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CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	•The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. •As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	•The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

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SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

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Reduction in specific steam consumption ratio of Process Air Compressor of Ammonia plant at Indo Gulf Fertilisers, (A unit of Aditya Birla Nuvo Limited) Jagdishpur.

Version: 01

Date: 06/06/2007

A.2. Description of the small-scale project activity:

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Indo Gulf Fertilisers (IGF) is a flag ship company of Aditya Birla Nuvo Limited (ABNL). IGF had started commercial production of Urea in 1988 with production capacity of 0.864 MTPA. IGF is the first Natural Gas (NG) based private sector Urea complex in India with ISO 9001, ISO 14001, and OHSAS 18001 certification. IGF markets Urea in the brand name of 'Birla Shaktiman' catering to the states of north and east parts of India like U.P., Bihar, Jharkhand and West Bengal.

IGF as a responsible global corporate and committed citizen realizes that energy conservation and environmental benign activities are key parameters for future businesses. IGF continuously explores opportunities for energy conservation and Green House Gas (GHG) emission reduction.

Purpose of the project activity

The IGF project activity aims to reduce Specific Steam Consumption Ratio (SSCR) of Process Air Compressor (PAC) by chilling suction air of PAC.

The existing suction air filter house located at inlet of PAC would be retrofitted by adding cooling coils and mist eliminator to make it more efficient filter house, with minimal pressure drop. After the implementation of the project activity the filter house will be equipped with weather louvers as first stage barrier, pre filter wall as second stage barrier, cooling coil as third stage barrier, mist eliminator as fourth stage barrier and finally fine filter wall as fifth stage barrier. Thus the project activity will increase the effectiveness of the filter house and would provide suction chilling of PAC inlet air.

Chilled water will be circulated in the heat exchanger coils (cooling coils) and suction air will be chilled by passing over the heat exchanger coils. Thus the temperature of inlet air to PAC reduces from atmospheric temperature 40^0C to 15^0C.

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Any decrease in temperature of suction air to PAC would result in reduction in volume of air per unit mass handled by PAC and subsequently reduce the steam consumption of PAC. Thus PAC requires lesser steam to generate same amount of output. This would lead to a reduction in SSCR of PAC and subsequently steam saving.

Steam savings in the PAC would result in the reduction in fossil fuel requirement in the boiler and subsequently reduces CO_2 emissions. In order to achieve the suction cooling of the inlet air to PAC, Vapour Absorption Machine (VAM) has been installed. The heat requirement of the VAM is met by the low grade waste heat available with ammonia process condensate.

In the absence of the project activity, IGF would have continued with existing suction air filter house (without suction air chilling) leading to higher SSCR of PAC and increased steam demand in the complex. This would have resulted in GHG emissions due to the combustion of additional fossil fuels in service boiler to meet the increased steam demand.

Project's contribution in sustainable development

The project activity assists the host country in achieving sustainable development. The project activity is also oriented towards social and environmental benefits. The sustainable development indicators for the project activity are:

Social well being- Project activity would be generating direct and indirect employment for the unskilled / semi skilled and skilled persons, during different stages of the project- design, construction and implementation.

Environmental well being- Project activity would reduce the fossil fuel consumption and leads to resource sustainability. The project activity would reduce CO_2 (GHG) emissions, helping in abating global warming.

Economic well-being- Project activity would result in conservation of fossil fuel and natural resources. Thus benefiting the economy.

Technological well being- Project activity would employ unique technology which is first of its kind and unconventional in Indian fertilizer industry. The project activity has good replication potential in Indian fertilizer industry.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India	Indo Gulf Fertilisers (IGF) (A unit of Aditya Birla Nuvo Limited)	No

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

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The project activity is located at the Urea Manufacturing facility of IGF at Jagdishpur.

A.4.1.1. Host Party(ies):

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India

A.4.1.2. Region/State/Province etc.:

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Uttar Pradesh

A.4.1.3. City/Town/Community etc:

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Jagdishpur

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

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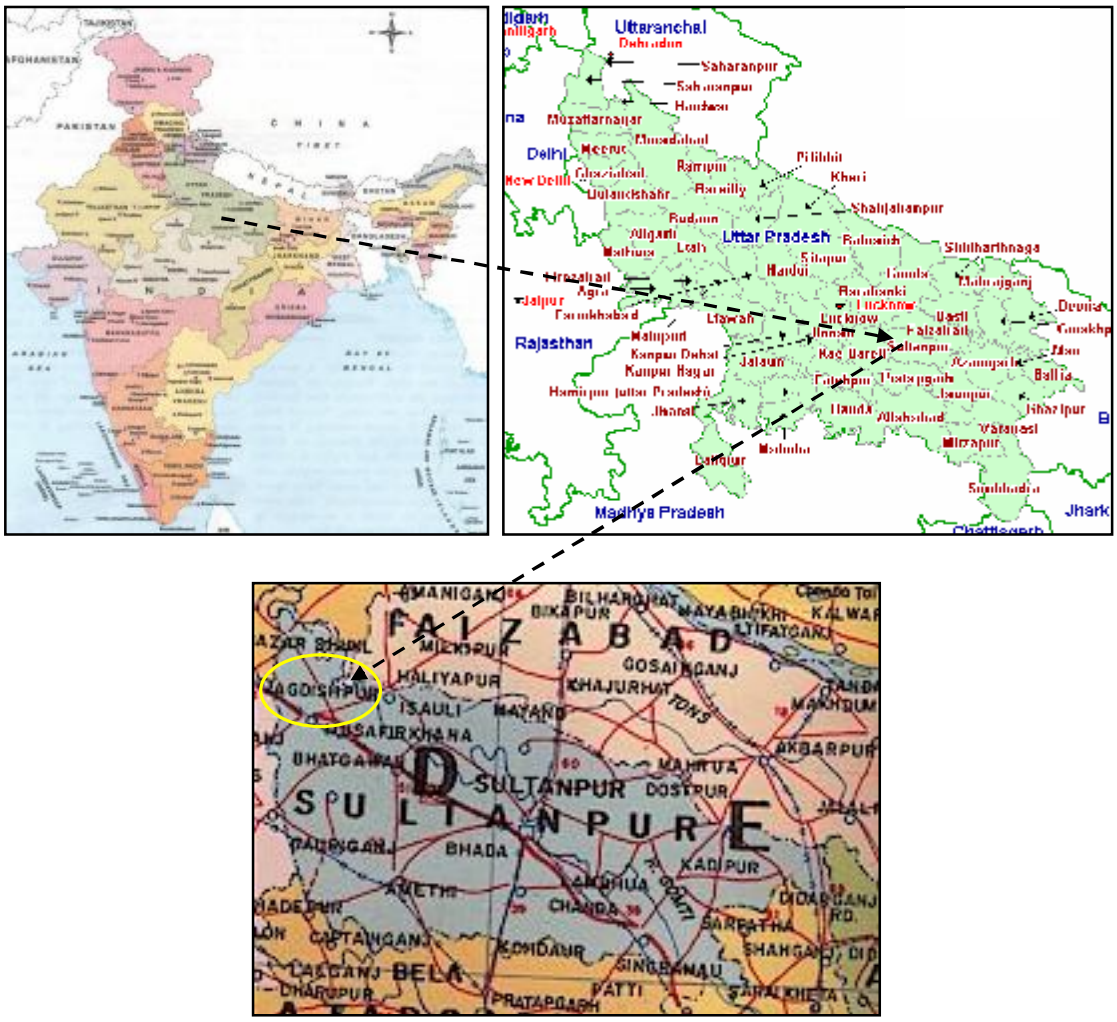
The project activity is located at Indo Gulf Fertilisers' (IGF) urea complex at Jagdishpur industrial area of District Sultanpur. Jagdishpur is located at a distance of 60 km from Dist. Sultanpur on National Highway no. 56. The nearest railway station Nihalgarh is 10 km and airport Lucknow is 90 km away from Site. Maximum rainfall is around 337mm and in a day 272.4mm.

