CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02 - in effect as of: 1 July 2004)

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

Jorf Lasfar heat recovery enhancement for power project.
Document Version Number #4
24th November 2005

A.2. Description of the project activity:

The Jorf Lasfar project (hereafter, the "Project") developed by Maroc Phosphore (hereafter referred to as the "Project Developer") is a heat recovery for power project in Jorf Lasfar, Morocco, hereafter referred to as the "Host Country".

The Maroc Phosphore III-IV complex Jorf Lasfar has as main activity the extraction of phosphoric acid and fertilizer from phosphate by using sulphuric acid. The sulphuric acid is produced locally from imported sulphur. The plant needs approximately 1.65 million tonnes of sulphur per year to produce about 5 million tonnes of sulphuric acid per year. The Maroc Phosphore III-IV Jorf Lasfar complex is owned and operated by OCP (Office Chérifien des Phosphates). The complex mainly consists of:

- A sulphuric acid production station;
- A phosphoric acid production station;
- A fertiliser production station;
- A thermal power plant

A large sea water network with a pumping station and a sea water uptake station is used for cooling and gypsum draining.

The production of Jorf Lasfar started in 1986. It has a total production capacity of 1.4 million tonnes of phosphoric acid per year, 850,000 tonnes of Diammonium Phosphate (DAP) and 850,000 tonnes of Triple Superphosphate (TSP) or DAP. The installation has been renovated in the year 2000 by Monsanto, who has been contracted for maintenance of the equipment.

Currently, 70% of the heat released by the sulphuric acid production is recovered and used for electricity production. The other 30% is wasted in the cooling water in the sea.

The purpose of the proposed project activity is to increase the amount of heat recovered, in the form of steam, from two lines of sulphuric acid production at the Maroc Phosphore III-IV site of Jorf Lasfar, in order to generate a greater amount of steam, leading to a greater on-site power generation. The proposed project activity involves the replacement of the existing intermediary absorption towers by a Heat Recovery System (HRS).

The new HRS will result in a significant increase of the heat recovery ratio, i.e. the ratio between the heat recovered and the heat released by exothermic reactions in the process. The steam will be produced by the HRS at a rate of 50 tonnes per hour and be mixed with the existing steam recovered in the production process. The excess steam delivered from the acid plants to the steam turbine generators enables OCP to

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generate more power than required for internal needs. The amount of sulphur used to generate the excess steam will remain constant in the proposed project activity, as compared to the current situation.

The Jorf Lasfar installation at the Maroc Phosphore complex is connected to the national power grid and the additional power can be sold back to the local utility ONE (Office National de l'Electricité). As a result, the additional heat recovered from the proposed project activity will lead to:

- in case there is a surplus of electricity generated by the new HRS at Jorf Lasfar, this excess amount of power will be sold to the grid;
- in case there is a deficit of power at the Maroc Phosphore complex, the extra power needed will be provided to the complex and reduce the amount of electricity consumption from the grid.

As a result, the increased zero emissions power generation will displace an equivalent amount of power from the Moroccan grid, which is mainly based on fossil fuels. The project will also lead to a significant reduction of atmospheric pollutants, such as SO_2, NOx, and carbon monoxide.

The project is helping the Host Country fulfil its goals of promoting sustainable development. Specifically, the project:

- Uses clean and efficient technologies, and conserves natural resources;
- Acts as a clean technology demonstration project.

Besides environmental considerations, the project will improve the competitiveness of Maroc Phosphore and reduce Morocco's coal importation, leading to net benefits for the economy of the country.

A.3. Project participants:

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)
Morocco (host)	Maroc Phosphore (OCP)	No

Table 1 - Project participants

Maroc Phosphore acts as the project developer. Maroc Phosphore is a subsidiary company of the OCP (Office Chérifien des Phosphates), in charge of the processing of phosphates extracted from Khouribga and Gantour mines.

The Secretariat of State for the Environment of Morocco is a participant in the project. The Sectratariat of State for the Environment is acting as the secretariat for the National CDM Council that acts as the Designated National Authority for Morocco.

Further details on the project participants are provided in Annex 1.

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time requesting registration, the approval by the party(ies) involved is required.

Further contact information of project participants is provided in Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Morocco

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

El Jadida

A.4.1.3. City/Town/Community etc:

The project takes place in Jorf Lasfar.

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

The site of the phosphoric acid processing plant Jorf Lasfar is located 25 km south of the city of El Jadida, on the Atlantic coast of Morocco. The plant is part of the Maroc Phosphore's complex III-IV.

A.4.2. Category(ies) of project activity:

According to Annex A of the Kyoto Protocol, this project fits into Sectoral Category 1, Energy Industries. The project could also be considered as an energy efficiency improvement chemical industry project. It utilizes approved methodology ACM0004/ Version 01- Consolidated baseline methodology for waste gas and/or heat for power generation.

