back Up Plans for measuring systems / Periodically observation of the automated monitoring system</i> and <i>Systematic measures for QA for monitoring data during analyser down times</i>.</p> |
| Purpose of data:                               | Calculation of baseline emissions  |
| Additional comment:                            | The parameter P <sub>NA,h</sub> (Nitric acid produced in the hour h) represents the hourly value of P <sub>production,y</sub> and is used for determining h <sub>r,y</sub> as described in section 5.3.3 of the applied methodology.   |

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| <b>Data / Parameter</b>          | <b>h<sub>y</sub></b>   |
| Unit                             | h  |
| Description                      | Number of hours of operation in year y   |
| Source of data                   | Measured   |
| Value(s) of monitored parameter: | <b>6,874 h</b>   |
| Monitoring equipment:            | <p><b>Meter location:</b> Located in the two ammonia oxidation reactors. Please refer also to <i>Section C – 1 (Line diagram)</i> of this Monitoring Report.</p> <p><b>Burner I:</b><br/> <b>TE 21014 and TE 21015</b><br/>         The same instruments have been calibrated during shutdown of nitric acid plant from 02/09/2013 – 05/09/2013:<br/>         Type: Temperature transmitter<br/>         Accuracy class: ±0.7°C digital accuracy in accordance with IEC 584<br/>         Serial number: 2304376 / 2304377<br/>         Calibration frequency: 2 years<br/>         Date of commissioning: 05/09/2013<br/>         Date of calibration check: 03/09/2013<br/>         Validity: 02/09/2015</p> <p><b>Burner II:</b><br/> <b>TE 21020 and TE 21021</b><br/>         The same instruments have been calibrated during shutdown of nitric acid</p> |

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|  | plant from 02/09/2013 – 05/09/2013:<br>Type: Temperature transmitter<br>Accuracy class: $\pm 0.7^{\circ}\text{C}$ digital accuracy in accordance with IEC 584<br>Serial number: 2304378 / 2304379<br>Calibration frequency: 2 years<br>Date of commissioning: 05/09/2013<br>Date of calibration check: 03/09/2013<br>Validity: 02/09/2015  |
| Measuring/<br>Reading/<br>Recording frequency: | Measuring: Continuously<br>Reading: Hourly<br>Recording: Hourly  |
| Calculation method<br>(if applicable):         | <p>The operation temperature of the two oxidation burners ranges from 850 – 910°C (as defined by the technology supplier) and this range corresponds to the real operation hours of the reactor. Therefore the plant is considered to be in operation when the temperature is in a range from 850 – 910°C. The temperature is reported automatically by two independent measurement points for each burner measuring the temperature at the same time.</p> <p>Instruments TAG numbers:<br/> <b>Burner I:</b><br/>             TE 21014<br/>             TE 21015<br/> <b>Burner II:</b><br/>             TE 21020<br/>             TE 21021</p> <p>The values of the instrument with the TAG numbers TE 21015 and TE 21021 were selected as <u>main signals</u> for monitoring the operation temperature; TE 21014 and TE 21020 are used as back-up signals in case of malfunction of the main signals.</p> <p>The information will be stored in electronic records and paper during whole project's lifetime.</p> |
| QA/QC procedures:                              | <p>Periodic calibration of relevant temperature transmitter as above mentioned will be performed according to supplier's recommendations.</p> <p>The quality assurance and quality control procedures, in terms of equipment operations and maintenance, have been incorporated in the ISO 9001:2008 and ISO 14001:2009 procedures of AFC.</p>   |
| Purpose of data                                | Calculation of baseline and project emissions  |
| Additional comment                             | Records to be maintained during project's lifetime   |

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|--|---|
| <b>Data / Parameter</b>                        | <b><math>h_{r,y}</math></b>   |
| Unit   | h   |
| Description                                    | For tertiary N <sub>2</sub> O abatement, Number of hours ( <i>h</i> ) in year <i>y</i> where the abatement system is by-passed, underperforming or failed |
| Source of data                                 | Measured  |
| Value(s) of monitored parameter:               | <b>0 h</b>  |
| Monitoring equipment:                          | -   |
| Measuring/<br>Reading/<br>Recording frequency: | Measuring: Continuously<br>Reading: Hourly<br>Recording: Hourly   |

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| Calculation method (if applicable): | <p>AFC nitric acid plant has used AM0028 in the first crediting period, accordingly the abatement system is deemed to be by-passed, not working or failed in the hour h in year y if:</p> $F_{N_2O, tailgas, h} > EF_{existing, y} \times P_{NA, h}$ <p>The parameters mentioned above will be determined and monitored as explained in the respective sections of this monitoring report:</p> <ul style="list-style-type: none"> <li>• <math>P_{NA, h}</math> see parameter <math>P_{production, y}</math></li> <li>• <math>F_{N_2O, tailgas, h}</math> see parameters <math>V_{t, db, n}</math>, <math>V_{i, t, db}</math> and <math>C_{H_2O, t, db, n}</math></li> <li>• <math>EF_{existing, y}</math> needs not to be monitored, since it's fixed for the crediting period.</li> </ul> |
| QA/QC procedures:                   | The quality assurance and quality control procedures, in terms of equipment operations and maintenance, have been incorporated in the ISO 9001:2008 and ISO 14001:2009 procedures of AFC.  |
| Purpose of data                     | Calculation of baseline and project emissions  |
| Additional comment                  | <p>Records to be maintained during project's lifetime.</p> <p>The parameter <math>P_{NA, h}</math> (Nitric acid produced in the hour h) represents the hourly value of <math>P_{production, y}</math> and is used for determining <math>h_{r, y}</math> as described in section 5.3.3 of the applied methodology.</p>  |

Parameters from the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 02.0.0)

