

OUARZAZATE II CONCENTRATED SOLAR POWER PROJECT



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Summary:

The main purpose of this project activity is to generate clean form of electricity through renewable energy sources. The project activity involves installation of 200 MW solar thermal power project with 7 to 8 hours of thermal storage in the Ait Ougrou rural community, Ghassate Commune of Morocco. The project aims at providing electricity to the state grid by effective utilization of renewable resources. The electricity generated from the project activity would be supplied to the Moroccan grid.

During the 10 years of first crediting period i.e. 25/04/2018 to 24/04/2028, the project will replace anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 406,293 tCO₂e per year, thereon displacing electricity from the generation-mix of power plants connected to the Moroccan grid, which is mainly dominated by thermal/fossil fuel-based power plant.

The objective of this validation activity is to have an independent third party for the assessment of the project design, estimated ER sheet and to ensure a thorough assessment of the proposed project activity against the applicable CDM and VCS requirements. In particular;

- the project's baseline is assessed against "ACM0002- Version 19.0"
- the project's monitoring plan is assessed against "ACM0002- Version 19.0"
- the projects compliance with, the requirements of Article 12 of the Kyoto Protocol, the CDM Modalities and Procedures as agreed in the Marrakech Accords under decision 3/CMP.1, the annexes to this decision, subsequent decisions and guidance made by COP/MOP & CDM Executive Board and other relevant rules, including the Host Country legislation and sustainability criteria along with VCS guideline and standard version 3.7
- CDM Validation and Verification Standard for project activities, version 02
- CDM Project Standard for project activities, version 02
- CDM project cycle procedure for project activities, version 02
- VCS standard, version 3.7
- VCS guideline, version 3.7

Validation is a requirement for all VCS projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of estimated verified emission reductions (VERs).

A risk-based approach has been followed to perform this validation activity. In the course of validation, 05 Corrective Action requests (CARs) and 03 Clarification Requests (CLs) were raised and successfully closed. And 01 Forward action request (FARs) were raised for the first verification.

The review of project design documentation, monitoring report and additional documents related to baseline and monitoring methodology; the subsequent background investigation, follow-up interviews and stakeholders have provided 4KES with sufficient evidence to verify the fulfillment of the stated criteria of VCS.

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1 INTRODUCTION

1.1 Objective

4KES has been contracted by Numerco Limited (Representative of Project proponent, to undertake the validation and verification of the renewable energy project titled “Ouarzazate II Concentrated Solar Power Project” (which was under the VCS pipeline with ID PL2004).

The purpose of this validation is to have an independent third party assessment of whether the project activity conforms to the qualification criteria set out in the VCS Version 3.7 standard/18/ to attain real, measurable, additional and permanent emission reductions. The validation statement/opinion is a written assurance that:

- The project complies with all the applicable VCS requirements and has the ability to generate the emission reductions stated over the project's crediting period.
- The validation followed the requirements of the current version of the VCS Standard Version 3.7 and VCS program guide 3.7/18/ to ensure the quality and consistency of the validation work and the report.

1.2 Scope and Criteria

The validation scope is given as an independent and objective review of the project design, the project's baseline study and monitoring plan which is included in the VCS PD and other relevant supporting documents.

The scope of work covered in the validation is described below:

- To validate whether the project activity meets the requirements of VCS Standard Version 3.7, VCS Validation and VCS program guide 3.7/18/ including additionality, proof of title and compliance with local laws.
- To evaluate whether the baseline and monitoring plan are in conformance with the applied methodology from the VCS approved GHG program
- To confirm that the information presented are completed, consistent, transparent and free of omission or material error
- Background investigation and follow up interviews
- Issuance of draft validation report with CARs, CRs & FARs, if any
- Final validation opinion

The information in the VCS PD is reviewed against the criteria of VCS Standard 3.7, the VCS program guide 3.7/18/ and the approved baseline and monitoring CDM methodology ACM0002, version 19.0.

4KES has performed validation based on a risk based approach focusing mainly on the significant risks to meet the qualification criteria and the ability to generate Verified Carbon Units (VCUs).

The validation is not meant to provide any consulting towards the client. However, stated request for clarifications and/or corrective actions may provide input for improvement of the project design.

1.3 Level of Assurance

The validation has been planned and organized to achieve a

☒ Reasonable level of assurance

☐ Limited level of assurance..

1.4 Summary Description of the Project

The proposed project activity involves the installation of Concentrated Solar Power Project (NOORo II) consists of the implementation of a framework to enable the construction of solar power plants with an expected installed capacity of around 200MW. The project is developed by Moroccan Agency for Solar Energy (Masen). The project uses concentrated solar power (CSP) parabolic trough technology and includes 7 to 8 hours of thermal energy storage.

The purpose of the project activity is to generate clean electricity with utilization of solar energy. The project is the second stage of a 580 MW solar power complex (In the first stage, NOORo I is already registered as a CDM under the project number 8946)/ The project is located on a green-field of the Ait Ougrour rural community, and falls within the administration of the Ghassate Commune in Morocco.

The project activity is commissioned on 25/04/2018.

The commissioning certificates/07/ and power purchase agreements/08/ are reviewed by the verification team and found to be appropriate. The verification team has also conducted onsite observation and physically verified the project equipment(s) and monitoring arrangements. The project activity was found to be implemented as it has been defined in the VCS PD/01/.

The estimation of GHG reductions by this project is limited to carbon dioxide (CO₂) only. Thus the project activity leads to an emission reduction of 406,293 tCO₂ per year or 4,062,929 tCO₂ for the chosen crediting period of 10 years. .

2 VALIDATION PROCESS

2.1 Method and Criteria

The validation process is undertaken by validation team that involves the following:

- The desk review of documents and evidences submitted by the project proponent in context of the reference VCS rules and guidelines,
- Undertaking site visit, interview or interactions with the representative of the project proponent,
- Reporting audit findings with respect to clarifications and non-conformities and the closure of the findings, as appropriate and
- Preparing a draft validation report
- Resolution of outstanding issues and the issuance of final verification report and opinion

In order to ensure transparency, a validation protocol was prepared for the project according to the VVS for PAs version 02.0 verification requirements and VCS Standard version 3.7/18/. The Clarification Requests (CL) were issued where additional information was needed to clarify issues, and Forward Action Requests (FAR) for issues relating to project implementation that required review during the first verification of the project activity.

2.2 Document Review

The validation team has conducted the validation using the VCS Standard and the ACM0002 version 19.0 methodology as the reference criteria. The validation team had done the completeness check of VCS PD submitted by the PP as per the VCS standard Version 3.7/18/ requirements was reviewed. Furthermore, a desk review was also carried out to assess the following:

- Information of project details in compliance with VCS PD template
- Appropriateness of methodology ACM0002 version 19.0 applied to the project activity
- Compliance with relevant laws and regulations
- Correctness of application of baseline and monitoring methodology
- Demonstration of additionality
- Monitoring plan described in the VCS PD
- Stakeholder consultation
- Proof of listing of project under pipeline
- Calculation of grid emission factor, etc. where applicable.

The VCS PD version 01 dated 15/10/2019 /01/ was initially reviewed and the PP requested to submit the revised documents along with the supporting information and documents. The revised documents and additional supporting documents were further assessed by the validation team during des review as well as verified physically during site visit. During the validation process, the revised VCS PD (version 02, dated 25/12/2019) /01/ and the supporting documents were assessed to confirm the actions taken by the PP to the CARs and CLs issued.