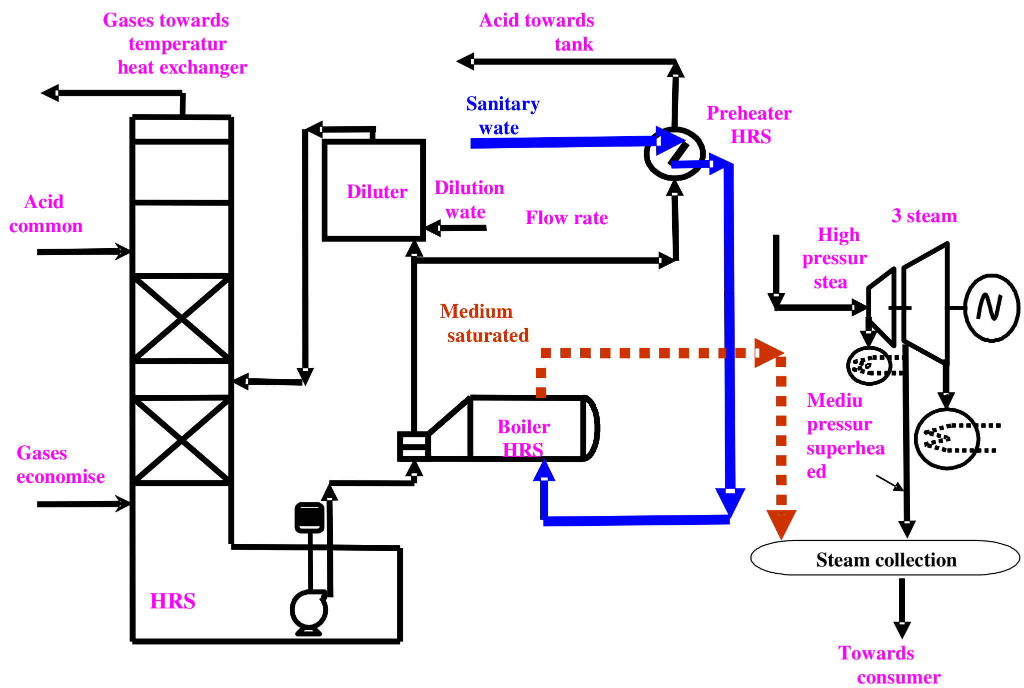
A.4.3. Technology to be employed by the project activity:

The proposed project activity involves the retrofit of two existing sulphuric acid production lines. The replacement of the current intermediary absorption towers of two production lines by HRS systems

(Mosento Enviro-Chem ©) will lead to an enhanced heat recovery. The technology is proven to be reliable, as the first unit of this type was installed in 1987 in Namahe, South Korea, and 18 units are currently operated worldwide. The retrofit implies the installation of two HRS systems together with their tanks and pumps, a steam boiler, water pre-heater, a dilution device, pumps for the water supply and for acid emptying, and the monitoring instrumentation, for a 200 million Dirham total investment.

Figure A.1 below presents a simplified flow scheme of the technology. The heat recovery system is basically an absorber that uses a boiler to remove the absorption heat as steam, instead of acid coolers (where heat is wasted).

Figure A.1: the HRS system



This new type of tower is characterised by a high temperature of the gases at the exit, which allows the generation of additional saturated steam, and lead to a greater ratio between the heat recovered and the heat released by the exothermic absorption process. Currently, 70% of the heat released by the process is recovered, while 28% is evacuated in the cooling water pumped from the sea, and 2 % is lost by radiation. The new installation will lead to 50 tons per hour of additional saturated steam at medium pressure (9.5 bars). Due to its saturated state, this steam cannot be expanded in the existing turbine. However, it substitutes steam currently extracted from the turbine for process needs, allowing the full expansion of a greater amount of steam. About 8 MW of additional power per unit can therefore be generated at nominal capacity of acid production, totalling 16 MW for the two units to be installed by the proposed project activity.

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

Explanation of how the project will result in a reduction of anthropogenic greenhouse gas (GHGs)

The additional power generated on-site as a result of the enhanced heat recovery will:

1) displace power imported from the grid when the on-site power capacity is not sufficient to fulfil the needs of the Jorf Lasfar complex; and

2) displace power generated by existing plants when power exceeding the internal needs is exported to the grid.

The additional power generated is free of CO_2 emissions since no additional fuel is consumed, while the power from the grid, mainly based on coal, is CO_2 intensive.

Explanation of why the emissions would not occur in absence of the project
Importing the equivalent amount of additional power when needed instead of generating it on-site with new HRS systems is economically preferable. The selling price associated with the power that could occasionally be exported is not high enough to compensate the investment in a reasonable timeframe. Furthermore, the production lines in Jorf Lasfar are not at the end of their lifetime; such type of units usually operate up to 30 years, while the two units concerned by the project started their operation in 1986. Thus, the project activities take place in a context where it is decided to apply best practice technology in terms of energy efficiency before the end of the lifetime of the replaced equipment. Under current difficult circumstances on the international market, OCP has many higher-ranking investment priorities which contribute to consolidate its market share. The project would therefore not occur in the absence of the Clean Development Mechanism. See also Section B.3 below.

The total emission reductions of the project over its crediting period are expected to be 890,527t CO_2e.

A.4.4.1. Estimated amount of emission reductions over the chosen crediting period:

The project will displace electricity from a relatively carbon intensive grid, with a combined margin of 0.752 tCO_2/MWh. The proposed project activity is expected to displace about 125,268 MWh per year of electricity. Subsequently, the total resulting CO_2 emissions reduction is calculated to be 94,202 tons of CO_2-eq per year when fully operational, totalling 890,527 tons of CO_2-eq over a 10 years crediting period (see Annex 3 for details).

Years	Annual estimation of emission reductions in tonnes of CO_2e
2006	40,843
2007	80,368
2008	94,202
2009	94,202

2010	94,202
2011	94,202
2012	94,202
2013	94,202
2014	94,202
2015	94,202
2016 (2 months)	15,700
Total estimated reductions (tonnes of CO_2e)	**890,527**
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	89,053

Table 2 - Estimated emissions reductions from the project

Refer to section E for further details on the quantification of GHG emission reductions associated with the project.

A.4.5. Public funding of the project activity:

The project will not receive any public funding from Parties included in Annex I of the UNFCCC.

SECTION B. Application of a baseline methodology

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

ACM0004 "Consolidated baseline methodology for waste gas and/or heat for power generation" will be used.