Geographical Coordinates: 26° 29' 15" North, 81° 33' 30" East

The location of the project activity on the map of India is shown below:



Location of the Project Activity (map not to scale)

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

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The category for the project activity according to the "Appendix B - Indicative Simplified Baseline and monitoring Methodologies for Selected Small Scale CDM Project Activities" is as follows:

Type-II: Energy efficiency improvement projects

Category II.D: Energy efficiency and fuel switching measures for industrial facilities, (version 10, EB33)

Technology of the project activity

Reducing SSCR of PAC:

The project activity aims to reduce SSCR of PAC by chilling suction air to PAC. The following equipments are installed in the project activity.

- Heat exchanger coils (cooling coil)
- Mist eliminator
- VAM

The existing suction air filter house located at inlet of PAC would be retrofitted by installation of Heat exchanger coils (cooling coil) and Mist eliminator in order to increase the efficiency of filter house with minimal pressure drop. The filters are made up of polyester fibres, which are thermally bonded in a graded density structure for minimal pressure drop. The pressure drop across the new filter house would be 50 mm of WC. In the project activity filter house will be equipped with weather louvers as first stage barrier, pre filter wall as second stage barrier, cooling coil as third stage barrier, mist eliminator as fourth stage barrier and finally fine filter wall as fifth stage barrier. The chilled water will circulates in the heat exchanger coils (cooling coils) and suction air is chilled by passing over the heat exchanger coils. Thus inlet air of PAC is cooled from existing temperature of 40^0C to 15^0C. Any decrease in temperature of air would result in reduction in volume of air per unit mass handled by PAC. The reduction in volume of air handled by PAC would subsequently reduce steam consumption of PAC. The steam requirement of PAC would reduce for the same amount of compresses air output. This leads to a reduction in the specific steam consumption of PAC leading to steam savings and GHG emission reduction.

In the project activity chilled water is supplied by a VAM which is based on waste heat of ammonia process condensate.

Operating principle of VAM

VAM produces chilled water by using heat source such as steam, Natural Gas, Furnace oil etc. Chilled water is produced by the principle that under the slightly vacuum condition liquid refrigerant (water) evaporates at low temperature by absorbing heat from circulating media (chilled water). The vapours of the refrigerant are absorbed by the concentrated absorbent in the absorber. The dilute solution from the absorber is again fractionated in to the concentrated absorbent and water by supplying additional heat. In this project activity pure water is being used as refrigerant and lithium bromide (LiBr) solution is used as absorbent. And the heat required in the generator to fractionate absorbent and refrigerant is being provided by the low grade waste

heat available with the ammonia process condensate. Chilled water generated by VAM is circulated in heat exchanger coils to cool the atmospheric air.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

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Years	Annual estimation of emission reductions in tones of CO_2 e
2007-2008	4593
2008-2009	4593
2009-2010	4593
2010-2011	4593
2011-2012	4593
2012-2013	4593
2013-2014	4593
2014-2015	4593
2015-2016	4593
2016-2017	4593
Total estimated reductions (tCO_2 e)	45930
Total number of crediting years	**10 years**
Annual average reductions over the crediting period (tCO_2 e)	**4593**

A.4.4. Public funding of the small-scale project activity:

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There is no public funding from Parties included in Annex I.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

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Appendix C of 'Simplified modalities and procedures for small-scale CDM project activities' corresponds to the procedures for determining the occurrence of debundling. According to Annex C 'Determining the Occurrence of Debundling' - 'debundling' is defined as the fragmentation of a large project activity into smaller parts.

A small-scale project activity that is part of a large project activity is not eligible to use the simplified modalities and procedures for small-scale CDM project activities. The full project activity or any component of the full project activity shall follow the regular CDM modalities and procedures.

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A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- . With the same project participants;
- . In the same project category and technology/measure;
- . Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

According to above-mentioned points of de-bundling, IGF project activity is not a part of any of the above; hence the proposed project is not a de-bundled component of a large project activity.

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SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

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The baseline and monitoring methodology used for this project activity is:

Type II Energy efficiency improvement projects.

Category D Energy efficiency and fuel switching measures for industrial facilities, (AMS II.D. version 10, EB 33)

Reference: UNFCCC website

B.2 Justification of the choice of the project category

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As per the 'Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories' project activity falls under **Type II- Energy efficiency improvement projects and Category II.D. - Energy efficiency and fuel switching measures for industrial facilities, (version 10, EB 33).**

According to AMS II.D methodology, the category comprises any energy efficiency and fuel switching measure implemented at a single industrial or mining and mineral production facility. This category covers project activities aimed primarily at energy efficiency; a project activity that involves primarily fuel switching falls into category III.B. Examples include energy efficiency measures (such as efficient motors), fuel switching measures (such as switching from steam or compressed air to electricity) and efficiency measures for specific industrial or mining and mineral production processes (such as steel furnaces, paper drying, tobacco curing, etc.). The measures may replace, modify or retrofit existing facilities or be installed in a new facility. The aggregate energy savings of a single project may not exceed the equivalent of 60 GWhe per year. A total saving of 60 GWhe per year is equivalent to a maximal saving of 180 GWhth per year in fuel input.

The project activity fulfils all the requirements of the applied methodology in ensuing manner:

1. The project activity is installed in single industrial facility i.e. IGF, Jagdishpur plant
2. The project activity reduces the specific steam consumption of the PAC, thus improving energy efficiency of PAC.

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3. The project activity retrofits the existing suction air filter house of PAC by adding heat exchanger coils (cooling coils) and mist eliminator to make the system more efficient. The suction air of PAC is chilled by circulating chilled water in heat exchanger coils. The chilled suction air reduces the SSCR of PAC, thus achieving energy efficiency. In order to supply chilled water, a waste heat based VAM is also retrofitted in the existing ammonia process condensate circuit.

4. The aggregate energy savings from the project is less than 180 GWh_{th} per year in fuel input. The proposed project activity at Indo Gulf Fertilisers (IGF), Jagdishpur would result in annual aggregate energy saving of 23.57 $GWh_{th.}$ The energy savings of the project would be below the equivalent of 60 GWh_e (180 GWh_{th} per year) every year throughout the crediting period.

Thus the project activity fulfills all the applicability conditions of the methodology.

B.3. Description of the project boundary:

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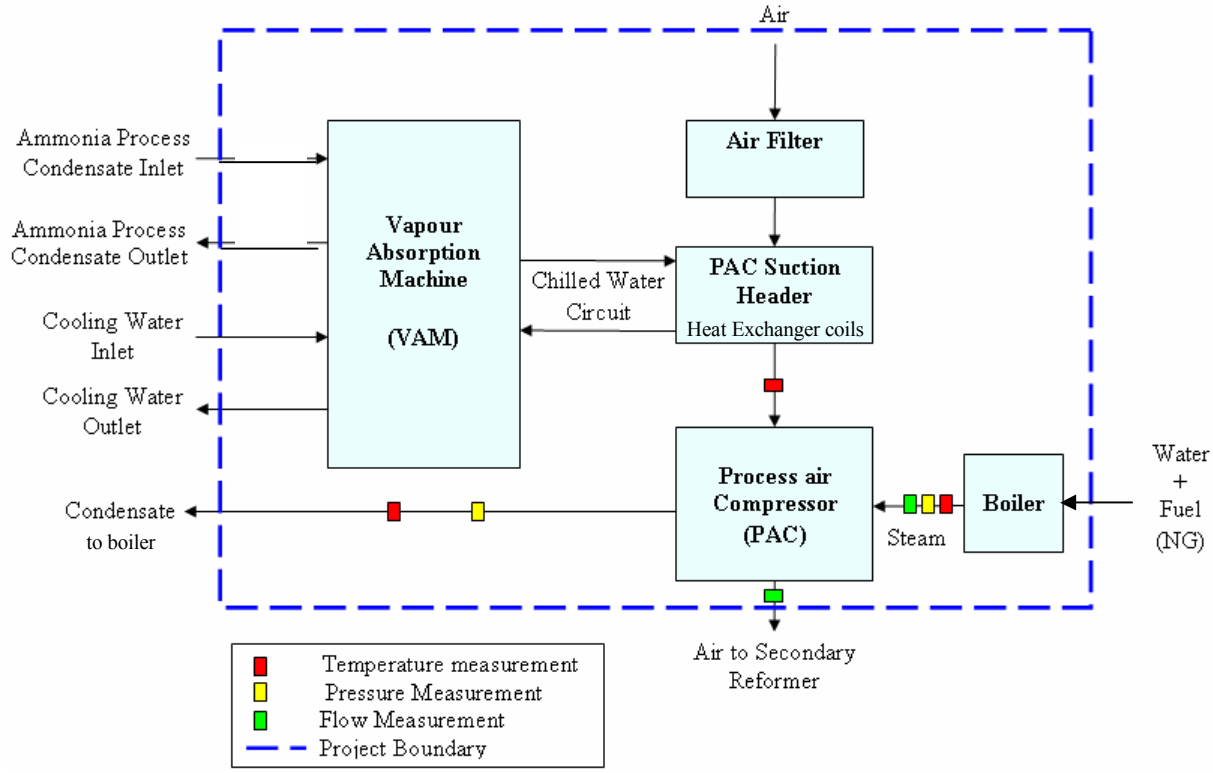
As per paragraph 2 of the AMS II.D. (Version 10, EB 33), the project boundary encompasses the physical, geographical site of the industrial or mining and mineral production facility, processes or equipment that are affected by the project activity.