The validation team has reviewed the final version of the VCS PD (i.e. Version 2.0 dated 25/12/2019) to confirm that all changes agreed have been incorporated adequately.

Further, prior to the onsite visit, it was verified by the validation team that the project was listed in the VCS pipeline in line with the requirements (Section 3, Registration and Issuance process, version 3.8) Ref: https://www.vcsprojectdatabase.org/#/pipeline_details/PL2004

2.3 Interviews

The site visit for the project activity was carried out on 21/12/2019. No sampling procedures were adopted either in document verification and all the document were cross checked to ensure conservative estimation of emission reduction. Kindly find below names of the persons interviewed (during onsite and telephonic interview later) for the site.

Sr. No	Name of the person	Role/Designation
1	Mr. Gareth Turner	Director, Numerco
2	Mrs. TAOBANE Nadia	MASEN
3	Mr. Julian Lopez	EPC (ACWA Power)
4	Mr. Mohammed Ouadane	Annasr association (Stake holder)
5	Mr. Abdellah Ounasser	Development association of Tasselmant (Stakeholder)
6	Mr. Mohammed El Ghali	Rouh el Moubadara Association (Stakeholder)
7	Mr. Omar Baba	Stakeholder
8	Mr. Hassan Naji	Stakeholder

2.4 Site Inspections

Duration of on-site inspection: 21/12/2019				
No	Activity performed on-site	Site location	Date	Team member
1.	Assessment team checked the implementation of the project, Baseline emission, Emission reduction calculation, technical description of the project and Monitoring.	Ait Ougrouir rural community, Ghassate Commune	21/12/2019	Ma Paa Puratchikkanal

2.5 Resolution of Findings

As an outcome of the validation process, the team can raise different types of findings:

A Clarification Request (CL) is raised if information is insufficient or not clear enough to determine whether the applicable VCS requirements have been met

Where a non-conformance arises the team leader shall raise a Corrective Action Request (CAR). A CAR is issued, where:

- The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions;
- The VCS requirements have not been met;
- There is a risk that emission reductions cannot be monitored or calculated.
- The validation process may be halted until this information has been made available to the team leader's satisfaction. Failure to address a CL may result in a CAR. Information or clarifications provided as a result of a CL may also lead to a CAR. No CL has been raised during the validation of the project activity.

During the validation process, total 05 CAR and 03 CL were raised and resolved satisfactorily. The list of CARs/CLs/FARs raised and the response provided, the mean of validation, reasons for their closure and references to correction in the relevant documents are provided in Appendix of this report.

2.5.1 Forward Action Requests

A Forward Action Request (FAR) is raised during validation to highlight issues related to project implementation that require review during the first verification of the project activity. FARs shall not relate to the VCS requirements for registration.

One FAR has been raised during the validation of this project activity for the 1st verification.

3 VALIDATION FINDINGS

3.1 Project Details

Project type, technologies and measures implemented, and eligibility of the project:

As per the project type defined by the UNFCCC and VCS standard version 3.7/18/ Guidelines, the project activity falls under type-I (Renewable energy projects) and the list of Sectoral the sectoral scope 1 - Energy Industries (renewable/ non-renewable sources).

The project activity consists of the installation of 200 MW parabolic Concentrated Solar Power (CSP) technology project. The project activity has already been commissioned as mentioned in section 1.4 of this report and it is found to be running satisfactorily. This is checked and confirmed from the commissioning certificates/07/ of the project activity, also verified during the site visit.

The project activity is a Green field project which results in an estimated GHG emission reduction of 406,293 tCO₂e per year (the calculated annualized average value as per ex-ante calculation) and a total of 4,062,929 tCO₂e over 10 years of the crediting period.

The technology employed, converts solar energy to electrical energy. The direct normal irradiance provided by the sun is concentrated onto a receiver tube using parabolic mirrors. A heat transfer fluid is circulated inside the receiver to collect the solar heat, which is then used to generate high pressure steam through a series of solar steam generation heat exchangers. The superheated steam is expanded through a steam turbine which in turn rotates the generator producing electricity. The steam turbine exhaust is condensed and then pressurized to complete the Rankine cycle. The project activity is the installation of an environmentally safe and sound technology since there are no GHG emissions associated with the electricity generation.

The different components of the power plant and specifications are as below:

Solar Field:

The collector field is made up of multiple single-axis-tracking parabolic trough solar collectors aligned on a north-south axis. Each system of parabola is composed by four monolithic parabolic mirrors, two inner symmetrical ones and two outer symmetrical ones. All mirrors will be constructed of low iron glass with a silver reflective backing. The receiver system of each module consist of a steel inner tube that conveys the heat transfer fluid encased by a glass outer tube used to maintain a vacuum space to minimize receiver heat losses. Metallic getters are installed in this vacuum space to absorb hydrogen that if present would increase heat losses. Linking of the steel inner tube and glass envelope is done using flexible bellows to account for differences in thermal expansion. A coating is applied to the steel tube to maximize solar absorptance.

Heat Transfer Fluid (HTF):

The HTF is a high-temperature synthetic oil that is commonly used in operating CSP trough plants and other heat transfer processes. It has a maximum operating temperature of about 400°C and a freezing temperature of about 12°C.

Thermal Storage System (TES):

The TES is dimensioned to provide thermal storage capacity to support turbine operation from storage equivalent to at least 7 full load hours. During the day, the HTF is used to heat molten salts, which are a binary salt mixture of sodium nitrate (NaNO₃) and potassium nitrate (KNO₃). The heat stored in the molten salts is recovered to be used to operate the turbine-generator unit and generate electricity after sunset.

Solar Steam Generator and Steam Turbine System:

The solar steam generator transfers solar energy from the HTF to feed water, generating steam used in a traditional reheat Rankine cycle for electricity generation. The turbine consists of high-pressure (HP) turbine and low pressure (LP) turbine constructed of alloy cast steel.

Cooling System:

The low-pressure turbine outlet steam is condensed transferring the residual heat to an air-cooled condenser. This is an important improvement in the design compared to NOORo I that used wet cooling.

Electrical System:

The electrical systems will consist of a generator with step-up transformer, an auxiliary supply for the power block, a distribution system for the solar field, and a transmission tie line with an interconnecting substation.

Auxiliary Heater/Boiler:

The plant will be provided with at least 2 auxiliary heaters: HTF heaters for HTF freeze protection and auxiliary boiler(s) for gland seal steam during plant start-up, running on diesel. Diesel will be used as an auxiliary fuel only and not for generation of power for the grid. The operator has the option to install auxiliary systems using fossil fuel. However, power shall be generated exclusively from solar energy.

Summary of the Ouarzazate NOOR II complex

Project	Technology	Stage	MW	Energy production (GWh/y)	Storage
NOORo II	Parabolic Trough	In operation	200	699	7-8 h

The purpose of the project activity is to generate the electricity by the utilization of solar power and is being supplied to Moroccan national grid. The project activity will generate greenhouse gas (GHG) emission reductions by avoiding GHG emissions which otherwise would have been generated by the operation of grid connected power plants and by the addition of new sources. Hence the project accomplishes VCS conditions.

Project proponent and other entities involved in the project:

The project activity is developed by Moroccan Agency for Solar Energy (Masen). Masen is the Project Proponent (PP) having overall operational control and ownership of the Project activity.

Another entity "Numerco Limited" is also involved into the project activity. Numerco Limited is the "Authorized Representative" of PP and the "Sole Focal Point" for all the communications with the DOE, VCS Board and Registry; and to take all the necessary actions for the project under VCS mechanism as and when required. Communication Agreement/20/ has been signed in between the parties.