B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

The project meets all the applicability criteria as set out in the methodologies. ACM0004 is applicable where projects:

- Displace electricity generation with fossil fuels in the electricity grid or displace captive electricity generation from fossil fuels, electricity;

- Where no fuel switch is done in the process where the waste heat or the waste gas is produced after the implementation of the project activity.

The project activity meets all the conditions above and is therefore applicable to the methodology.

B.2. Description of how the methodology is applied in the context of the project activity:

The methodology compares the emissions that would be associated with the existing and most recently built installation versus the situation following the retrofit of the two considered production lines. The methodology identifies the origin of the power displaced by the project through an analysis of the grid and the most recent additions to the grid. The approach followed for this purpose is based on the knowledge of the power generation mix, the amount of fuel consumed by the plants included in the mix and the specific emission factor associated to each plant delivering power to the grid.

In order to calculate the emission reductions of the Jorf Lasfar project, the amount of electricity output from the grid that will be displaced by the project has to be determined. This is done by evaluating the additional amount of electricity generated on-site due to the additional steam provided by the HRS system, as explained under chapter A.4.3. This additional amount of electricity generated is calculated according to the ratio between the current power generated by the steam turbines and the current amount of steam extracted from the turbine at medium pressure, as shown under section E. It is estimated that the additional electric output due to the proposed project is 125,268 MWh.

The steps below indicate how the steps described in the selected methodology to calculate the emissions factor (EFy) are applied in the context of the Jorf Lasfar project. The calculations are based on the instructions in ACM0004 for calculating the emission factors of the operating margin (OM) and build margin (BM), which are in turn based on the descriptions in ACM0002.

Step 1 – Calculation of the Operating Margin emission factor (OM)

The ACM0002 consolidated methodology provides four options to calculate the operating margin. For the proposed Jorf Lasfar project, option (a) Simple OM has been chosen. This is because undertaking a

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dispatch data analysis (the preferred methodological option) cannot be done at a reasonable cost, since the data is not readily available from the relevant authorities, and the analysis is a very time-consuming task. The simple OM can be used in the case of the proposed project activity since low-cost/must-run sources constitute less than 50% of the total grid in Morocco.

The simple OM emission factor has been calculated based on a 3-year vintage (2002-2004). The annual OM is calculated as the generation-weighted emissions per electricity unit of all generating units serving the system in the selected year, excluding low-operating cost and must-run power plants. Low-operating cost and must run power plants include typically hydro, low cost biomass and geothermal. The OM is calculated as follows, using a 3-year average:

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}}$$

where

$F_{i,j,y}$ is the amount of fuel (mass or volume) *i* consumed by relevant power sources *i* in year(s) y,

j refers to the power sources delivering electricity to the grid not including low-operating cost and must run plants, including imports to the grid,

$COEF_{i,j}$ is the CO_2 emission coefficient of fuel (tCO_2/mass or volume) taking into account the carbon content of the fuels used by the relevant power sources j and the percent oxidation of the fuel in year(s) *y*, and

$GEN_{i,j}$ is the electricity (MWh) delivered to the grid by source j.

In terms of the Moroccan electricity sector the 3-year vintage OM was calculated using data made available by the registered Tétouan wind farm project for Lafarge cement plant[1] for the years 2002, 2003 and 2004 (see also Annex 3). Sections E.4 and E.6 also provide details on the calculation.

Step 2 – Calculation of the Build Margin (BM)

ACM0002 allows project participants to choose between two given options for calculating the Build Margin (BM) for the project. In the case of Morocco, option 1 has been chosen (i.e., calculate the Build Margin emission factor ex-ante based on the most recent information available on plants already built at the time of PDD submission).

The BM of the year 2004 has been calculated as the generation-weighted average emission factor of the 5 most recently built power plants, using the following formula:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_{m} GEN_{m,y}}$$

The details of calculation of the BM are presented in section E.4 and E.6 below.

[1] The SSC-PDD is available for download from
http://cdm.unfccc.int/UserManagement/FileStorage/2IL0212PHJWEGLA5TU16WQY10F4YUE

The power plants included are Ahmed EL Hansali (hydro), Ait Messoud (hydro); Dakhla (gas turbine, diesel), Torres (wind) and Jorf Lasfar (coal). It should be noted that these power plants also constitute the capacity additions in the electricity system that comprise 20% of the system generation and that have been built most recently. An overview of the data on the performance of the 5 selected power plants is presented in Annex 3.

Step 3 - Calculation of the baseline emissions factor

The final step in applying the consolidated methodology for the baseline determination of Jorf Lasfar is to calculate the baseline emission factor. This has been calculated as the weighted average of the emissions factor of the OM and the BM. The formula that has been used to calculate this weighted average emission factor is as follows:

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y}$$

The emissions factors of the OM and BM in Morocco have been weighed equally, each 50%. Sections E.4 and E.6 below provide details of the calculation and results.

Project Emissions

A next step is to determine emissions that are related to the project operations. For power generated from waste heat, this is zero. The emission reductions of the Jorf Lasfar project are therefore equal to the baseline emissions. See also Section E. 5 below.

Subsequently, it needs to be demonstrated that the additional amount of electricity generated by the Jorf Lasfar project would not have been displaced in absence of the project. Please refer to section B.3 for how the additionality of the project has been demonstrated.

The formulae used to calculate emissions reductions are detailed in section D.