The project boundary for the project activity is shown below:



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Improvement Projects, II.D. (version 10, EB 33) Energy efficiency and fuel switching measures for industrial facilities, baseline is defined as:

- In the case of replacement, modification or retrofit measures, the baseline consists of the energy baseline of the existing facility or sub-system that is replaced, modified or retrofitted. In the case of a new facility the energy baseline consists of the facility that would otherwise be built.

In IGF project activity, the Specific Steam Consumption Ratio (specific energy) of PAC before retrofitting the heat transfer coil and mist eliminator in the existing filter house is considered as energy baseline.

- In the absence of the CDM project activity, the existing facility would continue to consume energy (ECbaseline, in GWh/year) at historical average levels (EChistorical, in GWh/year), until the time at which the industrial or mining and mineral production facility would be likely to be replaced, modified or retrofitted in the absence of the CDM project activity (DATEBaselineRetrofit). From that point of time onwards, the baseline scenario is assumed to correspond to the project activity, and baseline energy consumption (ECbaseline) is assumed to equal project energy consumption (ECy, in GWh/year), and no emission reductions are assumed to occur.

The PAC and existing suction filter house has a significant operational lifetime and is not likely to be replaced within the crediting period. Hence, in absence of the project activity, PAC and existing suction filter house would have continued to operate leading to higher Specific Steam Consumption Ratio of PAC (baseline SSCR of PAC). Therefore, no change is anticipated in the above mentioned baseline, within the crediting period.

Date of completion: 31/05/2007

Contact Person: Mr. C.K. Datta
IGF, Industrial Area Jagdishpur,
Dist. Sultanpur – 227 817 (UP)

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

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IGF project activity reduces anthropogenic emissions of GHG by sources below those that would have occurred in absence of the registered CDM project activity. The project activity aims to reduce Specific Steam Consumption Ratio (SSCR) of Process Air Compressor (PAC) by chilling

suction air of PAC. The chilled water is circulated in the heat exchanger coils (cooling coils) of retrofitted filter house and suction air is chilled by passing over the heat exchanger coils. Thus inlet air of PAC is cooled from existing temperature of 40^0C to 15^0C. Any decrease in temperature of air would result in reduction in volume of air handled by PAC. The reduction in volume of air handled by PAC would subsequently reduce the specific steam consumption of PAC. Thus PAC would require lesser steam to generate same amount of output. This would lead to steam savings and subsequent GHG emission reduction in the service boiler.

In the absence of the project activity, IGF would have continued with existing suction air filter house (without suction air chilling) leading to higher SSCR of PAC and increased steam demand in the complex. This would have resulted in higher GHG emissions due to the combustion of additional fossil fuels in service boiler to meet the increased steam demand.

Barriers and Additionality

Appendix B "Indicative Simplified baseline and monitoring methodologies for selected small scale CDM project activity categories" of the simplified modalities and procedures for small-scale CDM project activities attachment A of appendix B states that project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

(a) Technological Barriers

(b) Barrier due to prevailing Practice

(c) Barriers to Innovation

Technological Barriers:

PAC is imperative equipment in Ammonia plant, PAC supplies process air to secondary reformer. Process air is required in secondary reformer for controlled oxidation of CH_4 in process gas (feed) as well as to meet nitrogen requirement for the production of NH_3 (Ammonia). It is necessary to maintain the feed to air ratio in secondary reformer. Feed to air ratio is one of the critical parameter and should be maintained in optimal range. Higher feed to air ratio would lead to complete oxidation of the CH_4 and less feed to air ratio will reduce the N_2 availability for the process and may lead to catalyst poisoning and equipment malfunctioning. Both the conditions are highly undesirable for the NH_3 manufacturing process and would lead to plant shut down. As

PAC is the only source for the process air supply, PAC should be properly maintained for salubrious operation of Ammonia plant.

Any disruption in PAC operation would affect process air flow to secondary reformer and subsequently would alter feed to air ratio. Under this scenario secondary reformer operation would get affected and may lead to Ammonia plant shutdown, IGF would incur huge production and financial losses.

The project activity is to cool the inlet air of PAC from existing temperature of 40^0C to 15^0C. The suction chilling would help in reducing SSCR of PAC. The suction chilling is carried out by operating a VAM which is based on waste heat of ammonia process condensate.

The technology applied in the project activity is first of its kind, considering the retrofit measure carried out in the existing PAC of Ammonia plant. IGF may face many barriers due to unfamiliarity of technology, and its impact on the existing process.

IGF possess huge technological/operational risks by implementing the project activity. These risks may affect PAC operation and subsequently affect secondary reformer operation and might lead to stoppage of Ammonia plant. Under this scenario, IGF would incur huge production losses. The various technological/operational risks faced by the project activity are given below:

Failure of chiller pump of VAM or leakage of chilled water

The chiller pump is a critical component of the project activity, since it circulates chilled water in the coils which is placed in the suction of PAC. If chiller pump fails or chilled water leaks, there would be surge in inlet temperature of process air and subsequently there would be sudden increase in volume of process air handled by PAC. The chilled water heat exchanger coils (cooling coils) are placed inside suction air filter house of PAC. Suction air get cooled by passing over these coils, any leakage in the coil will lead to moisture carry over to the section of air compressor. This may creates the sever Pitting inside the suction casing and impeller of PAC.

This scenario would affect PAC operation and feed to air ratio of secondary reformer and would result in tripping of the secondary reformer thus stopping the Ammonia production.

Tripping of VAM

VAM supplies chilled water for suction air chilling. If VAM trips or solution pump of VAM trips then suction air chilling gets affected, there would be surge in inlet temperature of process air and subsequently there would be sudden increase in volume of process air handled by PAC. This

scenario would also affect PAC operation and feed to air ratio of secondary reformer and would result in tripping of the secondary reformer thus stopping the Ammonia production.

Higher pressure drop across suction air filter house

The heat exchanger coils (cooling coils) are placed inside suction air filter house of PAC. Chilled water is circulated inside the heat exchanger coils and suction air is chilled by passing over the heat exchanger coils. The heat exchanger coils along with suction air filter house is designed for a maximum pressure drop of 50 mm of water column across them. Any increase in pressure drop across the suction air filter house (increase in pressure drop may be due to dust formation, foreign material, moisture content on filters, coils etc.,) would lead to the suction starvation in process air compressor and consequently affect feed to air ratio of secondary reformer.