Other entities involved in the project are ACWA Power.

Project start date:

The start date for this project is 25-April-2018. This is the date of commissioning of the project.

Project crediting period-

The crediting period of the project activity is considered for 10 years (renewable) which can be renewed for maximum 2 times. The first crediting period is from 25/04/2018 to 24/04/2028.

Project scale and estimated GHG emission reductions or removals:

The estimated annual emission reductions for the project activity are 406,293 tCO₂e per year (proposed annualized average value) is higher than 300,000 tCO₂e. Hence, the category/scale of the project is applicable under "Large Scale Project".

Project location:

The project is located in the Ouarzazate NOORo complex. The complex located in Ait Ougroul rural community, and falls within the administration of the Ghassate Commune. Lies between 31° 2'6.31"N Latitude and 6°52'8.34"W Longitude. It is confirmed during site visit.

Conditions prior to project initiation:

The project is Greenfield project. There was no project installed prior to commissioning of this project. The project activity is set up to produce clean power from the solar. The project activity involves supply, erection, commissioning and operation of 200 MW CSP solar power plant with 7-8 hours storage capacity.

The project does not generate any GHG emissions and hence it can be said that the project has not been implemented to generate GHG emissions for the purpose of their subsequent reduction, removal or destruction.

In the absence of the project activity the equivalent amount of electricity sold to grid would have been generated by grid connected power plants (which is predominantly based on fossil fuels) and by the addition of new generation sources.

Project compliance with applicable laws, statutes and other regulatory frameworks:

Till date, there are no regulations and policies preventing the implementation of the project activity.

The main Moroccan legislation with regards to the environment consist of the following, which the proposed plant will be required to comply with:

Law No 12-03 concerning the environmental impact study process.

- Promulgated by Dahir No. 1-03-06 of 10 Rabii I 1424 (12 May 2003), lists the projects subject, the procedure of implementation and methodology of impact studies.
- This Act establishes the creation of a national committee and regional committees entrusted with the review of the environmental impact studies.

Law No 11-03 concerning the protection and improvement of the environment.

This law sets the general framework for the protection of the environment in Morocco, by identifying:

- Principles of environmental protection related to human settlements and the protection of nature and natural resources;
- Principle for establishing discharge standards and the definition of nuisances;
- Management tools and protection of the environment that are described within the impact studies, plans and standards.
- Standards of environmental quality and financial and tax incentives. The law also establishes a national fund for the protection and enhancement of the environment;
- Procedural rules defining the responsibilities and obligations in the event of damage.

Law No 13-03 concerning air pollution and decree No 2-09-286 of 23 Rajeb 1431.

- Chapter II of the Act, Article 2 states that the Act applies to any person or entity, public or private, who owns or possesses or uses or operates buildings or mining, industrial, commercial, agricultural or crafts. It also applies to motor vehicles or equipment or combustion or waste incineration or heating or cooling.
- Chapter III of the Act, Article 4 states that "it is forbidden to release, issue or refuse to allow the release, emission or discharge of pollutants in the air such as toxic gas or corrosive fumes, vapours, heat, dust, odours beyond the quality or concentration allowed by the standards laid down by regulation. "
- This article also states that "in the absence of standards laid down by regulation, operators of installations referred to in Article 2 are required to apply the most advanced technologies available to prevent or reduce emissions."

Through Decree No. 2-09-286 of 20 Di Hijja 1430 (8 December 2009), this law sets standards for air quality and air monitoring.

Law 10-95 concerning water management and decree No. 2-04-553 and 2-97-787 regarding wastewater management and water quality standards, respectively.

Decree 553 paves the way for the effective implementation of reporting procedures for existing discharges and subsequent payment of fees. The implementation of the Decree induces the need to:

- Request authorization to discharge from the concerned water authority;
- Meet the discharge limits set by domestic Order No. 1607-06 (25 July 2006).

Decree 787 aims to define quality classes to normalize and standardize the assessment of water quality. It also defines orders via quality standards which water must meet depending on the treated water use, including:

- Potable water;
- Irrigation;
- Wastewater for irrigation and aquaculture.

Law No 28-00 concerning Waste Disposal and Management.

This Act aims to prevent and protect human health, fauna, flora, water, air, soil, ecosystems, sites and landscapes and the environment in general against the effects of harmful waste, by ensuring the following:

- The reduction of harmful waste production;
- The organization of the collection, transport, storage, waste treatment and disposal in an environmentally sound manner;
- The recovery of waste by reuse, recycling or any other operation reusable means for energy recovery;
- Planning national, regional and local management and disposal waste;
- Informing the public about the harmful effects of waste on public health and environment as well as measures to prevent or compensate for their adverse effects;
- The establishment of a system of control and punishment for offenses

The project obtained all the relevant permits & approvals. Hence, the project complies with all relevant local and national laws & regulations in Morocco.

Ownership and other programs-

Right of use

The Project is developed and owned by Moroccan Agency for Solar Energy, who authorizes Numerco Limited as the authorized representative of project proponent for the VCS project, and to receive VCUs and remain focal point of communication at the registry /20/.

The ownership of the project activity is verified through power purchase agreement/8/

Emissions trading programs and other binding limits

The project is not participating in other emission trading programs. The letter of undertaking/19/ has been furnished by project participant confirming that net GHG emission reductions or removals generated by the project will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions.

Other forms of environmental credit sought or received and eligible to be sought or received:

The project seeking registration under the VCS (Pipeline ID-2004)

Participation under other GHG programs:

Project is seeking registration under VCS only (Pipeline ID-2004). The PP has submitted the declaration/19/ which states that the net GHG emission reductions generated by the project activity will not be used for compliance with any other emissions trading program or to meet binding limits on GHG emissions for the same monitoring period.

Rejection by other GHG programs:

The project has not been rejected by other GHG programs.

Additional information relevant to the project, including:

- **Eligibility criteria for grouped projects**

The project activity is not a grouped project, hence not applicable to the project activity.

- **Leakage management for AFOLU projects**

Not applicable to the project activity.

- **Commercially sensitive information**

No commercially sensitive information has been excluded from the public version of the project description.

Conclusion:

In view of the assessment of VCS PD /01/ and supporting documents as listed in Appendix 1 of this report, the validation team is able to confirm that the description contained in the VCS PD of the project activity provides the reader with a clear understanding of the precise nature of the project activity and the technical aspects of its implementation. Consequently, 4KES confirms that the project description of the project contained in the VCS PD/01/ to be complete and accurate. The VCS PD complies with the relevant forms and guidance for completing the VCS PD.

3.2 Application of Methodology

3.2.1 Title and Reference

Assessment team checked that following methodology and tools are applicable for the project activity. The details are as below:

Title: Grid-connected electricity generation from renewable sources - ACM0002- Version 19.0

Reference: The project activity meets the eligibility criteria of Large scale project as it is more than 15 MW

Methodology: Grid-connected electricity generation from renewable sources

Type I: Energy industries (renewable / non-renewable sources)

Category: Approved Consolidated Methodology

Tools referred with above methodology and applicable for project activity are:

- Tool to calculate the emission factor for an electricity system, Version 07.0

3.2.2 Applicability

All applicability conditions of the updated version of the methodology (ACM0002 version 19.0) are met. Thus the methodology is deemed fully applicable for the new crediting period and no request for deviation with regards to the applicability of the methodology is required. All applicability conditions are completely and correctly included in the VCS PD.

Criteria-1.