The following table provides the key information and data used to determine the baseline scenario:

Variable	**Unit**	**Data Source**
Operating Margin Emissions Factor (*EF_OM$_y$*)	tCO_2/MWh	Calculated using data from the Grid electricity company
Build Margin Emissions Factor (*EF_BM$_y$*)	tCO_2/MWh	Calculated using data from the Grid electricity company
Baseline Emissions Factor (EF_y)	tCO_2/MWh	Calculated using data from the Grid electricity company
Electricity displaced by the Project (*EG*)	MWh	Project developer

Table 3 - Data used to determine the baseline scenario

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity:

The determination of additionality of the proposed Jorf Lasfar project is done using the CDM consolidated tool for demonstration of additionality, which follows the following steps:

Step 0 - Preliminary screening of projects started after 1 January 2000 and prior to 31 December 2005

The project is only expected to start operation after registration with the UNFCCC. This is expected to occur by mid-2006. The crediting period will start on registration of the project with the UNFCCC. In any case, as it will be demonstrated in the following steps, CDM revenue has been considered from the early stages of development of the project, and it is an integral part of the financial package of the project.

Step 1 - Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a. Define alternatives to the project activity:

Alternative 1: The proposed CDM project activity not undertaken as a CDM project activity: Installation of the new HRS at Jorf Lasfar, which will increase the installed capacity with 16 MW to be connected to the Moroccan electricity grid.

Alternative 2: Import of electricity from the grid: The current situation will be continued. The project will continue to produce phosphoric acid and fertilizer with the existing equipment and, besides the use of some of the waste heat, will consume electricity from the grid. Grid electricity will continue to be generated by the existing generation mix operating in the grid.

Alternative 3: Existing or new captive power generation on-site, using other energy sources than waste heat and/or gas, such as coal, diesel, natural gas, hydro, wind, etc.: Current captive power is being generated solely by waste heat. Since the plant at Jorf Lasfar produces phosphor as its core business activity and not energy, it is highly unlikely that the company would have invested in another form of captive power generation on-site. Hence Alternative 3 is not considered to be a realistic alternative for the proposed Jorf Lasfar project.

Alternative 4: A mix of options 2 and 3, in which case, the mix of grid and captive power should be specified: Since Alternative 3 is not considered to be a realistic alternative for the proposed Jorf Lasfar project, Alternative 4 also needs to be excluded.

Alternative 5: Other uses of the waste heat and waste gas: The main purpose of the proposed project activity is to increase the levels of efficiency of current waste heat recovery in order to reduce the amounts of electricity being imported from the grid. Hence, other uses of the waste heat e.g. exporting it to a local settlement do not constitute feasible alternatives. Alternative 5 can thus be excluded.

Alternative 6: The continuation of the current situation, whether this is captive or grid-based power supply (if not already included in the options above): Please refer to Alternative 2, where this scenario has already been considered.

Therefore, the steps below further only consider Alternative 1 and 2.

Sub-step 1b. Compliance with applicable laws and regulations:

All the above alternatives comply with the laws and regulatory requirements for energy generation in Morocco and the project location.

Step 2. Investment Analysis

Sub-step 2a: Determine appropriate analysis method

According to the tool for the demonstration and assessment of additionality, one of three options must be applied for this step: simple cost analysis (where no benefits other than CDM income exist for the project), investment comparison analysis (where comparable alternatives to the project exist) or benchmark analysis. If the alternative to the project does not include investments of comparable scale to the project, then Option III must be used. In this case, the most likely alternative to the project is to simply continue importing electricity from the grid, and therefore does not involve investments of a similar scale to the project. Therefore, benchmark analysis will be applied.

Sub-step 2b: Option III - Application of benchmark analysis

The likelihood of development of this project, as opposed to the continuation of the current situation (i.e. continuation of import of electricity from the grid) in Jorf Lasfar will be determined by comparing its IRR calculated as return on equity with the required return on equity for the company.

Sub-step 2c: Comparison of financial indicators

The Jorf Lasfar HRS project will have an IRR of 11%. The required return on equity for Office Chérifien des Phosphates is 16%.

The calculations to substantiate the IRR for the Jorf Lasfar project and the required rate of return of OCP, based on its cost of capital, are available to the validator at OCP.

Sub-step 2d: Sensitivity analysis

The project IRR is far below the required rate of return. Reasonable variations in the assumptions in OCP's calculations will show that the project will not meet the required rate of return in any reasonable scenario without the CDM.

Step 3. Barrier Analysis

Sub-step 3a. Identify barriers that would prevent the implementation of type of the proposed project

activity and Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

The barriers identified in relation to implementation of the alternatives identified in Step 1 are described below.

Of the typical barriers that an energy efficiency project in the chemical industry sector might face, the Jorf Lasfar project clearly faces the following barriers:

(a) Investment barrier

The installation of a new HRS system (Alternative 1) faces specific investment barriers due to the fact that the capital costs involved in the project have to be compared against other internal activities in OCP. Within OCP, other project activities and retrofits have been prioritised in the past. The installation of a HRS at Jorf Lasfar is already on the agenda since 1994, as suggested by the environmental department of OCP. But the installation of a HRS system results in extra costs, which do not result in a return acceptable by the Investment Board of OCP. As a result, the activity is not a priority of the Board of OCP and thus no funding has been allocated to the project. This is due to the fact that the existing equipment is still adequate and has also been recently revised (in 2000). Moreover, there are other more financially attractive alternatives that have a higher priority for OCP, like revamping sulphuric and phosphoric units, the realization of a acid phosphor purification unit and the realization of a phosphoric line of 1000 TP2O5 per day.

No extra investments are available since extra investments pose a severe barrier, especially considering the high interest rates prevalent in developing countries like Morocco and considering the international competitive market in the phosphor industry.

- The continuation of current practices (Alternative 2) does not pose any investment barrier as it does not require any additional investment until the end of the lifetime of the existing equipment, which is 2016 (it is the business as usual scenario).