Barrier due to prevailing practice

PAC, in a fertilizer industry, is critical and essential equipment for smooth operation of the plant. The project activity aims to reduce Specific Steam Consumption Ratio (SSCR) of Process Air Compressor (PAC) by chilling suction air of PAC. The existing suction air filter house located at inlet of PAC would be replaced by efficient filter house with heat exchanger coils. The technology to chill suction air of PAC is adopted first time in Indian fertiliser industry.

In order to achieve the suction cooling of the inlet air a Vapour Absorption Machine (VAM) system has been installed. The heat requirement of the VAM is met by the low grade waste heat available with ammonia process condensate.

The use of VAM system for chilling of the inlet air to PAC is unconventional and unique practice in the Indian fertilizer industry. Also, it is not common practice to recover heat from low grade process condensate in the VAM to meet the heat requirements. The project is therefore, not a prevailing practice in the fertilizer industry in India and is first of its kind in the Indian fertilizer industry.

Barriers to innovation

IGF being an energy conscious organization continuously explores possibility for achieving energy efficiency. IGF realized their existed potential to reduce SSCR of PAC by reducing temperature of suction air. With this objective IGF explored various possibilities for suction air chilling by carrying out meticulous R&D and numerous trails and experiments. The journey of innovation started with installing a fine water sparger system for suction air chilling. In water fogging sparger system, water is sprayed into the suction air and air is humidified and gets cooled. Since volume of air handled by PAC is huge, the suction air cooling by the system was

not effective. Moreover, the water fogging resulted in the moisture carry over with suction air. It was anticipated that, moist suction air may cause corrosion problem in the PAC .Hence water sparger system was removed and IGF looked for another alternative.

Subsequently, IGF installed a heat exchanging system consisting of coils near filter chamber of PAC. In the coils, chilled ammonia (-15^0C) was circulated; which would cool the suction air to PAC. Within short time of implementation, IGF started facing numerous problems. The subzero temperature of chilled process ammonia, condensed the moisture present in air and frequently ice was formed over the surface of the coils (frosting). The ice formation over the coils created huge pressure drop across the coils, affecting PAC operation. Hence this system was also removed.

Undaunted by earlier failures, IGF formed a cross functional team called CORE team consisting of officials from various sections like Ammonia, Maintenance, Process etc. The CORE team spent good man hours in exploring various possible technologies and methods to chill suction air efficiently, effectively and reduce SSCR of PAC.

After exploring various possibilities, IGF decided to adopt a technology to chill suction air by circulating chilled water and a VAM was proposed to be installed to supply chilled water. The technology to chill suction air of PAC is implemented first time in Indian fertiliser sector

Since VAM requires heat energy for its operation, IGF explored various possibilities to avoid any increase in energy consumption due to VAM operation. Hence, IGF carried out extensive technical studies and R&D like process mapping, comprehensive Energy and Mass balance, waste heat identification etc.

After meticulous efforts and ground work, IGF is proposing to adopt a novel concept of utilising waste heat of ammonia process condensate to operate VAM. Utilisation of the waste heat of ammonia process condensate to operate VAM is first of its kind in Indian fertiliser sector.

In existing suction filter house (which is located at suction of PAC), the pressure drop across the filter is 40 mm of WC and with proposed heat exchanger coil (a component in the project activity) the expected pressure drop across present filter chamber and heat exchanger would be more than 50 mm of WC. Any pressure drop more than 50 mm of WC would affect PAC operation. Hence, IGF has spent numerous man hours in designing heat exchanger coils and new suction filter house for minimal pressure drop.

IGF is proposing to implement the project activity considering that the CDM fund would cover the risk faced by the project activity. Following impacts of CDM fund are identified from the point of view of removal of barriers:

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1. The CDM fund from the project would be used as additional coverage to the various risks faced by the project. The CDM revenue would help in offsetting any financial losses due to shutdown of plant, production losses etc., resulting from implementation of the project.
2. The CDM fund will stimulate R&D efforts of IGF to find methods of mitigating risks and enhance replication of such projects in the Indian fertilizer industry, to promote GHG abatement.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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To calculate emission reductions of the project activity, there is no specific formula available for the project activity of category Type-II- Energy Efficiency Improvement Projects, IID –Energy Efficiency and Fuel Switching measures for Industrial Facilities.

Hence, the following approach is adopted for calculating emission reduction due to implementation of project activity:

The project activity reduces SSCR of PAC by chilling suction air of PAC. The reduction in SSCR of PAC results in steam savings and subsequently reduces fuel consumption in service boiler leading to GHG emission reduction.

The calculation of emission reduction due to the project activity is briefly explained below:

Step 01: The reduction in specific steam consumption ratio (SSCR) of PAC is calculated as difference between specific steam consumption ratio of PAC- base case and specific steam consumption ratio of PAC- project case.

Step 02: By multiplying the reduction in specific steam consumption ratio of PAC and volumetric air flow rate of PAC in the project case, the reduction in steam consumption of PAC due to project activity shall be calculated.

Step 03: Subsequently the baseline emissions of the project activity shall be calculated by estimating reduction in input energy to the service boiler which would have been required for the equivalent quantity of additional steam generated in absence of the project activity (steam saved due to project activity) and emission factor of fuels used in the service boiler.

The reduction in input energy to the boiler is calculated from quantity of steam saved, net enthalpy of steam and efficiency of boiler.

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Step 04: The emission due to additional pumps installed for the project activity is considered as project emissions and project emissions is negated from the baseline emission to calculate the emissions reductions.

The baseline parameters (Steam consumption of PAC, volumetric air flow rate of PAC) are monitored from 3rd December 2005 to 30st November 2006 to estimate the baseline specific steam consumption ratio of PAC. The one year data is used for baseline fixation, since it considers all seasonal variations (summer and winter season).

Baseline Specific Steam Consumption Ratio (SSCR) of PAC = 0.675 ton of steam/ton of Air

The specific steam consumption ratio of PAC in the project case is calculated from the steam savings guaranteed by the equipment supplier.

The procedure applied to calculate project emissions, baseline emissions, leakage emissions and emission reductions attributable to the energy efficiency in process air compressor is the following:

Project Emissions

The anticipated project emission due to implementation of the project is GHG emissions associated with VAM operation. VAM requires heat energy for its operation, IGF explored various possibilities to avoid any increase in energy consumption due to VAM operation. The heat requirement of the VAM is met by the utilising low grade waste heat available with ammonia process condensate. However there would GHG emission due to operation of additional pumps installed due to the project activity. The project emissions due to operation of additional pumps are considered for emission reduction calculation.

Baseline Emissions

The project activity is to reduce specific steam consumption ratio of PAC by suction air chilling.

In the absence of the project activity, the PAC compressing the atmospheric air would have operated at higher SSCR leading to increase in steam demand of the complex and lead to higher GHG emissions. The baseline emissions attributable to the suction chilling of PAC is the amount of GHG emissions due to combustion of equivalent amount of fossil fuel to cater to the incremental steam demand in absence of the project activity.

Leakage Emissions

As per paragraph 6 of Indicative simplified baseline and monitoring methodology for selected small-scale CDM project activity -Type II - Category D. It has been specified that “If the energy

generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered".

In the proposed project activity, the existing equipments are not transferred to any other activity. Hence leakage is not considered.

Baseline Emissions

The project activity is to reduce specific steam consumption ratio of PAC by suction air chilling.