This methodology is applicable to grid-connected renewable energy power generation project activities that: (a) Install a Greenfield power plant; (b) Involve a capacity addition to (an) existing plant(s); (c) Involve a retrofit of (an) existing operating plants/units; (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s)/unit(s).

Validation assessment:

- Project activity is Greenfield solar power project, supplying electricity to Moroccan national grid. This is verified thorough the Power purchase Agreement/08/

Thus the criterion is fulfilled by the project activity.

Criteria-2:

The methodology is applicable under the following conditions:

(a) The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;

(b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.

Validation assessment:

The project activity is the installation of a new solar power plant. This is confirmed through commissioning certificates/07/.

Thus the criterion (a) is applicable and (b) is not applicable for the project activity.

Criteria-3, Criteria 4, Criteria 5 and Criteria 6:

The methodology is not applicable to these criteria given under the methodology as project is only a solar power project, not related to any hydro power generation.

Validation assessment:

The project activity is the installation of a new solar power plant and does not involve in any hydro power generation. This is confirmed through the commissioning certificates/07/.

Criteria-7:

The methodology is not applicable to these criteria given under the methodology as project is only a solar power project, not related to any hydro power generation.

(a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;

(b) Biomass fired power plants/units.

Validation assessment:

The project activity is the installation of a new solar power plant and does not involve switching from fossil fuels to renewable energy sources at the site of the project activity. This is confirmed through the commissioning certificates/07/.

Thus the criterion is not applicable for the project activity.

Criteria-8:

In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, that is to use the power generation

equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance.”

Validation assessment:

The project activity does not involve any capacity additions, retrofits or replacements of an existing facility because it is a Greenfield solar power generation project activity; same has been confirmed from physical inspection during the validation site visit.

Thus the criterion is not applicable for the project activity.

The project activity is the installation of a solar Power Generation project; it is not a hydro project, thus all conditions related to hydro plants are not applicable to the project activity (and not included in this section).

Thus, it can be concluded that the applied methodology ACM0002, version 19.0 is applicable to the project activity.

Further, the applied methodology refers to latest available versions of the following tools;

1. Tool to calculate the emission factor for an electricity system

The VCS PD /01/ refers and correctly applies the latest version of tool to calculate the emission factor for an electricity system, version 07.0 /05/. Also in the final version of the VCS PD, the PP has referred the estimated the Morocco Grid Emission Factor based on the data Published by National power utility (ONEE). This estimated based on the latest ONEE available at the time of VCS PD submission for validation of the project activity. The tool to calculate the emission factor for an electricity system, version 07.0 is used to estimate the OM, BM and CM of a project that is substituting grid electricity. The tool is used to calculate the emission factor of the Moroccan electricity network considering grid power plants only. The Project will deliver electricity to the Moroccan grid system that is operated by ONEE, and this system is not located partially or totally in any Annex I country.

Thus, the tool is applicable for the project activity.

3.2.3 Project Boundary

The project boundary is given by the applied methodology, ACM0002, version 19.0.0:

“The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.”

The project boundary includes the CPS solar power plant, grid and all power plants connected to grid. The proposed project activity will evacuate power to the Moroccan national grid. Therefore, the entire Morocco national grid and all connected power plants have been considered in the project boundary for the proposed VCS project activity, thereby displacing the grid generated electricity. The project boundary includes the CSP solar power plant, grid and all power plants

connected to grid, which has been illustrated in the Section 2.3 of the VCS PD/01/ and gives clear understanding of the project boundary; thus it is acceptable. The same has been confirmed during the site visit and is found to be appropriate.

The consideration, by the PP, of only CO₂ gas for the baseline emissions is conservative and also in line with the methodology. The exclusion of CH₄ & N₂O in the baseline scenario is appropriate. The project activity involves the generation of electricity using solar energy. However, the process involves use of fossil fuel as secondary fuel. Hence, considering CO₂ from burning of fossil fuel as project emissions is appropriate. No other project emission is involved. Hence, the exclusion of CH₄ & N₂O in the project scenario is appropriate. There are no other sources of project emissions.

The assessment team is able to conclude that the project boundary and selected sources are applied as per the methodology and the applicable VCS criteria.

3.2.4 Baseline Scenario

The project activity involves the installation of a newly built and grid-connected renewable power plant (i.e. solar) and supplying the generated electricity to Morocco national grid, hence, according to the applied methodology ACM0002, version 19.0.0, the baseline scenario is determined properly as:

“Electricity delivered to the grid by the Project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”..”

The latest available version for “Tool to calculate the emission factor for an electricity system” is version 07.0 /05/ and the PP has correctly referred to the same in the section 3.1 of the final VCS PD /1/ for determining baseline grid emission factor and it is found to be correct.

The PP has estimated the Morocco Grid Emission Factor based on the data Published by National power utility (ONEE). The baseline emission factor for the electricity system has been calculated on ex-ante basis and will remain fixed for the entire project crediting period.

Hence, the baseline determined in the VCS PD is correct and in line with the applied methodology ACM0002, version 19. Also the identified baseline for the project activity is the most likely scenario of what would have occurred in the absence of the project activity and is confirmed by validation team; thus it is accepted. The project participant has included all sources and references used for baseline determination for the project activity in the PD/1/ and the identified baseline is justified appropriately by the project participant. The Baseline scenario and baseline emission calculations are found as per ACM0002 version 19.0.0/4/. The combined margin approach is the ex-ante approach as per tool to calculate the emission factor for an electricity system. Based on the requirements of paragraph 83 of the VVS version 02.0 /10/, the validation team confirm that:

- a) All the assumptions and data used by the PP are listed in the VCS PD, including their references and sources;

- b) All documentation used is relevant for establishing the baseline scenario and correctly quoted and interpreted in the PD;
- c) Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable;
- d) Relevant national and/or sectoral policies and circumstances are considered and listed in the PD;
- e) (e)The approved baseline methodology has been correctly applied to identify the most reasonable baseline scenario and the identified baseline scenario reasonably represents what would occur in the absence of the project activity.

3.2.5 *Additionality*

The project activity is a large scale project and the additionality of the project activity was demonstrated as per 'Simplified procedure to demonstrate additionality' described in the section 5.3.1 of applied methodology ACM0002, version 19. As per the simplified procedure, the additionality is demonstrated in the following steps:

Methodology requirements	Assessment
Para 28: The simplified procedure to demonstrate additionality is applicable to the following grid connected electricity generation technologies (positive list): a) Solar photovoltaic technologies; b) Solar thermal electricity generation including concentrating Solar Power (CSP); c) Off-shore wind technologies; d) Marine wave technologies; e) Marine tidal technologies; f) Ocean thermal technologies.	The project is a Solar thermal electricity generation using CSP technology and supplying the power to Morocco grid. Hence, the criteria is fulfilled.
Para 29: A specific technology in the positive list is defined as automatically additional if at the time of PDD submission any of the following conditions is met: (a) The percentage share of total installed capacity of the specific technology in the total installed grid connected power generation capacity in the host country is equal to or less than two per cent; or (a) (b) The total installed capacity of the technology in the host country is less than or equal to 50 MW.	At the time of submission of VCS PD, the electricity installation capacity data of the Morocco are as below: Total installed capacity of the grid connected power plants is 10,937.8 MW/17/. And the installed capacity of the solar thermal power plants (excluding the plants that are currently in the validation) is 160 MW/17/. These details are verified from the IEA data and National power utility (ONEE) website. Hence, the percentage share of total installed capacity of solar thermal power plant technology in the country is about 1.5% (160/10,937.8) which is less than 2%. Hence, the criteria is fulfilled
Para 29: The project proponents that apply simplified procedure to demonstrate additionality shall provide information on actual capital cost of the project activity or the CPA at the time of the first verification.	PP confirmed that the actual capital cost of the project activity will be provided during the first verification. A FAR (FAR-01) has been raised for the same.
Para 30: The positive list of technologies indicated in paragraph 28 above is valid for two years from the date of entry into force of version 19.0 of ACM0002 on 31 August 2018. The Board may reassess the validity of these simplified procedures and extend or update them if needed. Any update of the simplified procedures does not affect the projects that request registration as a CDM project activity or a programme of activities by 30 August 2020 and apply the simplified procedures contained in version 19.0 of ACM0002.	The VCS PD is submitted to validation on October 2019 which before 30 August 2019. Hence, the project fulfils the criteria

As mentioned above, the project fulfils the all relevant criteria of Simplified procedure to demonstrate additionality mentioned in the applied methodology. Hence, the project is automatically additional. .