(b) Technical barrier

- In the case of Alternative 1 (project activity), the HRS technology is not required for the continuation of the existing situation because the existing equipment has by far not yet reached the end of its lifetime. While the incorporation of HRS systems within new installations is well established now, its introduction within an existing plant is more problematic. The HRS technology has already been introduced by OCP in Safi, Morocco, but under completely different circumstances, i.e. within a new production line. All equipments have been designed for such a technology, with steam generated by the HRS directly expandable in the turbine. Such a retrofit has never been experienced in Morocco, and rarely worldwide, implying a greater uncertainty.

- In the case of Alternative 2 (continuation of the use of grid electricity), there are no technical/technological issues as this simply represents a continuation of current practices and does not involve any new technology or innovation. Indeed, in this scenario there are no technical/technological implications as the scenario calls for continued purchases of electricity from the grid and continued operation of the existing equipment;

(c) **Other barriers**

- The installation of a new HRS at Jorf Lasfar (Alternative1, project activity) represents a deviation from current electricity generation practices in Morocco, and thus there are barriers associated with investors and developers perception of the risks related to the types of projects.

- Furthermore, under Alternative 1, the OCP will sell excess power to the grid. The OCP is not in the business of selling electricity and the conditions at which power can be sold to the grid are not favorable. This barrier does not exist for Alternative 2.

- In the case of Alternative 2 (continuation of current practices), there are obviously no business barriers associated with this alternative, as this is simply the continuation of such practices.

In summary, Alternative 1 (installation of the HRS at Jorf Lasfar) faces the largest number of barriers compared to Alternative 2, and therefore is unlikely to be the baseline scenario.

Step 4. Common Practice Analysis

Sub-step 4a. Analyse other activities similar to the proposed project and Sub-step 4b. Discuss any similar options that are occuring:

OCP has already installed a HRS system at their project site Safi. However, the situation at Safi and Jorf Lasfar are not comparable. In the case of Safi, the installation of a HRS formed an integral part of the sulphuric unit. The investment in HRS equipment were not a separate investment decisions, as is the case for Jorf Lasfar, but formed an integral part of the whole production unit at Safi. The whole existing equipment at that time was decommissioned. The installation of a HRS at Jorf Lasfar would be to overcome the current shortage of electricity for the Maroc Phosphore complex. For Jorf Lasfar, the investment does not only involve an investment in the HRS system, but also an investment in eliminating the existing equipment from the site and in equipment needed to connect to the existing grid. These costs were not involved for Safi.

Step 5. Impact of CDM registration

This section clearly explains how the approval and registration of the project as a CDM activity, and the attendant benefits and incentives derived from the project activity, will alleviate the barriers illustrated above, and thus enable the project to be undertaken.

The financial benefit from the revenue obtained by selling the CO_2 emissions reductions has been one of the key issues encouraging investment in the proposed project activity. The CDM has been considered from an early stage and it is an integral part of the financial package of the proposed project activity.

As shown in Step 2 and Step 3 above, the project is unlikely to move forward without the additional financial support of the CDM. The additional revenue generated by carbon sales will alleviate the barriers set out above.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:

Boundary of emission sources
For the project situation, the emissions related to the production of electricity do not have to be accounted for, as they are generated by waste heat/steam which is a zero emissions source. The emissions related to the sulphuric acid production process are not included in the project boundary, as a more efficient capturing of the waste heat does not have an impact on the production process itself.

For the baseline determination, the project will account for the CO_2 emissions from electricity generation in fossil fuel power stations operating in the grid system, which will be displaced by the project activity.

Spatial extent of the project boundary
The spatial extent of the project boundary includes the plant where the project activity will take place, including all waste heat or gas sources, captive power generation equipment, any equipment used to provide auxiliary heat to the waste heat recovery process, and the power plants connected physically to the electricity grid that the proposed project activity will affect. This will include all power plants in Morocco that are connected to the grid as well as imports from Algeria and Spain.

B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:

The baseline study was concluded in 01/12/2004. The entity determining the baseline and participating in the project as the Carbon Advisor is EcoSecurities B.V., The Netherlands (nl@ecosecurities.com, or www.ecosecurities.com), not a project participant

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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:

Operation of the first revised production line is planned for the second trimester of 2006. Operation of the second production line is expected to start in the first part of 2007.[2]

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

The expected operational lifetime will be more than 10 years.

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

A fixed crediting period has been selected for this project.

C.2.1. Renewable crediting period

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:

To start when the project becomes operational, expected to be 01/06/2006.

C.2.2.2. Length:

Length (max 10 years): 10 years

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[2] Based on information available in http://www.mdpmaroc.com/download/realisations05/TemoignageOCP.pdf.

SECTION D. Application of a monitoring methodology and plan

D.1. Name and reference of approved monitoring methodology applied to the project activity:

Approved consolidated monitoring methodology ACM0004, *"Consolidated monitoring methodology for waste gas and/or heat for power generation"* has been selected as the appropriate monitoring methodology for this project.

D.2. Justification of the choice of the methodology and why it is applicable to the project activity:

The proposed project activity 'Jorf Lasfar heat recovery enhancement for power' meets all the applicability criteria as outlined in the consolidated monitoring methodology ACM0004 (and which are in line with the applicability criteria of the consolidated baseline methodology ACM004).