|                                  |  |       |                                    |                 |                            |                        |         |                |                   |                        |            |                      |            |           |            |       |                          |                 |   |                        |         |
|----------------------------------|--|-------|------------------------------------|-----------------|----------------------------|------------------------|---------|----------------|-------------------|------------------------|------------|----------------------|------------|-----------|------------|-------|--------------------------|-----------------|---|------------------------|---------|
| Data / Parameter                 | $V_{t, db, n}$   |       |                                    |                 |                            |                        |         |                |                   |                        |            |                      |            |           |            |       |                          |                 |   |                        |         |
| Unit                             | Nm <sup>3</sup> dry gas/h  |       |                                    |                 |                            |                        |         |                |                   |                        |            |                      |            |           |            |       |                          |                 |   |                        |         |
| Description                      | Volumetric flow of the gaseous stream in time interval t on a dry basis  |       |                                    |                 |                            |                        |         |                |                   |                        |            |                      |            |           |            |       |                          |                 |   |                        |         |
| Source of data                   | Measured   |       |                                    |                 |                            |                        |         |                |                   |                        |            |                      |            |           |            |       |                          |                 |   |                        |         |
| Value(s) of monitored parameter: | <b>235,507 Nm<sup>3</sup> dry gas/h</b><br>(Standard temperature: 273.15K, standard pressure: 1,013.25 hPa)  |       |                                    |                 |                            |                        |         |                |                   |                        |            |                      |            |           |            |       |                          |                 |   |                        |         |
| Monitoring equipment:            | <p>Venturi tube, designed and manufactured in accordance with ISO 5167-4:2003</p> <p><b>Meter location:</b> Located in the tail gas line, downstream of the EnviNO<sub>x</sub>® reactor (21R004). Please refer also to <i>Section C – 1 (Line diagram)</i> of this Monitoring Report.</p> <p><b>FT 218003A/B</b><br/>           The same instruments have been calibrated during shutdown of nitric acid plant from 02/09/2013 – 05/09/2013:</p> <table> <tr> <td>Type:</td> <td>Differential pressure transmitters</td> </tr> <tr> <td>Accuracy class:</td> <td>±0.075% of calibrated span</td> </tr> <tr> <td>Calibration frequency:</td> <td>2 years</td> </tr> <tr> <td>Serial number:</td> <td>8657986 / 8657987</td> </tr> <tr> <td>Date of commissioning:</td> <td>05/09/2013</td> </tr> <tr> <td>Date of calibration:</td> <td>03/09/2013</td> </tr> <tr> <td>Validity:</td> <td>02/09/2015</td> </tr> </table> <p><b>TE 218005A/B</b><br/>           The same instruments have been calibrated during shutdown of nitric acid plant from 02/09/2013 – 05/09/2013:</p> <table> <tr> <td>Type:</td> <td>Temperature transmitters</td> </tr> <tr> <td>Accuracy class:</td> <td>±0.1% of calibrated span in accordance with IEC 584</td> </tr> <tr> <td>Calibration frequency:</td> <td>2 years</td> </tr> </table> | Type: | Differential pressure transmitters | Accuracy class: | ±0.075% of calibrated span | Calibration frequency: | 2 years | Serial number: | 8657986 / 8657987 | Date of commissioning: | 05/09/2013 | Date of calibration: | 03/09/2013 | Validity: | 02/09/2015 | Type: | Temperature transmitters | Accuracy class: | ±0.1% of calibrated span in accordance with IEC 584 | Calibration frequency: | 2 years |
| Type:                            | Differential pressure transmitters   |       |                                    |                 |                            |                        |         |                |                   |                        |            |                      |            |           |            |       |                          |                 |   |                        |         |
| Accuracy class:                  | ±0.075% of calibrated span   |       |                                    |                 |                            |                        |         |                |                   |                        |            |                      |            |           |            |       |                          |                 |   |                        |         |
| Calibration frequency:           | 2 years  |       |                                    |                 |                            |                        |         |                |                   |                        |            |                      |            |           |            |       |                          |                 |   |                        |         |
| Serial number:                   | 8657986 / 8657987  |       |                                    |                 |                            |                        |         |                |                   |                        |            |                      |            |           |            |       |                          |                 |   |                        |         |
| Date of commissioning:           | 05/09/2013   |       |                                    |                 |                            |                        |         |                |                   |                        |            |                      |            |           |            |       |                          |                 |   |                        |         |
| Date of calibration:             | 03/09/2013   |       |                                    |                 |                            |                        |         |                |                   |                        |            |                      |            |           |            |       |                          |                 |   |                        |         |
| Validity:                        | 02/09/2015   |       |                                    |                 |                            |                        |         |                |                   |                        |            |                      |            |           |            |       |                          |                 |   |                        |         |
| Type:                            | Temperature transmitters   |       |                                    |                 |                            |                        |         |                |                   |                        |            |                      |            |           |            |       |                          |                 |   |                        |         |
| Accuracy class:                  | ±0.1% of calibrated span in accordance with IEC 584  |       |                                    |                 |                            |                        |         |                |                   |                        |            |                      |            |           |            |       |                          |                 |   |                        |         |
| Calibration frequency:           | 2 years  |       |                                    |                 |                            |                        |         |                |                   |                        |            |                      |            |           |            |       |                          |                 |   |                        |         |

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|  | <p>Serial number: 2420014 / 2420015<br/> Date of commissioning: 05/09/2013<br/> Date of calibration: 03/09/2013<br/> Validity: 02/09/2015</p> <p><b>PT 218006A/B</b><br/> The same instruments have been calibrated during shutdown of nitric acid plant from 02/09/2013 – 05/09/2013:<br/> Type: Pressure transmitters<br/> Accuracy class: <math>\pm 0.075\%</math> of calibrated span<br/> Calibration frequency: 2 years<br/> Serial number: 8657989 / 8657990<br/> Date of commissioning: 05/09/2013<br/> Date of calibration: 03/09/2013<br/> Validity: 02/09/2015</p>   |
| Measuring/<br>Reading/<br>Recording frequency: | <p>Measuring: Continuously<br/> Reading: Every 1 second<br/> Recording: Hourly</p>   |
| Calculation method<br>(if applicable):         | <p>Volumetric flow measurement refers to normal conditions.<br/> Calculated based on the flow measurement on dry basis plus water concentration (according to Option A of the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”).</p>  |
| QA/QC procedures:                              | <p>The plausibility of measured values was checked with the values of the redundant instruments.</p> <p>The quality assurance and quality control procedures, in terms of equipment operations and maintenance, have been incorporated in the ISO 9001:2008 and ISO 14001:2009 procedures of AFC. Reliability and accuracy of data, is guaranteed as the instruments were continuously calibrated and maintained according to the QA/QC procedures.</p> <p>Please refer also to <i>Section C. – Back Up plans / Emergency procedures for monitoring system</i> of this Monitoring Report and respective sub-items.</p> |
| Purpose of data                                | Calculation of project emissions   |
| Additional comment                             | <p>Option A parameter, according to the applied tool.<br/> The volume flow is converted to normal conditions according to the applied methodology. Therefore, the respective parameters were determined at normal conditions (<math>P_t = P_n = 101,325 \text{ Pa}</math>; <math>T_t = T_n = 273.15 \text{ K}</math>).</p> <p><b>The information given in this table applies during the validity of temporary deviation from 15/09/2013 – 01/04/2014 (Temporary deviation – Section B 2.1)</b></p>   |

|                                  |   |
|----------------------------------|---|
| <b>Data / Parameter</b>          | <b><math>V_{t,db,n}</math></b>  |
| Unit                             | Nm <sup>3</sup> dry gas/h   |
| Description                      | Volumetric flow of the gaseous stream in time interval t on a dry basis   |
| Source of data                   | Measured  |
| Value(s) of monitored parameter: | <b>236,697 Nm<sup>3</sup> dry gas/h</b><br>(Standard temperature: 273.15K, standard pressure: 1,013.25 hPa)   |
| Monitoring equipment:            | <p><b>Meter location:</b> Located in the tail gas line, downstream of the EnviNO<sub>x</sub>® reactor (21R004) (at Stack). Please refer also to <i>Section C – 1 (Line diagram)</i> of this Monitoring Report.</p> <p><b>FT-21492</b><br/> New factory calibrated instrument has been installed by AFC's instrumentation department in cooperation with EMERSON Process</p> |