3.2.6 Quantification of GHG Emission Reductions and Removals

The project activity has applied baseline methodology as mentioned in the methodology ACM0002 version 19.0.0. As per the paragraph 42 of the methodology:

“Baseline emissions include only CO₂ emissions from electricity generation in power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants”.

The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid, CM, y} \dots\dots\dots(1)$$

Where:

BE_y = Baseline emissions in year y (t CO₂)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EG_{PJ,y} = EG_{PJ, facility, y}$ (for Greenfield projects paragraph 44 ACM0002)

$EF_{grid, CM, y}$ = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (tCO₂/MWh)

The Project proponent has adopted the combined margin approach for determination of the grid emission factor based on the data published by ONEE. The PP opted for combined margin emission factor ($EF_{grid, CM, y}$) for the project activity and it has been estimated ex-ante as 0.604 tCO₂/MWh. It will remain fixed throughout the crediting period for the project activity as opted by PP. The combined margin emission factor is obtained from the three years generation weighed average of the operating margin emission factor and the latest year build margin emission factors by applying suitable weights (i.e. 75% to operating margin emission factor ($EF_{grid, OM, y}$) and 25% to build margin emission factor ($EF_{grid, BM, y}$) as referred to the EF tool version 7.0.

The weighted operating margin value of 0.634 tCO₂/MWh and build margin value of 0.515 tCO₂/MWh for Morocco grid have been estimated based on the latest data Published by ONEE/16/. This is the latest available CO₂ baseline database at the time of the VCS PD submission for validation of the project activity. This is found to be appropriate and it is accepted.

Determination of $EG_{PJ, y}$ (Quantity of net electricity generation supplied by the project plant/unit to the grid in year y):

The PP has considered the value of $EG_{PJ,y}$ as 697,429 MWh/year for the project activity with the annual degradation of about 0.07% as which is based on the estimated generation provided in the Technical Summary Report Ouarzazate II SPP project /21/ available at the time of investment decision. Thus, the estimated annual average of emission reductions is arrived as 406,293 tCO₂e and total 4,062,929 tCO₂e over the 10 years of crediting period. The validation team confirms that the estimates of baseline emissions can be replicated using the information provided in the final VCS PD/1/. It can also be verified using the emission reduction calculation spread sheet/02/. Hence, it is concluded that the approach to calculate emission reductions is clearly demonstrated in the VCS PD /01/ is appropriate.

Based on the above generation and grid emission factor, the baseline emission is estimated as below:

Parameter	$EG_{PJ,y}$ MWh	$EF_{grid,CM,y}$ tCO ₂ /MWh	BE_y tCO ₂
25 th Apr 2018 – 24 th Apr 2019	6,97,429	0.604	421,247
25 th Apr 2019 – 24 th Apr 2020	6,96,931	0.604	421,086
25 th Apr 2020 – 24 th Apr 2021	6,96,434	0.604	420,785
25 th Apr 2021 – 24 th Apr 2022	6,95,938	0.604	420,486
25 th Apr 2022 – 24 th Apr 2023	6,95,442	0.604	420,186
25 th Apr 2023 – 24 th Apr 2024	6,94,946	0.604	419,886
25 th Apr 2024 – 24 th Apr 2025	6,94,451	0.604	419,587
25 th Apr 2025 – 24 th Apr 2026	6,93,957	0.604	419,289
25 th Apr 2026 – 24 th Apr 2027	6,93,463	0.604	418,990
25 th Apr 2027 – 24 th Apr 2028	6,92,970	0.604	418,692

Estimation of Project Emissions (PE_y):

As per paragraph 34 of the applied methodology, for most renewable power generation project activities, PE_y = 0. However, some project activities may involve project emissions that can be significant. These emissions shall be accounted for, by using the following equation:

$$PE_y = PE_{EF,y} + PE_{GP,y} + PE_{HP,y}$$

Where,

PE_y = Project emissions in year y (tCO₂e)

PE_{FF,y} = Project emissions from fossil fuel consumption in year y (tCO₂)

PE_{GP,y} = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO₂e)

PE_{HP,y} = Project emissions from reservoirs of hydro power plants in year y (tCO₂e)

The project does not involve geothermal power plants or water reservoir of hydro power plants, therefore:

$$PE_y = PE_{EF,y}$$

Calculation of $PE_{FF,y}$

$PE_{FF,y}$ are calculated as per the “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion” version 3 as follows:

$$PE_{FF,y} = \sum_i FC_{i, NoorII,y} \times COEF_{i,y}$$

Where:

$FC_{i, NO}$	Quantity of fuel type i combusted by NOORo II during the year y (mass or volume unit/yr)
$ORo II, y$	
$COEF_{i,y}$	CO ₂ emission coefficient of fuel type i in year y (tCO ₂ /mass or volume unit)
i	Fuel types combusted in process j during the year y

Since data to calculate $COEF_{i,y}$ using option A is not available, option B of the “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion” version 3 is used

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

As per VCS PD, the diesel will be used as auxiliary fuel. And for the ex-ante calculation it is assumed that about 4,239 tonnes of Diesel per year will be used as auxiliary fuel. Hence, the project emission for the ex-ante is calculated as below:

$$COEF_{diesel,y} = 43.3 \text{ GJ/t} \times 0.0748 \text{ tCO}_2/\text{GJ} = 3.24 \text{ tCO}_2/\text{t diesel}$$

$$PE_{diesel,y} = 4,239 \text{ t} \times 3.24 \text{ tCO}_2/\text{t diesel} = 13,731 \text{ tCO}_2$$

Estimation of Leakage Emissions (LE_y):

As per the paragraph 56 of ACM0002 version 19.0, No other leakage emissions are considered, thus leakage emissions are zero (LE_y = 0).

Estimation of GHG emission reductions:

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y,$$

Where

ER_y = Emission reductions in year y (tCO₂)

BE_y = Baseline Emissions in year y (tCO₂)

PE_y = Leakage emissions in year y (tCO₂)

The emission reduction for the crediting period is estimated as below:

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
25 th Apr 2018 – 24 th Apr 2019	421,247	13,731	0	407,516
25 th Apr 2019 – 24 th Apr 2020	421,086	13,731	0	407,355
25 th Apr 2020 – 24 th Apr 2021	420,785	13,731	0	407,055
25 th Apr 2021 – 24 th Apr 2022	420,486	13,731	0	406,755
25 th Apr 2022 – 24 th Apr 2023	420,186	13,731	0	406,455
25 th Apr 2023 – 24 th Apr 2024	419,886	13,731	0	406,156
25 th Apr 2024 – 24 th Apr 2025	419,587	13,731	0	405,857
25 th Apr 2025 – 24 th Apr 2026	419,289	13,731	0	405,558
25 th Apr 2026 – 24 th Apr 2027	418,990	13,731	0	405,260
25 th Apr 2027 – 24 th Apr 2028	418,692	13,731	0	404,962
Total	4,200,234	137,310	0	4,062,929

The year-wise ER value has been demonstrated under the section 3.4 of the VCS PD, which is found to be acceptable.