D.2.1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario

ID number *(Please use numbers to ease cross-referencing to D.3)*	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data kept?	Comment
1.Q_i	Volume of the auxiliary fuel used by project activity	Tonnes or m^3	m	Continuously	100%	Electronic	Credit period + 2yrs	To be measured and used for estimation of project emissions
2.NCV_f	Net Calorific Value of fuel (if any)	TJ/t or m^3	m	Monthly	random	Electronic	Credit period + 2yrs	To be measured and used for estimation of project emissions
3.EF_i	Carbon emissions factor of fuel	tC/TJ	National sources or IPCC defaults	Monthly	random	Electronic	Credit period + 2yrs	To be measured and used for estimation of project emissions
4.EG_{gen}	Total electricity generated	MWh/yr	m (online)	Continuously	100%	Electronic	Credit period + 2yrs	Monitoring location: meters at plant
5.EG_{aux}	Auxiliary electricity*	MWh/yr	m (online)	Continuously	100%	Electronic	Credit period + 2yrs	Monitoring location: meters at plant
6.EG_y	Net electricity supplied to the grid by the project	MWh/y	c (EG_{gen}-EG_{aux})	Continuously	100%	Electronic	Credit period + 2yrs	Calculated from above measured parameters

*Includes electricity utilised by the power generating equipment in project boundary

1.-3. Apply *only* if auxiliary fuels are fired such as in the case of emergencies.

4.-6. Refer to electricity generation by the project activity.

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D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

This will only apply if auxiliary fuels are fired in the case of emergencies.

$PE_y = \sum Q_i * NCV_i * EF_i * 44/12 * OXID_i$
Where:
PE_y Project emissions in year y (tCO_2)
Q_i Mass or volume unit of fuel i consumed (t or m3)
NCV_i Net calorific value per mass of volume unit of fuel i (TJ/t or m_3)
EF_i Carbon emissions factor per unit of energy of the fuel i (tC/TJ)
$OXID_i$ Oxidation factor of the fuel i (%)

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :

Although the baseline scenario for this project uses both grid imports and captive power, since the captive power is produced by waste heat and thus generates no emissions, the data to be collected equals that for a baseline scenario of grid power imports.

Data to be collected in order to estimate the baseline emission factor: grid power

ID number ***(Please use numbers to ease cross-referencing to table D.3)***	**Data variable**	**Data unit**	**Measured (m), calculated (c), estimated (e),**	**Recording frequency**	**Proportion of data to be monitored**	**How will the data be archived? (electronic/ paper)**	**For how long is archived data kept?**	**Comment**
7.EF_y	CO_2 emission factor of the grid	tCO_2/MWh	c	Yearly	100%	Electronic	During the crediting period and two years after	Calculated as a weighted sum of the OM and BM emission factors

8.$EF_{OM,y}$	CO_2 operating margin emission factor of the grid	tCO_2/MWh	c	Yearly	100%	Electronic	During the crediting period and two years after	Calculated as indicated in the relevant OM baseline method above
9.$EF_{BM,y}$	CO_2 build margin emission factor of the grid	tCO_2/MWh	c	Yearly	100%	Electronic	During the crediting period and two years after	Calculated as [∑i Fi,y*COEFi]/[∑m GENm,y]
10.$F_{i,j,y}$	Amount of each fossil fuel consumed by each power source/plant	t or m^3/year	m	Yearly	100%	Electronic	During the crediting period and two years after	Obtained from the power producers
11.$COEF_{i,k}$	CO_2 emission coefficient of each fuel type and each power source/plant	t CO_2/ t or m^3	m	Yearly	100%	Electronic	During the crediting period and two years after	Plant or country specific values (preferentially) or IPCC values
12.GENj,y	Electricity quantity	MWh/yr	m	Yearly	100%	Electronic	During the crediting period and two years after	Obtained from power producers

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

Although the baseline scenario for this project uses both grid imports and captive power, since the captive power is produced by waste heat and thus generates no emissions, the formulae for a baseline scenario of grid power imports applies.

Thus, the Emissions Factor for displaced electricity is calculated as in ACM0002.

Step 1) To calculate the Operating Margin (OM) use one of the four following methods – Simple OM, Simple adjusted OM, Dispatch data analysis, Average OM. Here the Simple OM is being used (compare section B.2):

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Simple OM

$$EF_{OM,\ simple,\ y} = \sum F_{i,j,y} * COEF_{i,j} / \sum GEN_{j,y}$$

where:
$F_{i,j,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in years *y*,
j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid,
$COEF_{i,j}$ is the CO2 emissions coefficient of fuel *i* (tCO2/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in years *y*, and
$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source *j*.

The CO_2 emission coefficient is obtained as

$$COEF_{i,} = NCV_i * EF_{CO2,\ i} * OXID_i$$

where:
NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel *i*,
$OXID_i$ is the oxidation factor of the fuel
$EF_{CO2,\ i}$ is the CO_2 emission factor per unit of energy of the fuel *i*.

Step 2) Calculate the Build Margin emission factor:

$$EF\_BM_y = \frac{\sum_{i,m} F_{i,m,y} * COEF_{i,m}}{\sum_{m} GEN_{j,y}}$$

where:
EF_BM: Build Margin emission factor (tCO_2e / MWh) and
m: refers to last additions power sources delivering electricity to the grid.

Step 3) Calculate the Baseline emissions:

$$BE_y = GEN_y * EF_y$$

where:

BE: Baseline emissions (t CO_2e)
GEN: Electricity supplied by the project to the grid (MWh)
EF: baseline emission factor (tCO_2e / MWh)
y: a given year

and

$$EF_y = \omega_{OM} * EF\_OM_y + \omega_{BM} EF\_BM_y$$

where:

EF: baseline emission factor (tCO_2e / MWh)
ω_{OM}: Operation Margin weight, which is 0.5 by default
EF_OM: Operational Margin emission factor (tCO_2e / MWh)
ω_{BM}: Build Margin weight, which is 0.5 by default
EF_BM: Build Margin emission factor (tCO_2e / MWh)
y: a given year

D.2.2. Treatment of leakage in the monitoring plan

No leakage needs to be accounted for by methodology ACM0004.