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|  | <p><u>Management during shutdown of nitric acid plant from 01/04/2014 – 03/04/2014:</u></p> <p>Type: Differential pressure transmitters<br/> Manufacturer: SKI<br/> Accuracy class: According to QAL1 certificate<br/> Check of calibration frequency: 4 weeks according to QAL1 certificate<br/> Serial number: 13069588 / FT-21492<br/> Date of commissioning: 03/04/2014<br/> Date of penultimate calibration: 20/05/2014<br/> Date of calibration: 29/05/2014<br/> Validity: 25/06/2014</p> <p>The schedule of the transmitter calibration takes place as per the check of calibration frequency besides the nitric acid plant operation circumstances (safety instructions have to be followed).</p> |
| Measuring/<br>Reading/<br>Recording frequency: | Measuring: Continuously<br>Reading: Every 1 second<br>Recording: Hourly   |
| Calculation method<br>(if applicable):         | <p>Volumetric flow measurement will refer to normal conditions.</p> <p>Calculated based on the flow measurement on dry basis plus water concentration (according to Option A of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream").</p>   |
| QA/QC procedures:                              | <p>According to European Norm 14181.</p> <p>Calibration and frequency of calibration is according to manufacturer's specifications.</p> <p>The quality assurance and quality control procedures, in terms of equipment operations and maintenance, have been incorporated in the ISO 9001:2008 and ISO 14001:2009 procedures of AFC.</p> <p>Please refer also to <i>Section C. – Back Up plans / Emergency procedures for monitoring system</i> of this Monitoring Report and respective sub-items.</p>   |
| Purpose of data                                | Calculation of project emissions  |
| Additional comment                             | <p>Option A parameter, according to the applied tool</p> <p>The volume flow is converted to normal conditions according to the applied methodology. Therefore, the respective parameters were determined at normal conditions (<math>P_t = P_n = 101,325 \text{ Pa}</math>; <math>T_t = T_n = 273.15 \text{ K}</math>).</p> <p><b>The information given in this table applies after validity of temporary deviation from 02/04/2014 onwards (Temporary deviation – Section B 2.1).</b></p>  |

|                                  |   |
|----------------------------------|---|
| <b>Data / Parameter</b>          | <b><math>V_{i,t,db}</math></b>  |
| Unit                             | Nm <sup>3</sup> gas i/Nm <sup>3</sup> dry gas   |
| Description                      | Volumetric fraction of greenhouse gas i in a time interval t on a dry basis   |
| Source of data                   | Measured  |
| Value(s) of monitored parameter: | <p><b><math>8.74 \cdot 10^{-6} \text{ Nm}^3 \text{ gas N}_2\text{O} / \text{Nm}^3 \text{ dry gas}</math></b><br/> (Standard temperature: 273.15K, standard pressure: 1,013.25 hPa)</p> <p>An excel book containing recorded daily values (for all days covered by this monitoring period), is attached as Appendix 3 to this Monitoring Report.</p> |

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| Monitoring equipment:                          | <p><b>Meter location:</b> Sample take-off is located in the tail gas line, downstream of the EnviNO<sub>x</sub>® reactor (21R004) and leads (via sample gas line) to the locked analyser house (located closely to the EnviNO<sub>x</sub>® reactor), where analysers and standard gases for calibrations are installed. Please refer also to <i>Section C – 1 (Line diagram)</i> of this Monitoring Report.</p> <p><b>AT 218002</b></p> <p>Type: NDIR Analyser</p> <p>Accuracy class: ±1% (zero/span)</p> <p>Serial Number: MLT: 990561462895</p> <p>Calibration Frequency: Zero calibration daily (automatically)<br/>Span calibration every other day (automatically)</p> <p>Date of last calibration: Done on daily basis</p> <p>Validity: Confirmed by complying with accuracy safe guarding instructions from Emerson Process Management</p> |
| Measuring/<br>Reading/<br>Recording frequency: | <p>Measuring: Continuously</p> <p>Reading: Every 1 second</p> <p>Recording: Hourly</p>  |
| Calculation method (if applicable):            | -   |
| QA/QC procedures:                              | <p>According to European Norm 14181.</p> <p>Calibration should include zero verification with an inert gas (N<sub>2</sub>) and at least one reading verification with a standard gas (single calibration gas or mixture calibration gas).</p> <p>Certified (certificates confirming stability of standard) standard gases are used.</p> <p>The quality assurance and quality control procedures, in terms of equipment operations and maintenance, have been incorporated in the ISO 9001:2008 and ISO 14001:2009 procedures of AFC.</p>  |
| Purpose of data                                | Calculation of project emissions  |
| Additional comment                             | The N <sub>2</sub> O concentration is converted to normal conditions according to the applied methodology. Therefore, the respective parameters were determined at normal conditions ( $P_t = P_n = 101,325 \text{ Pa}$ ; $T_t = T_n = 273.15 \text{ K}$ ).   |

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| <b>Data / Parameter</b>                        | <b>C<sub>H2O,t,db,n</sub></b>   |
| Unit   | mg H <sub>2</sub> O/m <sup>3</sup> dry gas  |
| Description                                    | Moisture content of the gaseous stream at normal conditions, in time interval t   |
| Source of data                                 | <p>Measurements according to the USEPA CF42 method 4 – Gravimetric determination of water content (QAL2 Report)</p> <p>Date of penultimate determination (QAL2): 10/07/2014</p>   |
| Value(s) of monitored parameter:               | <p><b>2,500 mg H<sub>2</sub>O/m<sup>3</sup> dry gas</b> (equivalent to 0.0025 kg H<sub>2</sub>O/m<sup>3</sup> dry gas; Highest measured value)</p> <p>Option A of the tool can be applied, as the moisture content is less than 0.05 kg H<sub>2</sub>O/m<sup>3</sup> dry gas.</p> |
| Monitoring equipment:                          | NA  |
| Measuring/<br>Reading/<br>Recording frequency: | <p>Measuring / Reading / Recording: Yearly</p> <p>Measurements will coincide with the Annual Surveillance Test (associated with requirements of the EN 14181 standard) or the calibration of the flow meter for the gaseous stream.</p>   |

|                                     |  |
|-------------------------------------|--|
| Calculation method (if applicable): | NA   |
| QA/QC procedures:                   | According to USEPA CF 42 method 4                              |
| Purpose of data                     | Calculation of project emissions                               |
| Additional comment                  | Option A parameter for proving that the gaseous stream is dry. |

Since the N<sub>2</sub>O concentration and the volume flow are converted to normal conditions according to the applied methodology the parameters T<sub>i</sub> and P<sub>i</sub> need not to be monitored.