Conclusion:

In line with the paragraph 113 of VVS for PAs version 02.0, validation team confirms that the project activity complies with the specified requirements of algorithms and/or formulae used to determine emission reductions and discussed above. The assessment team also confirms that:

- All assumptions and data used by the project participants are listed in the VCS PD, including their references and sources;
- All documentation used by project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the VCS PD;
- All values used in the VCS PD are considered reasonable in the context of the project activity;
- The baseline methodology and corresponding tool(s) have been applied correctly to calculate project emissions, leakage emissions, baseline emissions and emission reductions;
- All estimates of the baseline emissions can be replicated using the data and parameter values provided in the VCS PD.

3.2.7 Methodology Deviations

No methodology deviations identified.

3.2.8 Monitoring Plan

Fixed Parameters

The following parameters are fixed ex-ante in the VCS PD:

Parameter	Description	Value
$EF_{grid,CM,y}$	Combined margin emission factor	0.604 tCO ₂ /MWh
$EF_{grid,OM,y}$	Operating margin emission factor	0.634 tCO ₂ /MWh
$EF_{grid,BM,y}$	Build margin emission factor	0.515 tCO ₂ /MWh

The combined emission factor, operating margin & Build margin emission factor has been estimated based on the Tool to calculate emission factor of an Electricity system, version 7. PP has used the electricity data of 2016, 2017 & 2018 published by ONEE which are the latest 3 years data available at the time of submission of PDD. The IPCC fuel emission factors were used and the same is verified with the '2006 IPCC Guidelines for National Greenhouse Gas Inventories' and the fuel emission factor values used in the grid Emission factor calculation are found to be correct.

PP has submitted the grid emission factor calculation sheet. The validation team checked the excel sheet and found that the data and sources used in the emission factor calculation is appropriate and consistent with the respective source. The calculation method of OM, BM are verified and found to be in accordance with the Tool to calculate emission factor of an electricity system, version 7. The combined margin is estimated based on the weights as follows: wOM = 0.75 and wBM = 0.25. Since the project activity is a solar power generation project, the OM & BM weights used for calculation of emission factor is found to be correct in line with the para 86 of tool to calculate emission factor of an electricity system.

Hence, the parameters fixed ex-ante are correct and appropriate for the project activity.

Monitoring Parameters

According to the applied methodology, ACM0002, version 19.0, the following parameters need to be monitored for the estimation of baseline emission:

- Quantity of net electricity generation respectively supplied by NOORo II to the grid in year y ($EG_{NOORo II, y}$)

In accordance with the methodology requirement, net electricity supplied by the project activity is obtained from Energy Meter Reading. The bi-directional energy meter will measure both export & import electricity and net electricity supplied to grid is estimated from difference between export & import electricity. Electricity export to the grid and import from the grid is metered by main and backup energy meters of 0.2s accuracy class. The energy meter will be calibrated once in 180 days.

The following parameters will be monitored to estimate the project emission from fossil fuel consumption:

- Quantity of fuel type i combusted respectively in NOORo II during the year y
- Weighted average net calorific value of fuel type i in year y
- Weighted average CO₂ emission factor of fuel type i in year y

The quantity of fuel consumed will be measured from the flow meters installed at site. The flow meter measures the fuel consumption continuously and the same will be recorded quarterly. And the flow meter will be calibrated once in a year.

The net calorific value of fuel and emission factor of fuel are monitored using any of the below options:

Data source	Conditions for using the data source
a) Values provided by the fuel supplier in invoices	This is the preferred option.
b) Regional or national default values	If a) is not available These sources should be based on well-documented, reliable sources (such as energy balances)
c) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2/1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	If a) is not available

Other elements of monitoring plan:

"All data collected as part of monitoring should be archived electronically and be kept at least for 2 years after the end of the last crediting period".

Therefore, the quantity of net electricity generation supplied by the project plant to the grid will be reliably monitored through calibrated electricity meters and cross-checked with sales records as per internal monitoring practices.

Monitoring team and training

Data collection, consolidation and results analysis will be undertaken by a dedicated team adequately trained, well aware of VCS requirements. This team will not have any hierarchical relationships or dependence links with all entities involved to measure net electricity supplied to the grid and to assure the correct operation and maintenance of the measuring equipment. This independence shall guarantee the integrity of the work that will be done.

Monitoring organisation

Roles and responsibilities of the relevant staff involved in VCS monitoring will be in place at the start of the crediting period of the project activity.

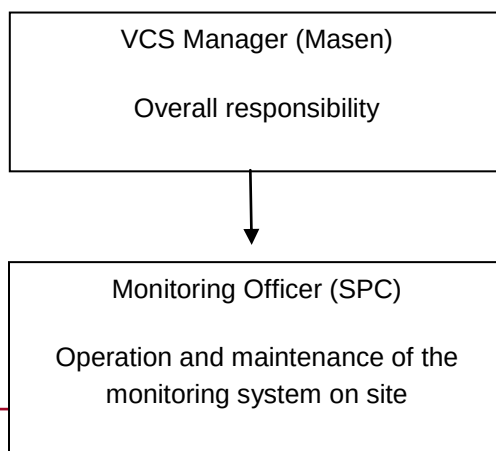
Masen will hold the overall responsibility for the monitoring system on this project and will assign this responsibility to a member of its staff ("VCS Manager").

The Solar Project Company (SPC) selected to design, finance, build, commission, operate and maintain the power plant will be responsible for the operation and maintenance of all the monitoring equipment on site, except for the VCS electricity meter that will be operated, maintained and calibrated by ONE, with the presence of Masen.

A formal set of monitoring procedures will be defined and established prior to the start of the project. These procedures will detail the organisation, control and steps required for certain key monitoring system features, and include:

- (a) VCS staff training
- (b) VCS data and record keeping arrangements
- (c) Data collection
- (d) VCS data quality control and quality assurance
- (e) Equipment maintenance
- (f) Equipment calibration
- (g) Procedures in case of equipment failure.

Figure: Management structure in order to monitor emission reductions



Staff training

Training will be conducted to ensure Masen's staff involved in monitoring activities is capable of performing their designated tasks to high standards. This will include VCS specific training to ensure that they understand the importance of complete and accurate data and records for VCS monitoring.

Monitoring equipment

Electricity meter(s) will measure the quantity of net electricity generation supplied by the power plant to the grid.

The electricity meters' accuracy shall be within 0.2%. The maintenance and calibration regime will follow the relevant standards and/or the manufacturer's specifications.

The VCS electricity meter corresponds to the one used for transaction purposes. In case of VCS meter(s) failure, check meter(s) can be used to estimate the quantity of net electricity generation supplied by the power plant to the grid.

Mass or volume meters may be installed to monitor the consumption of fossil fuel. Meters should be installed, maintained and calibrated according to equipment manufacturer instructions if applicable.

Monitoring data

The requirements for the electricity supply measurement are detailed in the power purchase agreement between Masen and the SPC. Data measured by meters will be double-checked against the electronic data received at the remote monitoring station.