In the absence of the project activity, the PAC using the atmospheric air from air filter would have operated at a lower efficiency. This would have resulted in increased steam demand. The baseline emissions attributable to the suction chilling of PAC is the amount of GHG emissions due to combustion of equivalent amount of fossil fuel to cater to the incremental steam demand over the project activity.

$$\mathbf{BE = E_{in} * \Sigma (EF_{fuel,i} * P_{fuel,i})}$$

Where,

BE	Baseline emissions (t CO_2 e/day)
E_{in}	Reduction in input energy to service boiler due to the project activity (GJ/day)
$EF_{fuel,i}$	CO_2 emission factor for fossil fuel 'i' used in boiler (t CO_2 e / GJ)
$P_{fuel,i}$	Energy contribution share of fuel 'i' in total energy generated by fuel mix

Where,

$$\mathbf{P_{fuel,i} = Q_i * NCV_i / \Sigma(Q_i * NCV_i)}$$

Where,

Q_i	Quantity of the fossil fuel 'i' fired in the service boiler (tonne/day)
NCV_i	Net Calorific value of the fossil fuel 'i' fired in the service boiler (GJ/tonne)

$$\mathbf{E_{in} = E_{net} / \eta_b}$$

Where,

E_{net}	Reduction in steam energy consumption per day in service boiler (GJ/day)
η_b	Efficiency of service boiler (%)

$$\mathbf{E_{net} = S_{net} * E_s}$$

Where,

S_{net}	Reduction in steam consumption of PAC per day (tonnes / day)
E_s	Net enthalpy of steam consumed by PAC (GJ / tonne)

$$\mathbf{E_s = E_i - E_o}$$

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Where,

E_i Enthalpy of steam at the inlet of PAC (GJ / tonne)

E_o Enthalpy of condensate at the outlet of PAC (GJ / tonne)

$$\mathbf{S_{net} = (SSCR_{base} - SSCR_{proj}) * Q_{proj}}$$

Where,

$SSCR_{base}$ Baseline Specific steam consumption ratio of PAC

$SSCR_{proj}$ Project Specific steam consumption ratio of PAC

$$\mathbf{SSCR_{proj} = S_{proj} / Q_{proj}}$$

Where,

S_{proj} Steam consumption of PAC during project (tonne/day)

Q_{proj} Volumetric air flow rate of PAC during project (tonne/day)

$$\mathbf{SSCR_{base} = S_{base} / Q_{base}}$$

Where,

S_{base} Steam consumption of PAC during baseline (tonne/day)

Q_{base} Volumetric air flow rate of PAC during baseline (tonne/day)

Project Emissions:

Following steps are followed to estimate the additional CO_2 emissions due to electric motor.

Sub-step 1*:* The maximum rating / Nameplate data of the motors is considered

Sub-step 2: **Estimate daily input energy (E_{add}) to the electrical energy source**

The emission is resulted due to operation of some additional new motors installed during implementation of the energy savings scheme. The formulae used to calculate the emissions are given below:

$E_{add} = ((P_{tot} \times H_d) \times 0.0036) / (\eta_g)$

Where:

E_{add} = Daily input energy to the electrical energy source (GJ/day)

H_d = No of operating hours in a day (24 hrs/day)

P_{tot} = Name plate Capacity of additional motors (kW)

η_g = Efficiency of captive power plant based on historical data

Sub-step 3: **Estimate CO_2 emissions**

$C_{add} = E_{add} \times D_y \times F_n$

Where:

C_{add} = Increase in CO_2 emissions due to increase in power consumption (TCO_2e/day)

E_{add} = daily input energy to the electrical energy source (GJ/day)

D_y = No. of working days in a year (day/year)

F_n = Emission factor of fuel (Natural gas as per IPCC-guidelines) (TCO_2e / GJ)

Project Emissions (PE) = C_{add}

Leakage Emissions

As per paragraph 6 of Indicative simplified baseline and monitoring methodology for selected small-scale CDM project activity -Type II - Category D. It has been specified that "If the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered".

In the proposed project activity, the existing equipments are not transferred to any other activity. Hence leakage is not considered.

Emission Reductions

ER = Baseline Emissions - Project Emissions- Leakage Emissions

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	**S_{base}**
Data unit:	Tonne/day
Description:	Steam consumption of PAC during baseline
Source of data used:	PRMS Database
Value applied:	1367
Justification of the choice of data or description of measurement methods and	Steam flow rate is measured by online steam flow meter with integrator. The flow meter is of accuracy ±0.26 %. This parameter is used to calculate the baseline specific steam consumption ratio of PAC.

procedures actually applied :	
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	**Q_{base}**
Data unit:	NM^3/day
Description:	Volumetric air flow rate of PAC during baseline
Source of data used:	PRMS Database
Value applied:	65165
Justification of the choice of data or description of measurement methods and procedures actually applied :	Air flow rate is measured by online air flow meter with integrator. The flow meter is of accuracy ±0.094 %. This parameter is used to calculate the baseline specific steam consumption ratio of PAC.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	**Power consumption by additional Pump / motors**
Data unit:	GJ/day
Description:	Power consumption by additional Pump / motors
Source of data used:	Design specification of the Motor
Value applied:	5.2
Justification of the choice of data or description of measurement methods and procedures actually applied :	Power consumption by additional Pump / motors is estimated on the basis of design data supplied by the equipment supplier. This parameter is used to calculate the equivalent CO_2 emissions due to additional power requirement for running the pump/motor in the post project scenario.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last

	issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	**Efficiency of power generation system**
Data unit:	%
Description:	Efficiency of power generation system -NG based Gas Turbine Generator (GTG)
Source of data used:	Plant Record
Value applied:	61.51 %
Justification of the choice of data or description of measurement methods and procedures actually applied :	Efficiency of power generation system (Natural gas based gas turbine) is calculated. This parameter is used to calculate the additional power requirement due to project activity.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	**$EF_{fuel,i}$**
Data unit:	tCO_2/GJ
Description:	CO_2 Emission factor for fuel used (NG) used in GTG
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	Natural gas 56.1 tCO_2/TJ
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

B.6.3 Ex-ante calculation of emission reductions:

>>

Specific Steam Consumption of PAC in Base case = 0.645 (Tonnes of steam / Tonnes of air)

Specific Steam Consumption of PAC in Project Case = 0.639 (Tonnes of steam / Tonnes of air)

Step: 01 Estimate the difference in SSCR of base case and project scenarios ($SSCR_{diff}$)

Difference in SSCR of PAC in baseline and project scenario ($SSCR_{diff}$) = 0.036 (Tonnes of steam/ tonnes of air)

Step: 02 Estimate net reduction in steam consumption (S_{net})

Net reduction in LP steam consumption by PAC per day (S_{net}) = 72.216 (Tonnes of steam/day)

Step: 03 Estimate the net reduction in energy due to reduction in steam consumption (E_{net})

Net reduction in steam energy consumption per day (E_{net}) = 214 GJ/Day

Reduction in input energy to the boiler (E_{in})

$$E_{in} = (E_{net} / \eta_b)$$

Energy input for steam reduction in boiler (E_{in}) = 241.73GJ/day

Baseline Emission (emissions reductions due to project activity) = 4760 tCO_2 / year

Project Emissions (emission due to additional motors)= 167 tCO_2 / year

Estimation of CO_2 emission reduction= 4593 tCO_2 / year

B.6.4 Summary of the ex-ante estimation of emission reductions:

>>

Year	Project activity emissions (tCO_2e)	Baseline emissions (tCO_2e)	Leakage (tCO_2e)	Emission reductions (tCO_2e)
2007-08	167	4760	0	4593
2008-09	167	4760	0	4593

Year	Project activity emissions (tCO_2e)	Baseline emissions (tCO_2e)	Leakage (tCO_2e)	Emission reductions (tCO_2e)
2009-10	167	4760	0	4593
2010-11	167	4760	0	4593
2011-12	167	4760	0	4593
2012-13	167	4760	0	4593
2013-14	167	4760	0	4593
2014-15	167	4760	0	4593
2015-16	167	4760	0	4593
2016-17	167	4760	0	4593
Total (t CO_2e)	167	4760	0	4593

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	**S_{proj}**
Data unit:	Tonne/day
Description:	Steam consumption of PAC during project
Source of data to be used:	Log sheets / DCS Database
Value of data	1295
Description of measurement methods and procedures to be applied:	Steam flow rate is measured by online steam flow meter with integrator. The flow meter is of accuracy ±0.26 %. This parameter is used to calculate the project specific steam consumption ratio of PAC.
QA/QC procedures to be applied:	The parameter is online monitored and logged in DCS database; Two hourly data will be logged in log sheets (which is a controlled ISO document). Based on the logged data and a report consisting of the parameter is prepared by Shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis.