*Parameters from the "Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion" (Version 02)*

|                                  |  |
|----------------------------------|--|
| <b>Data / Parameter:</b>         | <b>FC<sub>i,j,y</sub></b>  |
| Unit                             | Nm <sup>3</sup> /y   |
| Description                      | Quantity of fuel type i combusted in process j during the year y   |
| Source of data                   | Measured<br><br>The natural gas used as reducing agent is measured by standard flow meter. Flow is converted to standard conditions based on temperature and pressure measurement.   |
| Value(s) of monitored parameter: | <b>556,373 Nm<sup>3</sup>/y</b>  |
| Monitoring equipment:            | <p><b>Meter location:</b> Located in the natural gas line, upstream of the EnviNO<sub>x</sub>® reactor (21R004). Please refer also to <i>Section C – 1 (Line diagram)</i> of this Monitoring Report.</p> <p><b>FT 218002</b><br/>Factory recalibrated instrument of the same type was installed during the shutdown of the nitric acid from 02/09/2013 – 05/09/2013:<br/> Type: Natural gas flow meter<br/> Accuracy class: ±1.6% in accordance with VDI/VDE 3513<br/> Calibration frequency: 2 years<br/> Date of commissioning: 05/09/2013<br/> Serial number: 6/191199.001<br/> Date of factory calibration: 09/04/2013<br/> Validity: 08/04/2015</p> <p><b>TE 218004</b><br/>The same instruments have been calibrated during shutdown of nitric acid plant from 02/09/2013 – 05/09/2013:<br/> Type: Temperature transmitter<br/> Accuracy class: ±0.1% of calibrated span<br/> Calibration frequency: 2 years<br/> Serial number: 2420017<br/> Date of commissioning: 05/09/2013<br/> Date of calibration: 03/09/2013<br/> Validity: 02/09/2015</p> <p><b>PT 218004</b><br/>Factory recalibrated instrument of the same type was installed during the shutdown of the nitric acid from 02/09/2013 – 05/09/2013:<br/> Type: Pressure transmitter<br/> Accuracy class: ±0.075% of calibrated span<br/> Calibration frequency: 2 years<br/> Date of commissioning: 05/09/2013<br/> Serial number: 8195466<br/> Date of factory calibration: 25/04/2013</p> |

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|  | Validity: 24/04/2015   |
| Measuring/<br>Reading/<br>Recording frequency: | Measuring: Continuously<br>Reading: Every 1 second<br>Recording: Hourly  |
| Calculation method<br>(if applicable):         | NA   |
| QA/QC procedures:                              | The quality assurance and quality control procedures, in terms of equipment operations and maintenance, have been incorporated in the ISO 9001:2008 and ISO 14001:2009 procedures of AFC.<br><br>Please refer also to <i>Section C. – Back Up plans / Emergency procedures for monitoring system</i> of this Monitoring Report and respective sub-items. |
| Purpose of data                                | Calculation of project emissions   |
| Additional comment                             | NA   |

|  |   |
|--|---|
| <b>Data / Parameter:</b>                       | <b><math>w_{C,i,y}</math></b>   |
| Unit   | tC/mass unit of the fuel type   |
| Description                                    | Weighted average mass fraction of carbon in fuel type i in year y   |
| Source of data                                 | Certificate of hydrocarbon supplier   |
| Value(s) of monitored parameter:               | <b>0.75</b>   |
| Monitoring equipment:                          | Composition of the delivered hydrocarbon is measured by the supplier and provided on specific certificates.   |
| Measuring/<br>Reading/<br>Recording frequency: | Measuring; In order to assure conservativeness a certificate from the hydrocarbon supplier is requested at least on a yearly basis.   |
| Calculation method<br>(if applicable):         | Composition of the delivered hydrocarbon is measured by the supplier and provided on specific certificates. The mass fraction of carbon should be obtained regularly, from which weighted average annual values should be calculated. |
| QA/QC procedures:                              | It will be verified, if the applied value is within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines.  |
| Purpose of data                                | Calculation of project emissions  |
| Additional comment                             | Applicable where Option A of the tool is used   |

|  |  |
|--|--|
| <b>Data / Parameter:</b>                       | <b><math>\rho_{i,y}</math></b>   |
| Unit   | t/Nm <sup>3</sup>  |
| Description                                    | Weighted average density of fuel type i in year y  |
| Source of data                                 | Hydrocarbon supplier certificate   |
| Value(s) of monitored parameter:               | <b><math>7.8 \cdot 10^{-4}</math></b>  |
| Monitoring equipment:                          | Composition of the delivered hydrocarbon is measured by the supplier and provided on specific certificates.  |
| Measuring/<br>Reading/<br>Recording frequency: | Measuring, In order to assure the conservativeness a certificate from the hydrocarbon supplier is requested on a yearly basis.   |
| Calculation method<br>(if applicable):         | Composition of the delivered hydrocarbon is measured by the supplier and provided on specific certificates.  |
| QA/QC procedures:                              | NA   |
| Purpose of data                                | Calculation of project emissions   |
| Additional comment                             | Applicable where Option A is used and where $FC_{i,j,y}$ is measured in a volume unit. Preferably the same data source should be used for $w_{C,i,y}$ and $\rho_{i,y}$ . |

### D.3. Implementation of sampling plan

>>

Not applicable for the project activity.

## SECTION E. Calculation of emission reductions or GHG removals by sinks

### E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

>>

According to the applied methodology ACM0019 version v02.0 the baseline emissions ( $BE_y$ ) are given by the following equation:

$$BE_y = \left( \min\{P_{production,y}; P_{product,max}\} \times EF_{existing,y} + \max\{P_{production,y} - P_{product,max}; 0\} \times EF_{new,y} \right) \times \frac{(h_y - h_{r,y})}{h_y} \times GWP_{N_2O} \times 10^{-3}$$

Where:

- $BE_y$  = Baseline emissions in year  $y$  (t CO<sub>2</sub>e)
- $P_{product,max}$  = Design capacity (t HNO<sub>3</sub>)
- $P_{production,y}$  = Production of nitric acid in year  $y$  (t HNO<sub>3</sub>)
- $EF_{existing,y}$  = N<sub>2</sub>O emission factor for nitric acid plants that have used AM0028 or AM0034 in the first crediting period in year  $y$  (kg N<sub>2</sub>O/t HNO<sub>3</sub>)
- $EF_{new,y}$  = Baseline N<sub>2</sub>O emission factor for nitric acid production in year  $y$  (kg N<sub>2</sub>O/t HNO<sub>3</sub>)
- $GWP_{N_2O}$  = Global Warming Potential of N<sub>2</sub>O valid for the commitment period
- $h_y$  = Number of hours in year  $y$  during which the plant was in operation ( $h$ )
- $h_{r,y}$  = Number of hours ( $h$ ) in year  $y$  where:
- (a) For secondary N<sub>2</sub>O abatement: the abatement system was not installed, underperforming or failed;
  - (b) For tertiary N<sub>2</sub>O abatement: the abatement system is bypassed, underperforming or failed

The values for the present period are:

| Year / Period                  | $BE_y$             | $EF_{existing,y}$                      | $EF_{new,y}$                           | $P_{production,y}$ | $P_{production,max}$ | $h_y$        | $h_{r,y}$ | $GWP_{N_2O}$ |
|--------------------------------|--------------------|--|--|--------------------|----------------------|--------------|-----------|--------------|
|                                | tCO <sub>2</sub> e | kg N <sub>2</sub> O/t HNO <sub>3</sub> | kg N <sub>2</sub> O/t HNO <sub>3</sub> | tHNO <sub>3</sub>  | tHNO <sub>3</sub>    | h            | h         | -            |
| 15/09/2013 – 31/12/2013        | 432,246            | 7.23                                   | 3.70                                   | 200,626            | 207,360              | 2,592        | 0         | 298          |
| 01/01/2014 – 30/06/2014        | 710,279            | 7.23                                   | 3.50                                   | 329,674            | 342,560              | 4,282        | 0         | 298          |
| <b>15/09/2013 – 30/06/2014</b> | <b>1,142,525</b>   |  |  | <b>530,300</b>     |                      | <b>6,874</b> | <b>0</b>  |              |