All VCS relevant data will be measured & collected as detailed. All data required for verification and issuance will be backed-up and kept for at least two years after the end of the crediting period or the last issuance of VCUs of this project, whichever occurs later.

While the project is expected to start operating in 2018, the exact configuration of the meters and the exact design of the monitoring plan for the proposed project activity may be subject to change given the fact that the PD is completed at an early stage of project development.

Data Quality Control and Quality Assurance

All data collected on-site by the SPC can be verified by Masen through a remote station connected to the plant. Masen will be responsible for the following:

- perform a check of all the relevant data received from the SPC,

- perform the ER calculations, and
- analyse emission reduction performance periodically.

The main obligations of the SPC under the VCS monitoring plan as specified above has been included in the Request for Proposal for the Ouarzazate II Concentrated Solar Power Project, and specifically in the Minimum Function Specification and the power purchase agreement in order to ensure that the winning bidder which will create the SPC will implement the monitoring according to this monitoring plan.

Conclusion:

The monitoring methodology applies consistently the choice of the option selected for monitoring of baseline emissions. The monitoring plan provide procedures for the collection and archiving of all relevant data necessary for estimation or measuring the emission reductions within the project boundary during the crediting period.

The project participant has the ability to implement the monitoring plan. This is checked through discussion with consultant, the project participant and O&M contractors of the project activity during the physical site inspection. The staffs at the sub-station and the representative of the technology providers were also interviewed to verify the accuracy in the documents. This has been checked during the site visit and is found to be acceptable.

The final VCS PD /01/ has been reviewed to check that the procedure for data uncertainty, emergency preparedness, roles and responsibility, operational and management structure are mention in the PD. The monitoring plan completely describes all measures to be implemented for monitoring all parameters required. Based on the above discussion and the requirements of paragraphs 117 and 119 of the VVS for PAs version 02.0/10/, the validation team confirm that:

1. The monitoring plan included in the VCS PD is based on the baseline methodology ACM0002 version 19.0.0 which has been applied to the VCS project activity.
2. The monitoring arrangements described in the monitoring plan are feasible within the project design.
3. The PP has the ability to implement the monitoring plan as per the VCS PD.

3.3 Non-Permanence Risk Analysis

The project activity does not require a non-permanence risk analysis. Hence this is not applicable..

4 SAFEGUARDS

4.1 No Net Harm

The development of the project will inevitably result in environmental and social impacts, both positive and negative.

Main sources and project impact receptors

Phases	Main impact sources	Main impact receivers	
		Biophysical	Human
Construction	• Installation and commissioning of the life base • Release of the right-of-way • Recruitment of site staff • Paths of deviations • Earthworks • Transport of materials	• Air • Ground • Waters • Vegetation • Wildlife	• Health and security • Population displacements • Landscape and living environment of the populations • Agriculture and Livestock
Exploitation	• Commissioning of the plant • Routine and periodic maintenance work	• Air • Ground • Waters • Flora • Wildlife	• Health and security • Population displacements • Landscape and living environment of the populations • Agriculture and Livestock

These potential impacts and appropriate mitigation measures are presented in more detail in the chapters of assessment report on the identification and assessment of impacts and in the Environmental and Social Management Plan:

Impact	Impact receiver	Mitigation	Tools for monitoring (IOV)	Tools for reporting (MV)	Schedule
Natural risks (fire due to lightning)	Site and surrounding area	Lightning rod	Lightning rod installation	Visual assessment	During operation phase
Fire risks related to short-circuit	Site and surrounding area	Fighting equipment against fire (fire extinguisher), Prevention and emergency plan	Number of fire extinguisher available, PPE	Visual assessment, System documentation of the security site management	During operation phase
Fire risk related to neighboring activities	Project site	Firewall around the plant	Existing firewall and conformity	Visual assessment	During operation phase

Risk of theft and vandalism and deterioration of facilities	Cattle, peoples within the area of the plant	Sign a contract with a security company	Contract with a security company	Visual assessment, System documentation of the security site management	During operation phase
Professional risk (work-related accident)	Employees	Training and awareness about professional risks, request using PPE, implement an urgent care procedure for accident	effectiveness and existing PPE, Management system and procedures in place for accident	Visual assessment, System documentation of the security site management	During operation phase
Risks related to pollution soils and waters	Underground and ground	Install toilet blocks with septic tanks draining for employees	Existing and workable toilet blocks	Visual assessment	Before effective date of operation
Obstruction of livestock corridors	Breeders for transhumance and neighboring farmers	Corridors implementation	Corridors	Visual assessment	During operation phase
Risks of social conflict	Local peoples	Priority to local hiring, Social actions	Number of local employment	Monitoring of the agreements signed among sponsors and peoples	During operation phase

Conclusion:

The validation team checked the Specific Environmental and Social Impact Assessment report (SESIA)/13/ of the project. The report analyses the impacts of the project during the various stage of the project. Validation team finds the environmental and social impacts of the project are correctly identified in the report and the summary of the same is reported in the VCS PD.

Validation team also reviewed the 'Environmental and Social Management Plan' provided in the SESIA report. The summary of the same is provided in the VCS PD. The validation team finds that the management plan including the mitigation measures of the impacts are found to be appropriate and feasible to implement.

4.2 Environmental Impact

Framework environmental impact assessment (FESIA) was prepared for the complete NOORo Complex as per the requirements of national Law number 12-03 on environmental impact assessment (EIA) and Institutional Financial Investors (IFIs) environmental and social guidelines.

PP also prepared a Specific Environmental and Social Impact Assessment reports (SESIA)/13/ for this project activity. The SESIAs were prepared in compliance with Moroccan Law and relevant environmental and social requirements from IFIs guidelines.

In SESIA the following environmental impacts are identified during the different stage of construction of power plants:

- Soil contamination
- Water and Wastewater Management
- Air quality
- Noise and vibration
- Solid and hazardous Materials,
- Stormwater management,
- Ecology and Biodiversity
- Traffic and transportation,
- Socio economic,
- Cultural heritage and archaeology, and
- Landscape and Visual Impact.

Validation team reviewed the 'Environmental and Social Management Plan' provided in the SESIA report. The summary of the same is provided in the VCS PD. The validation team finds that the management plan including the mitigation measures of the impacts are found to be appropriate and feasible to implement.

4.3 Local Stakeholder Consultation

As per the VCS requirements, it is necessary to invite the relevant stakeholders, prior of the validation process. The local stakeholder consultation process has been described in detail, by the PP, in section 5.3 of the VCS PD the project participant identified the relevant stakeholders such as local villagers, local employee, representatives of government/administrative bodies, research offices & local private companies and associations.

Local stakeholder consultation process has been performed jointly for NOORo II & NOORo III projects during the design phase through inviting the relevant stakeholders to comment on the project activity. The Local Stakeholder Meeting was held on 03/02/2015 at Hotel Ibis, Ouarzazate in Morocco.

Stakeholders were invited through public notice at advance. The public notification has been given in two French and two Arabic local and regional newspapers. The documentary evidence provided as proof of date of the invitation, meeting; and mode of invitation/9/ has been checked by the assessment team during the site visit and found to be appropriate.

An initial presentation was undertaken to outline the main elements of the project, to summarize the environmental baseline on the study area (physical, biological and human), to outline the positive and negative impacts identified, explain the preliminary assessment undertaken and specify the mitigation measures that were being considered, and finally conclude on the environmental acceptability of the project. The following is a summary of the perspectives and concerns of the stakeholders:

- Potential solar flux/rays from the tower on neighbouring communities;
- Employment, and
- Concerns about the role of the project in the development of the local region.