D.2.3. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

The emissions reduction (ER_y) by the project activity during the given year y is the difference between the baseline emissions though substitution of electricity generation with fossil fuels (BE_y) and project emissions (PE_y) as follows:

$$ER_y = BE_y - PE_y$$

where:
ER_y are the emissions reductions of the project activity during the year y in tons of CO_2,
BE_y are the baseline emissions due to displacement of electricity during the year y in tons of CO_2,
PE_y are the project emissions during the year y in tons of CO_2.

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored		
A (Indicate ID number)	Uncertainty level of data (High/Medium/Low)	Outline explanation why QA/QC procedures are or are not being planned.
1., 2.	Low	This data will be required for the calculation of project emissions
4.-6.	Low	This data will be used for the calculation of project electricity generation.
7.-9.	Low	This data is calculated, so does not need QA procedures.
10.-12.	Low	This data will be required for the calculation of baseline emissions (from grid electricity) and will be obtained through published and official sources.

D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

The project monitoring will be conducted by the director for the business unit intermediary products (Division Produits Intermédiare). As identified previously no significant sources of leakage are expected.

D.5 Name of person/entity determining the monitoring methodology:

Jan-Willem Martens
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THE NETHERLANDS
Tel. +31 70 365 4749
Fax. +31 70 365 6495
Email: jan-willem@ecosecurities.com

Not a project participant

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

The additional power generated by the project activity is obtained using the heat recovered from an exothermic process. No additional fuel is used, and thus no emissions are associated with the project activities. If in the case of an emergency, auxiliary fuels are used, these will be accounted for.

E.2. Estimated leakage:

No leakage needs to be accounted for by this methodology.

E.3. The sum of E.1 and E.2 representing the project activity emissions:

The sum of E.1 and E.2 is equal to 0 tCO_2 per annum.

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

The equation for calculating emissions in the baseline is:

$$BE_y = EG_{y,NET} * EF_y$$

where:

BE: Baseline emissions (t CO_2e)
$EG_{y,NET}$: Electricity supplied by the project to the grid (MWh)
EF: baseline emission factor (tCO_2e / MWh)
y: refers to a given year

The baseline emission factor calculations will be based on the combined margin using the Simple Operating Margin option (a) as presented in Step 2 of the baseline methodology . The calculation of these components is as follows:

$$BE_y = \omega_{OM} * EF\_OM_y + \omega_{BM} * EF\_BM_y$$

where:

EF: baseline emission factor (tCO_2e / MWh)
ω_{OM}: Operation Margin weight, which is 0.5 by default
EF_OM: Operational Margin emission factor (tCO_2e / MWh)
ω_{BM}: Build Margin weight, which is 0.5 by default
EF_BM: Build Margin emission factor (tCO_2e / MWh)
y: refers to a given year

Using the approach above, and the data shown in Annex 3, the baseline emissions will be 890,527tCO_2e for the entire 10-year crediting period.

E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:

Given that E.3 is equal to zero, the emission reductions of project activity are equal to E.4.

E.6. Table providing values obtained when applying formulae above:

The estimated emissions reductions are expressed in the following Table.

Table E6.1

Year	Estimation of project activity emission reductions	Estimation of baseline emission reductions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of emission reductions (tonnes of CO_2e)

	(tonnes of CO_2e)			
2006	0	40,843	0	40,843
2007	0	80,368	0	80,368
2008	0	94,202	0	94,202
2009	0	94,202	0	94,202
2010	0	94,202	0	94,202
2011	0	94,202	0	94,202
2012	0	94,202	0	94,202
2013	0	94,202	0	94,202
2014	0	94,202	0	94,202
2015	0	94,202	0	94,202
2016 (2 months)	0	15,700		15,700
Total (tonnes of CO_2e)	0	**890,527**	0	**890,527**

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

As the modifications occur within the existing site, no environmental impacts study is required under the Moroccan law.

F.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:

Not applicable.

SECTION G. Stakeholders' comments

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

The project activities for the heat recovery enhancement for power are located within the boundaries of the Maroc Phosphore III-IV complex Jorf Lasfar, the emissions and discharges associated are similar or lower than those of the baseline scenario. Hence, there are no additional stakeholders directly affected by the project. Regardless of this, key local stakeholders including local and central authorities, representatives from the public, NGOs, the University Chouaib Doukkali and the press[3] have been consulted.

Moreover, the project is part of national CDM capacity building efforts, information about which is published by the national CDM office.

G.2. Summary of the comments received:

To date, no comments have been received.

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

Not applicable, given that no comments have been received so far.

[3] Detailed in http://www.mdpmaroc.com/download/realisations05/TemoignageOCP.pdf.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Project developer:

Organization:	Groupe OFFICE CHERIFIEN DES PHOSPHATES
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

This project will not receive any public funding.

Annex 3

BASELINE INFORMATION

Table 1: CEFs of the ONE national grid (2002-2004)

Designation	Emission Factor in tCO_2 by MWh
<<Operating Margin (OM)>>	
2002	0.737
2003	0.741
2004	0.750
Average OM in 2002-2004	0.743
<<Build Margin (BM)>>	0.761
<<Combined Margins (CM)>> [Average OM & BM]	0.752

Source: PDD of the Small-Scale-Project Tétouan wind farm project for Lafarge cement plant registered on 23rd September 2005 with the ref. no. 0042 as a CDM project by the UNFCCC.

The average of the 2002-2004 Operating Margin CEF is 0.734. Taking a 50% - 50% average of the Operating Margin and the 0.761 for the Build Margin as required by the methodology leads to a Combined Margin of 0.752.