Determination of the baseline N<sub>2</sub>O emission factor ( $EF_{existing,y}$ ):

$$EF_{existing,y} = \min\{EF_{historical}; EF_{default,y}\}$$

Where:

- $EF_{existing,y}$  = N<sub>2</sub>O emission factor for nitric acid plants that have used AM0028 or AM0034 in the first crediting period in year  $y$  (kg N<sub>2</sub>O/t HNO<sub>3</sub>)
- $EF_{historical}$  = Historical baseline emission factor of the nitric acid plant (kg N<sub>2</sub>O/t HNO<sub>3</sub>)
- $EF_{default,y}$  = Default emission factor according to the operating pressure of the ammonia burner in year  $y$  (kg N<sub>2</sub>O/t HNO<sub>3</sub>)

If the monitoring period spans across two (or more) calendar years, the baseline emissions ( $BE_y$ ) shall be calculated separately for each calendar year, first establishing  $EF_{existing,y}$ ,  $EF_{new,y}$ ,  $EF_{default,y}$  and then applying this to the nitric acid production of that calendar year.

The values for the present period are:

| Year / Period           | $EF_{existing,y}$                      | $EF_{historical,y}$                    | $EF_{default,y}$<br>(For medium pressure) |
|-------------------------|--|--|---|
|                         | kg N <sub>2</sub> O/t HNO <sub>3</sub> | kg N <sub>2</sub> O/t HNO <sub>3</sub> | kg N <sub>2</sub> O/t HNO <sub>3</sub>    |
| 15/09/2013 – 31/12/2013 | 7.23                                   | 7.23                                   | 8.40                                      |
| 01/01/2014 – 30/06/2014 | 7.23                                   | 7.23                                   | 8.20                                      |

## E.2. Calculation of project emissions or actual net GHG removals by sinks

>>

Project emissions ( $PE_y$ ) are defined by the following equation:

$$PE_y = PE_{N_2O,y} + PE_{CO_2,tertiary,y}$$

Where:

- $PE_y$  = Project emissions in year  $y$  (t CO<sub>2</sub>e)
- $PE_{N_2O,y}$  = Project emissions of N<sub>2</sub>O from the project plant in year  $y$  (t CO<sub>2</sub>e)
- $PE_{CO_2,tertiary,y}$  = Project emissions of CO<sub>2</sub> from the operation of the tertiary N<sub>2</sub>O abatement facility in year  $y$  (t CO<sub>2</sub>)

The values for the present period are:

| Year / Period           | $PE_y$              | $PE_{N_2O,y}$       | $PE_{CO_2,tertiary,y}$ |
|-------------------------|---------------------|---------------------|------------------------|
|                         | t CO <sub>2</sub> e | t CO <sub>2</sub> e | t CO <sub>2</sub> e    |
| 15/09/2013 – 30/06/2014 | 9,703               | 8,515               | 1,188                  |

Project emissions of N<sub>2</sub>O from the project plant ( $PE_{N_2O,y}$ ):

$$PE_{N_2O,y} = \sum_1^{h_y-h_{r,y}} F_{N_2O,tailgas,h} \times GWP_{N_2O} \times 10^{-3}$$

Where:

- $PE_{N_2O,y}$  = Project emissions of N<sub>2</sub>O from the project plant in year  $y$  (t CO<sub>2</sub>e)
- $GWP_{N_2O}$  = Global warming potential of N<sub>2</sub>O valid for the commitment period

- $F_{N_2O, tail\ gas, h}$  = Mass flow of  $N_2O$  in the gaseous stream of the tail gas in the hour  $h$  (kg  $N_2O/h$ )
- $h_y$  = Number of hours in year  $y$  during which the plant was in operation ( $h$ )
- $h_{r,y}$  = Number of hours ( $h$ ) in year  $y$  where:
- For secondary  $N_2O$  abatement. Abatement system was not installed, underperforming or failed;
  - For tertiary  $N_2O$  abatement. The abatement system is by-passed, underperforming or failed

The values for the present period are:

| Year / Period                  | $PE_{N_2O, y}$      | $F_{N_2O, tail\ gas, h}$ | $h_y$        | $h_{r,y}$ | $GWP_{N_2O}$ |
|--------------------------------|---------------------|--------------------------|--------------|-----------|--------------|
|                                | t CO <sub>2</sub> e | kg $N_2O/h$              | h            | h         | -            |
| <b>15/09/2013 – 30/06/2014</b> | <b>8,515</b>        | <b>27,880</b>            | <b>6,874</b> | <b>0</b>  | <b>298</b>   |

#### Determination of $F_{N_2O, tail\ gas, h}$ :

The amount of  $N_2O$  emissions from the tail gas stream of the project plant shall be determined using the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”. In applying the tool, the following provisions apply:

- Throughout the crediting periods of the project activity, the  $N_2O$  concentration and volume or mass flow of the tail gas are to be monitored continuously. The monitoring system is to be installed and maintained throughout the crediting period based on the European Norm 14181 (2004), or any more recent update of that standard;
- The monitoring system should provide separate hourly average values for the  $N_2O$  concentration and the volume or mass flow of the tail gas based on two seconds (or shorter) interval readings that are recorded and stored electronically. These  $N_2O$  data sets shall be identified by means of a unique time/date key indicating when exactly the values were observed;
- The correction factors derived from the calibration curve of the QAL2 audit for the monitoring components as determined during the QAL2-test in accordance with EN14181 must be applied to both the  $N_2O$  concentration and the volume or mass flow of the tail gas. This can either be applied automatically to the raw data recorded by the data storage system at the plant or it can be applied to the calculated hourly averages as part of the calculation of project emissions;
- If data for either the  $N_2O$  concentration or the volume or mass flow of the tail gas are not available for more than 1/3 of any hour while the plant was in operation, the value for that hour shall be replaced with the maximum value of  $N_2O$  concentration or volume or mass flow of the tail gas observed during the monitoring period. If data for neither the  $N_2O$  concentration nor the volume or mass flow of the tail gas are available for more than 1/3 of any hour while the plant was in operation, the maximum value of mass flow of  $N_2O$  calculated during the monitoring period shall be applied to any such hour. Values observed during five operating hours before and after a plant start-up and shut-down shall not be used for the determination of the maximum values;
- In the case that the  $N_2O$  concentration and the volume or mass flow of the tail gas and by-pass are automatically converted to normal conditions by the AMS during the monitoring process, the parameters  $P_t$  and  $T_t$  do not need to be monitored

except, if applicable, for the purpose of determining the moisture content in the gaseous stream.

As described in section *B.2.1 – Temporary deviation* of this monitoring report it was not possible for the Project Participants to perform QAL2 at the beginning of 2<sup>nd</sup> crediting period. After QAL2 was performed on the period of (08/07/2014 – 10/07/2014), QAL2 correction factors were applied retrospectively in order to fully comply with the requirements.