	The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IGF official) for Verification. After data verification, Auditor (IGF official) will be informed to carry out the Audit for concerned data. The control panel log sheet which is ISO document is audited regularly according to ISO procedure. The instruments used for monitoring data are calibrated once in a year and calibration procedure no. INM-P-09 is used for calibrating the instruments.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	**Q_{proj}**
Data unit:	Nm^3/day
Description:	Volumetric air flow rate of PAC
Source of data to be used:	Log sheets / DCS Database
Value of data	65165
Description of measurement methods and procedures to be applied:	Air flow rate is measured by online air flow meter with integrator. The flow meter is of accuracy ±0.094 %. This parameter is used to calculate the project specific steam consumption ratio of PAC.
QA/QC procedures to be applied:	The parameter is online monitored and logged in DCS database; Two hourly data will be logged in log sheets (which is a controlled ISO document). Based on the logged data and a report consisting of the parameter is prepared by Shift in charge in soft copy and is forwarded

	to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IGF official) for Verification. After data verification, Auditor (IGF official) will be informed to carry out the Audit for concerned data. The control panel log sheet which is ISO document is audited regularly according to ISO procedure. The instruments used for monitoring data are calibrated once in a year and calibration procedure no. INM-P-09 is used for calibrating the instruments.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	Steam Pressure at inlet of PAC
Data unit:	$kg/cm^2(g)$
Description:	Pressure of steam at the inlet of the PAC
Source of data to be used:	Log sheets / DCS Database
Value of data:	37.6
Description of measurement methods and procedures to be applied:	Pressure of steam is measured in the plant premises by using pressure gauge of accuracy ±0.30%. This parameter is used to calculate enthalpy of steam inlet to PAC
QA/QC procedures to be applied:	The parameter is online monitored and logged in DCS database; Two hourly data will be logged in log sheets (which is a controlled ISO

	document). Based on the logged data and a report consisting of the parameter is prepared by Shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IGF official) for Verification. After data verification, Auditor (IGF official) will be informed to carry out the Audit for concerned data. The control panel log sheet which is ISO document is audited regularly according to ISO procedure. The instruments used for monitoring data are calibrated once in a year and calibration procedure noINM-P-09 is used for calibrating the instruments.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	Steam Temperature at inlet of PAC
Data unit:	°C
Description:	Temperature of steam inlet to PAC
Source of data to be used:	Log sheets / DCS Database
Value of data:	378.6 °C
Description of measurement methods and procedures to be applied:	Steam Temperature inlet to PAC is measured in the plant premises by using temperature sensor, with accuracy of ±0.85 % .This parameter is used to calculate the enthalpy of steam inlet to PAC.
QA/QC procedures to be applied:	The parameter is online monitored and logged in DCS database; Two

	hourly data will be logged in log sheets (which is a controlled ISO document). Based on the logged data and a report consisting of the parameter is prepared by Shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IGF official) for Verification. After data verification, Auditor (IGF official) will be informed to carry out the Audit for concerned data. The control panel log sheet which is ISO document is audited regularly according to ISO procedure. The instruments used for monitoring data are calibrated once in a year and calibration procedure noINM-P-09 is used for calibrating instruments.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	Process Condensate water Temperature
Data unit:	°C
Description:	Temperature of Process Condensate water leaving the PAC
Source of data to be used:	Log sheets /DCS Database
Value of data:	48.4°C
Description of measurement methods and procedures to be applied:	Process Condensate water Temperature is measured in the plant premises by using temperature sensor of accuracy ±0.85 %. This parameter is used to calculate the enthalpy of process condensate.

QA/QC procedures to be applied:	The parameter is online monitored and logged in DCS database; Two hourly data will be logged in log sheets (which is a controlled ISO document). Based on the logged data and a report consisting of the parameter is prepared by Shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IGF official) for Verification. After data verification, Auditor (IGF official) will be informed to carry out the Audit for concerned data. The control panel log sheet which is ISO document is audited regularly according to ISO procedure. The instruments used for monitoring data are calibrated once in a year and calibration procedure no INM-P-09 is used for calibrating the instruments.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	Process Condensate water pressure
Data unit:	mm of Hg(abs)
Description:	Pressure of Process Condensate water leaving PAC
Source of data to be used:	Log sheets / DCS Database
Value of data applied for the purpose of calculating expected emission reductions in	657.2

section B.5	
Description of measurement methods and procedures to be applied:	Process Condensate water pressure is measured in the plant premises by using pressure meter of accuracy ±0.30 %. This parameter is used to calculate the enthalpy of the condensate leaving the PAC.
QA/QC procedures to be applied:	The parameter is monitored and logged in log sheets (which is a controlled ISO document). Based on the logged data and a report consisting of the parameter are prepared by Shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IGF official) for Verification. After data verification, Auditor (IGF official) will be informed to carry out the Audit for concerned data. The control panel log sheet which is ISO document is audited regularly according to ISO procedure. The instruments used for monitoring data are calibrated once in a year and calibration procedure noINM-P-09 is used for calibrating the instruments.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	Steam Generation Rate of Boiler
Data unit:	Ton/day
Description:	High pressure steam generated by the boiler
Source of data to be	Log sheet

used:	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1774.8 Ton/day
Description of measurement methods and procedures to be applied:	HP Steam generation by the boiler is measured in the plant premises by using flow meter of accuracy ±0.6%.This parameter is used to calculate the boiler efficiency.
QA/QC procedures to be applied:	The parameter is monitored and logged in log sheets (which is a controlled ISO document). Based on the logged data and a report consisting of the parameter is prepared by Shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IGF official) for Verification. After data verification, Auditor (IGF official) will be informed to carry out the Audit for concerned data. The control panel log sheet which is ISO document is audited regularly according to ISO procedure. The instruments used for monitoring data are calibrated once in a year and calibration procedure no INM-P-09 is used for calibrating instruments.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	Steam Pressure of Boiler

Data unit:	kg/cm^2(g)
Description:	Pressure of HP steam generated by boiler
Source of data to be used:	Log sheet
Value of data applied for the purpose of calculating expected emission reductions in section B.5	109 kg/cm^2(g)
Description of measurement methods and procedures to be applied:	Pressure of HP steam is measured in the plant premises by using pressure gauge of accuracy ± 0.6%.This parameter is used to calculate the efficiency of boiler.
QA/QC procedures to be applied:	The parameter is monitored and logged in log sheets (which is a controlled ISO document). Based on the logged data and a report consisting of the parameter is prepared by Shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IGF official) for Verification. After data verification, Auditor (IGF official) will be informed to carry out the Audit for concerned data. The control panel log sheet which is ISO document is audited regularly according to ISO procedure. The instruments used for monitoring data are calibrated once in a year and calibration procedure no INM-P-09 is used for calibrating instruments.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	Steam Temperature of Boiler
Data unit:	°C
Description:	Temperature of HP steam generated by boiler
Source of data to be used:	Log sheet
Value of data applied for the purpose of calculating expected emission reductions in section B.5	514 °C
Description of measurement methods and procedures to be applied:	Temperature of HP steam generated by boiler is measured in the plant premises by using temperature sensor; with accuracy of ±1%.This parameter is used to calculate the efficiency of boiler.
QA/QC procedures to be applied:	The parameter is monitored and logged in log sheets (which is a controlled ISO document). Based on the logged data and a report consisting of the parameter is prepared by Shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IGF official) for Verification. After data verification, Auditor (IGF official) will be informed to carry out the Audit for concerned data. The control panel log sheet which is ISO document is audited regularly according to ISO procedure. The instruments used for monitoring data are calibrated once in a year and calibration procedure no INM-P-09 is used for calibrating instruments.

Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	Boiler Feed Water Temperature
Data unit:	°C
Description:	Boiler Feed Water Temperature
Source of data to be used:	Log sheet
Value of data applied for the purpose of calculating expected emission reductions in section B.5	124 °C
Description of measurement methods and procedures to be applied:	Boiler feed water temperature is measured in the plant premises by using temperature sensor with accuracy of ±0.6%.This parameter is used to calculate the efficiency of boiler.
QA/QC procedures to be applied:	The parameter is monitored and logged in log sheets (which is a controlled ISO document). Based on the logged data and a report consisting of the parameter is prepared by Shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IGF official) for Verification. After data verification, Auditor (IGF official) will be informed to carry out the Audit for concerned data. The control panel log sheet which is ISO document is audited regularly according to ISO procedure. The instruments used for monitoring data are calibrated once in a year and

	calibration procedure no INM-P-09 is used for calibrating instruments.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	Quantity of fuel (s) used in the boiler(s)
Data unit:	Nm^3/day for Natural gas, kL/day for Naphtha
Description:	Quantity of fuels used in the boiler (Natural gas/ Naphtha)
Source of data to be used:	PRC Report
Value of data applied for the purpose of calculating expected emission reductions in section B.5	117801 Nm^3/day (Natural gas) 48 , kL/day (Naphtha)
Description of measurement methods and procedures to be applied:	This parameter is measured in the plant premises by using flow meter of accuracy ± 0.6%.This parameter is used to calculate the efficiency of boiler.
QA/QC procedures to be applied:	The parameter is monitored and logged in PRC Report (which is a controlled ISO document). Based on the logged data and a report consisting of the parameter is prepared by Process (MIS) Engineer in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IGF official) for Verification. After data verification, Auditor (IGF official) will be informed to carry out the Audit for concerned data. The PRC Report which is ISO document is audited regularly according to ISO

	procedure.
Any comment:	The data would be archived until 2 years after end of the crediting period or the last issuance of CERs for this project activity, which ever occurs later.

Data / Parameter:	Boiler Efficiency
Data unit:	%
Description:	Efficiency of boiler
Source of data to be used:	Calculated
Value of data applied for the purpose of calculating expected emission reductions in section B.5	88.5%
Description of measurement methods and procedures to be applied:	Boiler efficiency calculated monthly, direct method (based on heat balance) is used for the efficiency calculation.
QA/QC procedures to be applied:	This parameter is calculated and logged in log sheets (which is a controlled ISO document). Based on the logged data and a report consisting of the parameter is prepared by Shift in charge in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IGF official) for Verification. After data verification, Auditor (IGF official) will be informed to carry out the Audit for concerned data. The control panel log sheet which is ISO document is audited regularly according to ISO procedure.
Any comment:	The data will be archived until 2 years after the end of crediting period or the last

	issuance of CERs for this project activity, whichever occurs later

Data / Parameter:	Calorific value of Fuel (s)
Data unit:	Kcal/Sm^3 for Natural gas
Description:	NCV of fuel(s) used in the boiler
Source of data to be used:	PRC Report
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Natural Gas – 8230.4 Kcal/Sm^3
Description of measurement methods and procedures to be applied:	NCV of the fuels used in the boiler is used for the Boiler efficiency calculation.
QA/QC procedures to be applied:	The parameter supplied with every delivery of fuel by fuel supplier is logged in PRC Report (which is a controlled ISO document). Based on the logged data and a report consisting of the parameter is prepared by Process (MIS) Engineer in soft copy and is forwarded to CDM Coordinator through email on monthly basis. The data used is reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IGF official) for Verification. After data verification, Auditor (IGF official) will be informed to carry out the Audit for concerned data. The PRC Report which is ISO document is audited regularly according to ISO procedure. The instruments used for monitoring data are calibrated once in a year and calibration procedure no GAIL/JAG/FTL/2006/02 is used for calibrating instruments.
Any comment:	The data would be archived until 2 years after end of the crediting period.

B.7.2 Description of the monitoring plan:

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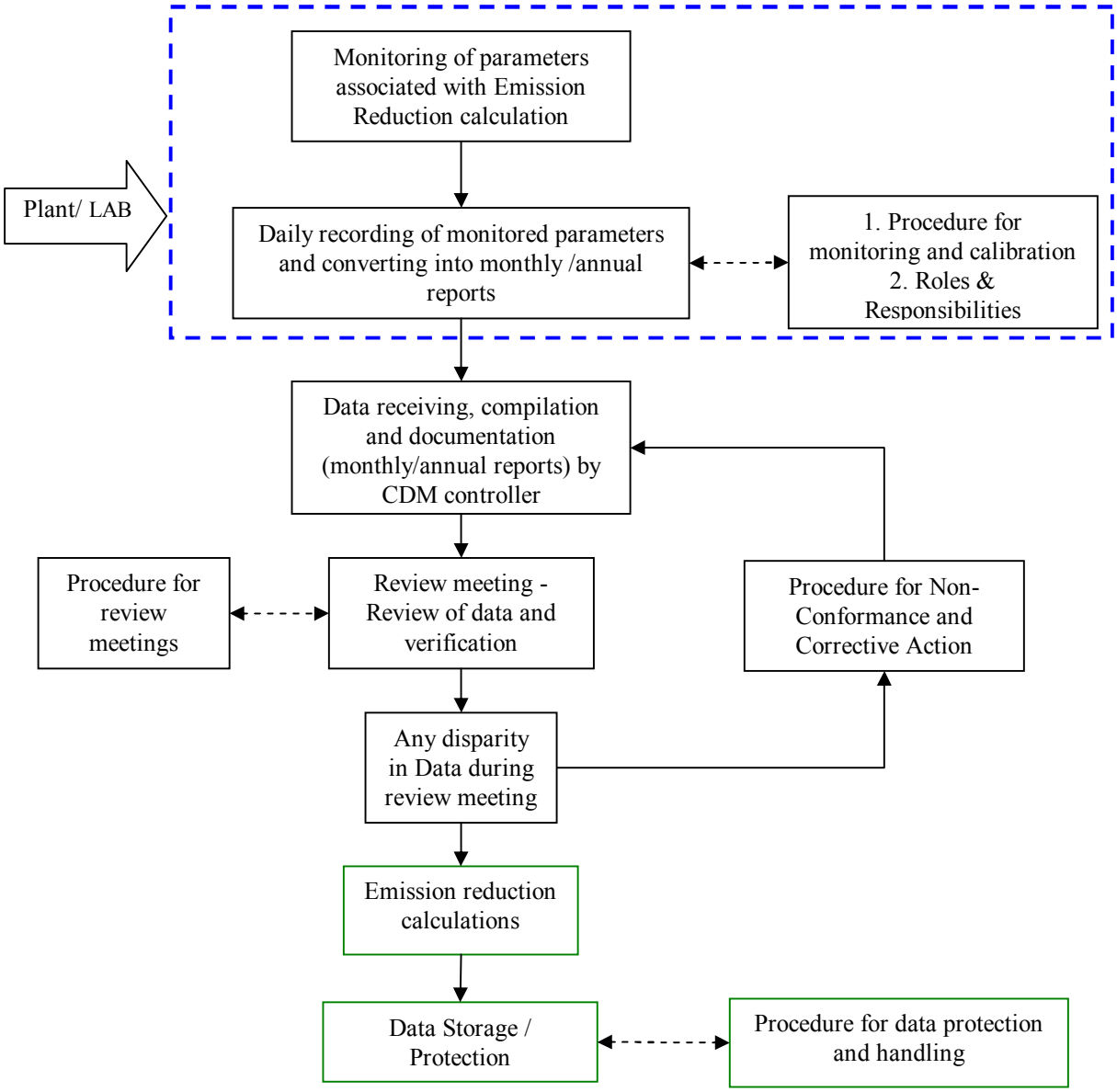
The project activity falls under the Type-II Energy Efficiency Improvement Project, Subcategory: II.D. : Energy efficiency and fuel switching measures for industrial facilities. The monitoring methodology and plan as per the paragraphs 6 and 7 of the methodology are:

> *In the case of replacement, modification and retrofit measures the monitoring shall consist of:*
>
> *(a) Documenting the specifications of the equipment replaced;*
>
> *(b) Metering the energy use of the industrial or mining and mineral production facility, processes or the equipment affected by the project activity;*
>
> *(c) Calculating the energy savings using the metered energy obtained from subparagraph(b)*
>
> *In the case of a new facility, monitoring shall consist of:*
>
> *(a) Metering the energy use of the equipment installed;*
>
> *(b) Calculating the energy savings due to the equipment installed.*



Since the project activity is energy efficiency project, the emission reductions of the project activity depends on the amount of steam saved. The steam consumption (steam energy) of PAC, as well as SSCR (energy use) of PAC is monitored before and after implementation of the project. Hence according to the methodology, energy use of PAC is monitored and energy savings is calculated from energy use of PAC before and after implementation of the project. The following parameters are monitored in the project:

- Steam consumption in PAC

CDM – Executive Board

- Steam Temperature at inlet of PAC
- Steam Pressure at inlet of PAC
- Condensate water temperature at outlet of PAC
- Condensate water pressure at outlet of PAC
- Volumetric air flow rate of PAC
- Boiler Feed Water Temperature
- Steam Generation Rate of Boiler
- Temperature of steam generated by boiler
- Pressure of steam generated by boiler
- Fuel consumption in the Boiler
- Net calorific value of fuel
- Boiler efficiency (Calculated)

The parameter mentioned in the section above would be monitored and logged in log sheet (which is a controlled ISO document) by the respective CDM Team member. Based on the logged data and a report would be prepared by Shift in charge in soft copy and forwarded to CDM Coordinator through email on a monthly basis.

The data would be reviewed by conducting a inter department review meeting once in 6 months. The Coordinator CDM will discuss the data (received from respective departments) with CDM Team member of concerned departments. Once the data is compiled and checked, it will be handed over to Verifier (IGF official) for Verification. After data verification, Auditor (IGF official) will be informed to carry out the Audit for concerned data.

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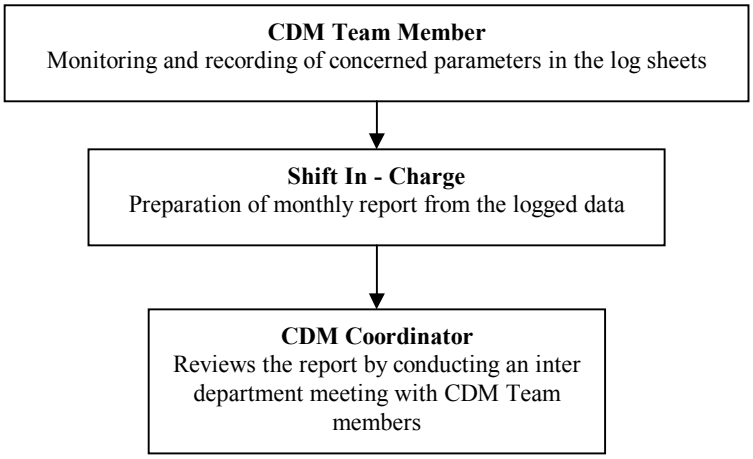
The control panel log sheet which is ISO document is audited regularly according to ISO procedure.



B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

>>

Date of completion: 07/05/2007

Contact Person: Mr. C.K. Datta

IGF, Industrial Area Jagdishpur,

Dist. Sultanpur – 227 817 (UP)

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
23/01/2006

C.1.2. Expected operational lifetime of the project activity:

>>
20 year 0 month

C.2 Choice of the crediting period and related information:

>>
A fixed crediting period of 10 years has been selected

C.2.1. Renewable crediting period

>>
Not Applicable

C.2.1.1. Starting date of the first crediting period:

>>
Not Applicable

C.2.1.2. Length of the first crediting period:

>>
Not Applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
01/10/2007 or the date of registration, which ever occurs later.

C.2.2.2. Length:

>>
10 year 0 month

SECTION D. Environmental impacts

>>

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

>> According to schedule I of Environment Impact Assessment (EIA) Notification vide S.O. 60(E) dated 27/01/94 - which lists the project activities required to get Environmental clearance from Ministry of Environment and Forests (MoEF), Government of India, IGF project activity is not required to conduct EIA.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

The project activity involves reduction in specific steam consumption ratio of PAC by suction cooling of the inlet air of PAC. The reduction in SSCR of PAC results in steam savings and subsequently reduces fuel consumption in service boiler leading to GHG emission reduction.

The project activity results in simultaneous benefits of conservation of fuel, achieving energy efficiency of the plant and has many associated environmental benefits. The environmental impacts and benefits on various parameters are discussed below:

Impact on Air

The project would not have any adverse impact on the air quality. The project activity would lead to reduction in steam consumption of the PAC. Thus, the project activity would reduce CO_2 emissions associated with the combustion of equivalent amount of fossil fuel (NG / Naphtha) to cater to the steam requirement in the absence of the project activity.

Impact on Water

The project activity reduces steam consumption of the PAC. Thus the project activity reduces the demand for demineralised water required in the service boiler. There is no possible water pollution arising due to project activity.

Impact on Land

There is no possible soil or land pollution anticipated due to the project activity.

Impact on Ecology

There is no reserved or protected area in and around the project area. There are no endangered species located in and around the plant area and no adverse impact on the ecology of the area is anticipated due to the implementation of the project activity.

Socio – Economic Impacts

The location of project activity is inside the existing plant premises and therefore there will be no procurement of new land and hence there is no human displacement anticipated. No rehabilitation programme is therefore, required.

It is therefore evident that the project activity has no significant adverse impacts on the local and global environment.

SECTION E. Stakeholders' comments

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E.1. Brief description how comments by local stakeholders have been invited and compiled:

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The project activity involves reduction in specific steam consumption of PAC by suction cooling of the inlet air of PAC. The inlet air of PAC is cooled by chilled water and a VAM is installed to supply the chilled water. The VAM would utilize the waste heat of ammonia process condensate and use it as a heat source to produce chilled water. The project activity results in simultaneous benefits of conservation of fuel and achieving energy efficiency of the plant.

Stakeholders have been identified on the basis of their involvement at various stages of project activity. The list of relevant stakeholders includes all the organizations, which were communicated / applied to get necessary clearances. The stakeholders identified for the project are as under:

- Employees of IGF
- Ministry of Environment & Forest (MoEF), Government of India
- Uttar Pradesh Pollution Control Board (UPPCB)

IGF invited employees of various departments like Ammonia, Urea etc for a meeting. During the meeting the various activities carried out by IGF in field of energy efficiency and environment was explained to the employees. IGF informed about techno-economical benefits of the energy efficiency project.

E.2. Summary of the comments received:

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IGF explained and deliberated with the employees on various features and benefits of the project activity. The employees expressed their appreciation for the project activity as it would reduce steam demand and the harmful effects due to associated GHG emissions.

There were no adverse comments received from stakeholders.

Equipment supplier would supply all the equipments required for the project activity as per the specification.

CDM – Executive Board

Ministry of Environment & Forest (MoEF), Government of India (GoI) would provide the host country approval for the project activity. IGF has received the 'Consent to operate' the plant from UPPCB.

E.3. Report on how due account was taken of any comments received:

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There were no adverse comments/concerns raised by the stakeholders. Further, as required by the CDM cycle, the PDD would be published at the DOE's web site for public comments

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Parties included in Annex I to the Convention is involved for the project activity.

Annex 3

BASELINE INFORMATION

As per Section B.4 of the PDD

Annex 4

MONITORING INFORMATION

As Per Section B.7.2 of the PDD

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