Table 2: Plants included in the Build Margin

Plant Name	MW	Year operational	Accumulated capacity	
			MW	%
Ahmed El Ansali	92	2003	92	0,02
Ait Messaoud	6,4	2003	98,4	0,03
Ed Dakhla	21	2002	119,4	0,03
Torres	54	2000	173,4	0,05
Jorf Lasfar	660	2000	833,4	0,22

Table 3: Estimated production of the heat recovery system in MWhs

Production prévisionnelle acide sulfurique & production énergie électrique supplémentaire prévisionnelle

DESIGNATION		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Production acide sulfurique	TMH/an	5,333,000	5,269,000	5,269,000	5,349,000	5,333,000	5,333,000	5,333,000	5,349,000	5,333,000	5,333,000
Production moyenne horaire acide sulfurique	TMH/h	609	601	601	609	609	609	609	609	609	609
Production horaire énergie électrique :	0.16										
* Sans HRS	MW	96.1	95.8	95.8	96.1	96.1	96.1	96.1	96.1	96.1	96.1
* Avec HRS	MW	96.1	102.0	108.0	110.4	110.4	110.4	110.4	110.4	110.4	110.4
* Ecart HRS	MW	0	6.2	12.2	14.3	14.3	14.3	14.3	14.3	14.3	14.3
Production annuelle énergie électrique :											
* Sans HRS (1)	MWH	841,836	839,208	839,208	841,836	841,836	841,836	841,836	841,836	841,836	841,836
* Avec HRS (2)	MWH	841,836	893,520	946,080	967,104	967,104	967,104	967,104	967,104	967,104	967,104
* Ecart HRS (2) - (1)	MWH	0	54,312	106,872	125,268	125,268	125,268	125,268	125,268	125,268	125,268

Table 4: Results of CO_2 emission reductions

CEF (tCO2/MWh)	0.752										2 months
Crediting period	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Years	1	2	3	4	5	6	7	8	9	10	11
CERs	40842.62	80367.74	94201.54	94201.54	94201.54	94201.54	94201.54	94201.54	94201.54	94201.54	15700.33
TOTAL CERs	890527										

Annex 4

MONITORING PLAN

This section details the steps taken to monitor on a regular basis the GHG emissions reductions from the Jorf Lasfar heat recovery enhancement for power project in Morocco. The main components covered within the monitoring plan are:

1. Parameters to be monitored, and how the data will be collected
2. The equipment to be used in order to carry out monitoring
3. Operational procedures and quality assurance/responsibilities
4. The documentation used to report and archive monitoring results

The requirements of this MP are in line with the kind of information already being routinely collected by OCP, so internalising the procedures should be simple and straightforward. If necessary, the MP can be updated and adjusted to meet operational requirements, provided that such modifications are approved by a Designated Operational Entity during the process of verification.

The monitoring plan details the actions necessary to record all the variables and factors required by the methodology ACM0004, as detailed in section D of the PDD. All data will be archived electronically, and data will be kept for the full crediting period, plus two years.

Monitoring will be undertaken by the director for the business unit intermediary products (Division Produits Intermédiare).

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1. Monitoring parameter

Table 4a Data to be collected or used to monitor emissions reductions from the project activity.

ID Number	Data Variable	Data Unit	Measured (m), calculated (c) or estimated (e)	Monitoring Frequency and Method	Proportion of data to be Monitored	Responsible Parties/ Individuals For Monitoring	Monitoring Equipment	Comments
1.Q_i	Volume of the auxiliary fuel used by project activity	Tonnes or m^3	m	Data measured continuously and recorded weekly by operator	100%	On-site personnel	Flow meter	Data will be aggregated monthly and yearly, as of June 2006.
4.EG_{gen}	Total electricity generated	MWh/yr	m (online)	Data measured continuously and recorded weekly by operator	100%	On-site personnel	Electricity meter	Data will be aggregated monthly and yearly, as of June 2006.
5.EG_{aux}	Auxiliary electricity*	MWh/yr	m (online)	Data measured continuously and recorded weekly by operator	100%	On-site personnel	Electricity meter	Data will be aggregated monthly and yearly, as of June 2006.

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2. Monitoring equipment

Table 4b Equipment used to monitor emissions reductions from the project activity

Equipment	Variables Monitored	Operational range	Calibration procedures	Parties responsible for operating equipment	Procedure in case of failure	Default value to use in case of failure	Comments
Flow meter	1.Q_i		Equipment will be calibrated regularly according to the product specificationes by the equipment supplier on sit	On-site personnel	Failure reported to equipment supplier and repairs carried out. If repair is not possible, equipment will be replaced by equivalent item. Failure events will be recorded in the site events log book.	Previous reading minus 5%	
Electricity meter	4.EG_{gen} 5.EG_{aux}		Equipment will be calibrated regularly according to the product specifications by the equipment supplier on site	On-site personnel	Failure reported to equipment supplier and repairs carried out. If repair is not possible, equipment will be replaced by equivalent item. Failure events will be recorded in the site events log book.	Previous reading plus 5%	

3. Operational procedures and quality assurance

Table 4c Operational procedures and responsibilities for monitoring of emissions reductions from the project activity (E = responsible for executing data collection, R = responsible for overseeing and ensuring accuracy, I = to be informed)

Task	On-Site Personnel	Director for Intermediary Products	OCP Management	Equipment Supplier	EcoSecurities
Collect Data	E	R			
Enter data into Spreadsheet	I	E	R		
Make monthly and annual reports		E	R		I
Archive data & reports		E		R	I
Calibration/Maintenance, rectify faults		R	I	E	I

4. Documentation

All information and data collected will be stored electronically. A log book to record failures, break-downs, unforeseen events, etc. will be kept. Monthly and annual reports will be produced and stored. Collected data as well as reports will be archived over the entire crediting period plus an additional 2 years.