As described in the PDD according to the applied tool the mass flow of greenhouse gas *i* in the gaseous stream in time interval *t* ( $F_{i,t}$ ) is calculated based on measurements of (a) the total volume flow or mass flow of the gas stream, (b) the volumetric fraction of the gas in the gaseous stream, and (c) the gas composition and water content. The flow and volumetric fraction may be measured on a dry basis or wet basis. The tool covers the possible measurement combinations, providing six different calculation options to determine the mass flow of a particular greenhouse gas (Option A to F).

As stated in the PDD flow measurement on a dry basis is not doable for a wet gaseous stream. Therefore, it is necessary to demonstrate that the gaseous stream is dry to use option A. There are two ways to do this:

- Measure the moisture content of the gaseous stream ( $C_{H_2O,t,db,n}$ ) and demonstrate that this is less or equal to 0.05 kg H<sub>2</sub>O/m<sup>3</sup> dry gas; or
- Demonstrate that the temperature of the gaseous stream ( $T_t$ ) is less than 60°C (333.15 K) at the flow measurement point.

Option A of the tool (measurement options: volume flow of gaseous stream on dry basis, volumetric fraction on dry or wet basis) was applied, since it was demonstrated by QAL 2, which was performed by AIRTEC in July 2014, that the gaseous stream is dry according to USEPA CF42 method 4. The measured moisture content in the stack gas is less than 0.05 kg/m<sup>3</sup> dry gas.

**Table 5:** Moisture content measurements (according to AST report)

| Measuring Sequence | Date       | Moisture Content                                  |
|--------------------|------------|---|
| 1                  | 08/07/2014 | 0.0025 kg H <sub>2</sub> O/m <sup>3</sup> dry gas |
| 2                  | 09/07/2014 | 0.0021 kg H <sub>2</sub> O/m <sup>3</sup> dry gas |
| 3                  | 10/07/2014 | 0.0024 kg H <sub>2</sub> O/m <sup>3</sup> dry gas |

The mass flow of greenhouse gas *i* ( $F_{i,t}$ )<sup>6</sup> is determined as follows:

$$F_{i,t} = V_{t,db} \times v_{i,t,db} \times \rho_{i,t}$$

With

$$\rho_{i,t} = \frac{P_t \times MM_i}{R_u \times T_t}$$

Where:

|              |   |  |
|--------------|---|--|
| $F_{i,t}$    | = | Mass flow of N <sub>2</sub> O in the gaseous stream of the tail gas in the hour <i>h</i> (kg N <sub>2</sub> O/h)                             |
| $V_{t,db}$   | = | Volumetric flow of the gaseous stream in time interval <i>t</i> on a dry basis (m <sup>3</sup> dry gas /h)                                   |
| $v_{i,t,db}$ | = | Volumetric fraction of greenhouse gas <i>i</i> in time interval <i>t</i> on dry basis (m <sup>3</sup> gas <i>i</i> / m <sup>3</sup> dry gas) |

<sup>6</sup>  $F_{i,t}$  corresponds to the parameter  $F_{N_2O,tail\ gas,h}$  of the methodology ACM0019 v02.0.

|              |   |   |
|--------------|---|---|
| $\rho_{i,t}$ | = | Density of greenhouse gas $i$ in the gaseous stream in time interval $t$ (kg gas $i$ /m <sup>3</sup> gas) |
| $P_t$        | = | Absolute pressure of the gaseous stream in time interval $t$ (Pa)   |
| $MM_i$       | = | Molecular mass of gaseous $i$ (kg/kmol)   |
| $R_u$        | = | Universal ideal gases constant (Pa.m <sup>3</sup> /kmol.K)  |
| $T_t$        | = | Temperature of gaseous stream in time interval $t$ (K)  |

The values for the present period are:

| Year / Period                  | $F_{N_2O, tail\ gas, h}$ | $\rho_{i, y}$     | $V_{t, db, n}$           | $V_{i, t, db}$  |
|--------------------------------|--------------------------|-------------------|--------------------------|---|
|                                | kg N <sub>2</sub> O/h    | t/Nm <sup>3</sup> | m <sup>3</sup> dry gas/h | m <sup>3</sup> N <sub>2</sub> O gas /m <sup>3</sup> dry gas |
| <b>15/09/2013 – 30/06/2014</b> | <b>27,880</b>            | <b>1.96</b>       | <b>235,871</b>           | <b>8.74*10<sup>-6</sup></b>                                 |

For calculation of  $F_{N_2O, tail\ gas, h}$  as well as application of calibration curves or corrections to data in case of observations and events as described above on an hourly basis, please refer to the excel book which is available as *Appendix 3* to this monitoring report.

| Year / Period                  | $\rho_{i, y}$     | $P_n$          | $MM_i$       | $R_u$                     | $T_n$         |
|--------------------------------|-------------------|----------------|--------------|---------------------------|---------------|
|                                | t/Nm <sup>3</sup> | Pa             | kg/kmol      | Pa.m <sup>3</sup> /kmol.K | K             |
| <b>15/09/2013 – 30/06/2014</b> | <b>1.96</b>       | <b>101,325</b> | <b>44.02</b> | <b>8,314</b>              | <b>273.15</b> |

#### Project emissions from the operation of the tertiary N<sub>2</sub>O abatement facility ( $PE_{CO_2, tertiary, y}$ ):

This emission source only needs to be estimated if a tertiary N<sub>2</sub>O abatement facility is installed under the project activity and if fossil fuels are used to operate the facility or re-heat the gas after the facility. This applies to the project activity as a tertiary N<sub>2</sub>O abatement facility is installed.

The emissions related to the operation of the N<sub>2</sub>O destruction facility include only on-site emissions due to the fossil fuel use as input to the N<sub>2</sub>O destruction facility:

$$PE_{CO_2, tertiary, y} = PE_{FF, y}$$

Where:

|                          |   |  |
|--------------------------|---|--|
| $PE_{CO_2, tertiary, y}$ | = | Project emissions of CO <sub>2</sub> from the operation of the tertiary N <sub>2</sub> O abatement facility in year $y$ (t CO <sub>2</sub> ) |
| $PE_{FF, y}$             | = | Project emissions related to fossil fuel input to the destruction facility and/or re-heater in year $y$ (t CO <sub>2</sub> )                 |

Project proponents shall use the latest version of the “Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion” to calculate the project emissions related to fossil fuels used in year  $y$ . Specific guidance on the use of the tool are:

- The parameter  $PE_{FC, j, y}$  used in the “Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion” corresponds to the parameter  $PE_{FF, y}$  in this methodology; and
- The element process  $j$  in the tool corresponds to the consumption of fossil fuels for the operation of the tertiary N<sub>2</sub>O abatement facility and/or the re-heating of the tail gas.

It shall be considered that for synchronizing the applied tool with the methodology, “Annual”, “Yearly”, “yr” and the year “ $y$ ” are understood to cover the same time period unless otherwise explained.

The values for the present period are:

| Year / Period           | $PE_{CO_2,tertiary,y} = PE_{FF,y} = PE_{FC,i,y}$ |
|-------------------------|--|
|                         | tCO <sub>2</sub>                                 |
| 15/09/2013 – 30/06/2014 | 1,188  |

According to the applied tool CO<sub>2</sub> emissions from fossil fuel combustion in process *j* are calculated based on the quantity of fuels combusted and the CO<sub>2</sub> emission coefficient of those fuels, as follows:

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y}$$

Where:

- $PE_{FC,j,y}$  = Are the CO<sub>2</sub> emissions from fossil fuel combustion in process *j* during the year *y* (tCO<sub>2</sub>/yr)
- $FC_{i,j,y}$  = Is the quantity of fuel type *i* combusted in process *j* during the year *y* (mass or volume unit/yr)
- $COEF_{i,y}$  = Is the CO<sub>2</sub> emission coefficient of fuel type *i* in year *y* (tCO<sub>2</sub>/mass or volume unit)
- i* = Are the fuel types combusted in process *j* during the year *y*

Option A of the tool will be applied, as the chemical composition of the used fossil fuel (i.e. natural gas) will be provided by the natural gas supplier.

The CO<sub>2</sub> emission coefficient  $COEF_{i,y}$  is calculated based on the chemical composition of the fossil fuel type *i*, using the following approach:

$$COEF_{i,y} = w_{C,i,y} \times \rho_{i,y} \times 44/12 \quad FC_{i,j,y} \text{ is measured in a volume unit}$$

Where:

- $COEF_{i,y}$  = Is the CO<sub>2</sub> emission coefficient of fuel type *i* (t CO<sub>2</sub>/mass or volume unit)
- $w_{C,i,y}$  = Is the weighted average mass fraction of carbon in fuel type *i* in year *y* (t C/mass unit of the fuel)
- $\rho_{i,y}$  = Is the weighted average density of fuel type *i* in year *y* (mass unit/volume unit of the fuel)
- i* = Are the fuel types combusted in process *j* during the year *y*

The values for the present period are:

| Year / Period           | $PE_{FC,j,y}$    | $FC_{i,y,j}$    | $COEF_{i,y}$                      |
|-------------------------|------------------|-----------------|-----------------------------------|
|                         | tCO <sub>2</sub> | Nm <sup>3</sup> | tCO <sub>2</sub> /Nm <sup>3</sup> |
| 15/09/2013 – 30/06/2014 | 1,188            | 556,373         | 2.13*10 <sup>-3</sup>             |

### E.3. Calculation of leakage

>>

According to the applied methodology (ACM0019 v02.0) any leakage emissions sources are deemed to be negligible.

#### E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

| Item         | Baseline emissions or baseline net GHG removals by sinks (t CO <sub>2</sub> e) | Project emissions or actual net GHG removals by sinks (t CO <sub>2</sub> e) | Leakage (t CO <sub>2</sub> e) | Emission reductions or net anthropogenic GHG removals by sinks (t CO <sub>2</sub> e) |
|--------------|--|---|-------------------------------|--|
| <b>Total</b> | 1,142,525  | 9,703   | 0                             | 1,132,822 *)   |

\*) Note that actual calculation of emissions reductions as presented in chapters E1 to E4 has been done in the excel book. Rounding in chapters E1 to E4 has just been done for ease of presentation. Please note that conservative rounding has been made for final ER<sub>y</sub> calculation only. This can be traced in the excel book attached to this monitoring report as Appendix 3.

#### E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

| Item  | Values estimated in ex-ante calculation of registered PDD                                      | Actual values achieved during this monitoring period |
|---|--|--|
| <b>Emission reductions or GHG removals by sinks (t CO<sub>2</sub>e)</b> | 378,406 (15/09/2013 – 31/12/2013)<br>634,181 (01/01/2014 – 30/06/2014)<br>1,012,587 (289 days) | 1,132,822 (289 days)                                 |

#### E.6. Remarks on difference from estimated value in registered PDD

>>

The emissions reductions in this Monitoring Period are 1,132,822 tonnes of CO<sub>2</sub> equivalents. The yearly expected emissions reductions of 2013 and 2014 according to the registered PDD are 378,406 (108 days) tonnes of CO<sub>2</sub> equivalents and 1,278,874 (365 days) tonnes of CO<sub>2</sub> equivalents respectively. This corresponds to emissions reductions of 1,012,587 tonnes of CO<sub>2</sub> equivalents in 289 days, hence the observed emissions reduction are higher than expected.

The reason for this is that N.A plant shutdowns in this Monitoring Period were shorter than expected. Hence, there were more operating days of the N.A plant (286 days) compared to the value of 261 days approximately used for calculation of ex-ante emission reductions in the PDD.

#### E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

| Item  | Actual values achieved up to 31 December 2012 | Actual values achieved from 1 January 2013 onwards |
|---|---|--|
| <b>Emission reductions or GHG removals by sinks (t CO<sub>2</sub>e)</b> | NA  | 2,065,101 (546 days)                               |

- - - - -

## Appendix 1. Contact information of project participants and responsible persons/ entities

|  |   |
|--|---|
| <b>Project participant and/or responsible person/ entity</b> | <input checked="" type="checkbox"/> Project participant<br><input type="checkbox"/> Responsible person/ entity for completing the CDM-MR-FORM |
| <b>Organization name</b>                                     | CARBON EGYPT Ltd.   |
| <b>Street/P.O. Box</b>                                       | 2 Simon Bolivar Square, Garden City, P.O. Box 489   |
| <b>Building</b>  | -   |
| <b>City</b>  | Cairo   |
| <b>State/Region</b>  | -   |
| <b>Postcode</b>  | 11461   |
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| <b>E-mail</b>  | carboneg@internetegypt.com  |
| <b>Website</b>   | -   |
| <b>Contact person</b>  | Mr. Hani Riskalla   |
| <b>Title</b>   | -   |
| <b>Salutation</b>  | -   |
| <b>Last name</b>   | Riskalla  |
| <b>Middle name</b>   | -   |
| <b>First name</b>  | Hani  |
| <b>Department</b>  | -   |
| <b>Mobile</b>  | -   |
| <b>Direct fax</b>  | -   |
| <b>Direct tel.</b>   | -   |
| <b>Personal e-mail</b>                                       | -   |

|  |   |
|--|---|
| <b>Project participant and/or responsible person/ entity</b> | <input checked="" type="checkbox"/> Project participant<br><input type="checkbox"/> Responsible person/ entity for completing the CDM-MR-FORM |
| <b>Organization name</b>                                     | KOMMUNALKREDIT PUBLIC CONSULTING GmbH   |
| <b>Street/P.O. Box</b>                                       | Tuerkenstrasse 9  |
| <b>Building</b>  | -   |
| <b>City</b>  | Vienna  |
| <b>State/Region</b>  | -   |
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| <b>Personal e-mail</b>                                       | -   |

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|--|---|
| <b>Project participant and/or responsible person/ entity</b> | <input checked="" type="checkbox"/> Project participant<br><input type="checkbox"/> Responsible person/ entity for completing the CDM-MR-FORM |
| <b>Organization name</b>                                     | RWE Power AG  |
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| <b>Mobile</b>  | -   |
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| <b>Personal e-mail</b>                                       | -   |

|  |   |
|--|---|
| <b>Project participant and/or responsible person/ entity</b> | <input checked="" type="checkbox"/> Project participant<br><input type="checkbox"/> Responsible person/ entity for completing the CDM-MR-FORM |
| <b>Organization name</b>                                     | CARBON Climate Protection GmbH  |
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## Appendix 2. Social Fund

As described in the PDD a Social Fund was established by the project developer and the project operator. This fund contributes to the social and environmental benefit of the people living in the area of the project activity by financing projects. The contribution to the Social Fund and the activities are monitored and reported on an annual basis. The contribution to the Social Fund since start of operation of the CDM project activity was:

- 2006: no issuance of emission reduction certificates
- 2007: 263,230 Euro
- 2008: 292,690 Euro
- 2009: 467,115 Euro
- 2010: 192,851 Euro
- 2011: 517,411 Euro
- 2012: 255,147 Euro
- 2013: 272,049 Euro

The total amount was transferred to the AFC Social Fund bank account expeditiously.

By the end of this Monitoring Period the following Social Fund projects have been finished and cleared or are still on-going:

| Finished and ongoing projects |   |                    |               |                   |                   |
|-------------------------------|---|--------------------|---------------|-------------------|-------------------|
| No                            | Project   | Status             | Status Date   | Expenses [LE]     | Estimated [LE]    |
| 1                             | Environmental surveillance stations   | Finished & cleared | 6/2012        | 1,845,168         | 2,000,000         |
| 2                             | Adding a central unit to the environment surveillance stations in order to connect it with the national network for industrial emissions surveillance | Finished & cleared | 12/2010       | 17,185            |                   |
| 3                             | Maintenance and fortification project of the roads (Ali Maher) surrounding AFC company  | Finished & cleared | 12/2010       | 2,174,622         |                   |
| 4                             | Medical convoy (Purchasing of necessary cleaning tools, masks and medicine for the adjacent hospital as well as disinfection measurements)            | Finished & cleared | 12/2010       | 52,412            |                   |
| 5                             | Removing Wastes surrounding AFC company   | On-going           | 12/2010       | 570,000           |                   |
| 6                             | Water treatment of a drain in district of Adfina city in El-Buharira governate  | Finished & cleared | 12/2010       | 45,500            | 45,500            |
| 7                             | Planting trees on the roads in the surrounding environment  | On-going           | 4/2012        | 272,303           | 250,000           |
| 8                             | Renovation and rehabilitation of schools in the surrounding environment   | On-going           | 12/2010       | 394,268           | 450,000           |
| 9                             | Agricultural Area: Purchasing equipment for eradicating mosquitoes and flies including pesticides;  | On-going           | 9/2012        | 299,815           | 300,000           |
| 10                            | Medical care for students and people around AFC area for medical checkup and endemic diseases (medical convoy 2 )                                     | On-going           | 6/2012        | 99,392            | 100,000           |
| 11                            | Making an environmental study of one of the ditches in the area surrounding the company   | On-going           | 6/2012        | 150,000           | 300,000           |
| 12                            | Environmental cleaning activities around AFC area   | On-going           | 4/2013        | 290,426           | 500,000           |
| 13                            | Establishment of bridges on Rakta canal for serving residents around AFC area   | On-going           | 4/2012        | 628,975           | 750,000           |
| 14                            | Donating for an equipped ambulance for Jone medical center for quick help   | On-going           | 4/2012        | 431,955           | 475,000           |
| 15                            | Financing the tools and applications under the cooperation protocol between AFC and Faculty of Science for treatment of El-Amiya drainage canal       | On-going           | 6/2012        | 847,270           | 1,000,000         |
| 16                            | Construction of a reading and celebration hall  | On-going           | 4/2012        | 244,252           | 300,000           |
| 17                            | Finalizing the import of charcoal kiln  | Finished & cleared | 6/2011        | 115,000           | 115,000           |
| 18                            | School development project  | On-going           | 11/2012       | 169,480           | 300,000           |
| 19                            | Medical clinic project (Houd 9 area)  | On-going           | 12/2012       | 144,076           | 200,000           |
| 20                            | Developing & upgrading project of the environmental affairs agency branch in Alexandria   | On-going           | 4/2013        | 226,179           | 500,000           |
| 21                            | Maintaining and strengthening the roads surrounding the company   | On-going           | 4/2013        | 742,061           | 3,600,000         |
| 22                            | Medium sized fire truck   | On-going           | 7/2014        | 2,538,000         | 2,820,000         |
| 23                            | supporting the installation of smokestack monitoring devices  | On-going           | 7/2014        | 922,039           | 1,000,000         |
| <b>Total amount spent</b>     |   | <b>cleared</b>     | <b>7/2014</b> | <b>13,220,379</b> |                   |
| <b>(including estimate)</b>   |   |                    |               |                   | <b>17,802,534</b> |

AFC and the local DNA (EEAA) commonly agreed on the funding of the above mentioned and approved projects.

Furthermore AFC and EEAA agreed on the funding of several new projects. They are currently in the design phase.

| Designed Projects             |  |        |               |                  |
|-------------------------------|--|--------|---------------|------------------|
| No                            | Project  | Status | Status Date   | Estimated [LE]   |
| 1                             | Project of Rakta lake annual cleaning works                                    | Design | 9/2012        | To be defined    |
| 2                             | Covering the canal and the drains on both side of Ali Maher 's road            | Design | 12/2012       | 2,500,000        |
| 3                             | Developing environmental projects in Alexandria                                | Design | 9/2012        | 135,000          |
| 4                             | complete the furniture work of reading and celebration hall                    | Design | 12/2012       | 150,000          |
| 5                             | Developing the post office of the company's residential city                   | Design | 12/2012       | 150,000          |
| 6                             | comprehensive maintenance works for fertilizer preparatory / secondary schools | Design | 12/2012       | 1,500,000        |
| <b>Total amount estimated</b> |  |        | <b>7/2014</b> | <b>4,435,000</b> |

The process of decision making between the plant operator AFC and the local DNA (EEAA) ensures the highest possible social and environmental integrity of projects funded by the AFC Social Fund.

*All relevant documents, bank statements and correspondence between AFC and EEAA are submitted for verification.*

## Appendix 3. Emission Reduction Calculation

An Excel book containing monitored data and calculations of baseline emissions, project emissions and emission reductions and additional checks and information is attached:

MP28\_AFC\_UNFCCC\_confidential.xlsx

*Please note: This file is used for claiming emission reductions.*

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### Document information

| Version   | Date            | Description  |
|---|-----------------|--|
| 04.0  | 25 June 2014    | Revisions to: <ul style="list-style-type: none"> <li>• Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0));</li> <li>• Include provisions related to standardized baselines;</li> <li>• Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1;</li> <li>• Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>;</li> <li>• Editorial improvement.</li> </ul> |
| 03.2  | 5 November 2013 | Editorial revision to correct table in page 1.   |
| 03.1  | 2 January 2013  | Editorial revision to correct table in section E.5.  |
| 03.0  | 3 December 2012 | Revision required to introduce a provision on reporting actual emission reductions or net anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).   |
| 02.0  | 13 March 2012   | Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).   |
| 01  | 28 May 2010     | EB 54, Annex 34. Initial adoption.   |
| Decision Class: Regulatory<br>Document Type: Form<br>Business Function: Issuance<br>Keywords: monitoring report |                 |  |