PP confirmed all the concerns are already addressed in the environmental and social management plan and the same will be implemented properly. The Minutes of the meeting of the stakeholder meeting and attendance sheet/9/ have been submitted by the PP.

PP also conducted a survey among the stakeholder between 06/07/2019 to 30/09/2019 to get their feedback. The survey was conducted in local language ie, Arabic. The completed survey questionnaire/9/ were verified and found that all the comments are positive in nature. No negative comments received. .

During the site visit the assessment team interviewed some of the local villagers. Based on the replies of the villagers, the validation team was convinced that the process of stakeholder consultation was carried out as described in the VCS PD. The villagers also confirmed that they were invited for the meeting through public notice. This was found to be consistent with the invitation process mentioned in the VCS PD /01/.

Overall, there was an understanding among the stakeholders that the project activity would lead to the overall development of the area, mainly by generating employment opportunities and improving the infrastructure leading to an improved life for the villagers. The local stakeholders interviewed during the site visit endorsed this view.

4.4 Public Comments

In accordance with the requirement in clause 3.17.5 of the VCS standard version 3.7 “All VCS projects are subject to a 30-day public comment period. The date on which the project is listed on the project pipeline marks the beginning of the project’s 30-day public comment period”.

The PP listed their project activity in the VCS pipeline for 30 days from 19/11/2019 to 19/12/2019 (https://www.vcsprojectdatabase.org/-/pipeline_details/PL2004) for public comments.

No comments received during the commenting period, as evident from the VCS pipeline in the web interface.

5 VALIDATION CONCLUSION

Numerco Limited has contracted the 4K Earth Science Pvt. Ltd (also referred to as 4KES) to validate and verify the project: “Ouarzazate II Concentrated Solar Power Project” with regard to VCS Version 3 requirements and the information provided by the project proponent related to the project design, operation, monitoring and reporting.

A risk-based approach has been followed to perform this validation and verification. In the course of the validation 05 Corrective Action Requests (CARs), 03 Clarification requests (CLs) were raised and successfully closed. And 01 Forward Action Request has been raised for the 1st verification

No limitations or doubts were identified related to the validation and verification.

4KES has reviewed the project description documents and subsequently carried out site visit interviews to confirm the fulfilment of stated criteria.

The purpose of this project activity is to generate electricity using renewable sources (Solar) and export it to Morocco national grid, thereby marginally contributing to reducing the energy demand supply gap in Morocco.

The project activity has applied the baseline and monitoring methodology, ACM0002: Grid-connected electricity generation from renewable sources, Version 19.0.0, which is an approved methodology under the CDM programme and is acceptable under VCS Version 3. The baseline has been determined in accordance with the stated approved baseline methodology.

As summary the validation team able to conclude that:

- The project is in line with all relevant host country criteria (Morocco) and all relevant VCS version 3 program guidelines requirements.
- The project additionality is sufficiently justified in the VCS PD.
- The monitoring plan is transparent and adequate and in line with applied baseline and monitoring methodology of ACM0002, version 19.0.
- The calculation formulae and use of parameter for the project emission reductions estimation are transparent and in line with the requirement of the applied methodology. The ex-ante projection of emission reductions given is found to be appropriate, conservative and in line with the requirement. The ex-ante projected volume of 406,293 tCO₂e/year and a total of 4,062,929 tCO₂e is most likely to be achieved during the 10 years (renewable) of crediting period.

- The conclusions of this report show, that the project, as it was described in the project documentation, is in line with all criteria applicable for the validation as outlined under VCS version 3.

Therefore, 4KES is able to certify that the project is in full compliance with the VCS Standard Version 3.7 and recommend registration of the project activity.

Approved by



**Chandrakala R
Director**

Date: 28/12/2019

4K Earth Science Pvt. Ltd

Place: Bangalore, India

APPENDIX 1: DOCUMENTS REVIEWED DURING VALIDATION

Ref. No	Title of Document	Version	Date
1	VCS Project Description	1.0	15/10/2019
		2.0	25/12/2019
2	Emission Reductions Calculation Spread sheet	03	06/12/2019
3	Technical specifications of the project		
4	ACM0002, "Grid-connected electricity generation from renewable sources"	19.0	-
5	Tool to calculate the emission factor for an electricity system	07.0	EB 100 Annex 4
6	VCS pipeline https://www.vcsprojectdatabase.org/#/pipeline_details/PL2004	-	-
7	Commissioning Certificates of the project activity	-	25/04/2018
8	Power purchase agreement (PPAs)	-	March 2015
9	Local stakeholder documents – - Public notice - Minutes of meeting - Attendance sheet	-	03/02/2015
	Completed Stakeholder survey questionnaire	-	06/07/2019 to 30/09/2019
10	Clean Development Mechanism Validation and Verification Standard	02.0	29/11/2018
11	Tool for the demonstration and assessment of additionality	07.0.0	EB 70, Annex 8
12	Construction Permit	-	-
13	Specific Environmental and Social Impact Assessment Report		27/03/2015
14	O&M Agreement		07/10/2019
15	Approvals and Clearances for project activity	-	-
16	Morocco Grid Emission Factor calculation sheet	-	-
	Electricity data published by ONEE		2016 – 2018
17	ONEE electricity Statistics data 2018 (data on the total installed capacity & total solar thermal capacity installed in Morocco)	-	-
18	VCS Standard	Version 3.7	21/06/2017
	VCS Program Guide	Version 3.7	21/06/2017
19	Letter of undertaking/declarations from PP regarding not having created or sought any other form of environmental credits and other GHG programs for the project	-	
20	Communication agreement	-	21/10/2019
21	Technical Summary report of the project		

APPENDIX 2: CLARIFICATION REQUESTS, CORRECTIVE ACTION REQUESTS, FORWARD ACTION REQUESTS (CAR/CL/FAR)

Table 1. CL from this Validation

CL ID	01	Section no.		Date: 17/12/2019
Description of CL				
1. Declaration from PP regarding participation in other trading / GHG programs, rejection under other GHG program etc. is missing. PP requested to submit the same. 2. Emission reduction estimate calculation is not provided to DOE for verification. 3. Supporting documents for stakeholder consultation documents are not provided				
Project participant response				Date: 25/12/2019
1. The declaration letter for double counting is submitted to DOE 2. ER sheet is submitted to DOE for verification 3. All documents related to stakeholder consultation process is submitted to DOE				
Documentation provided by project participant				
1. Declaration letter 2. ER sheet 3. LSC supporting documents				
DOE assessment				Date: 28/12/2019
PP has submitted all the requested documents. The same is verified and found to be ok. CL is closed.				

CL ID	02	Section no.		Date: 07/12/2019
Description of CL				
1. In section B.1, it is mentioned that the $EG_{PJ,y}$ will be estimated as follows: $EG_{PJ,y} = EG_{NoorII,y} + EG_{NoorIII,y}$ Clarify why energy generation from Noor III project is included under this project. 2. Also explain the usage notation $EG_{NOORo II,y}$ (resp. $EG_{NOORo III,y}$) which also have reference of NOOR III project. 3. Under the parameter table there are two values given one for parameter $EG_{PJ,y}$ and $EG_{NOORo II,y}$ are given. Clarify what is the difference between these parameter				
Project participant response				Date: 25/12/2019
1. Typo-error in the equation has been rectified and the revised PD is submitted to DOE 2. Typo-error in the equation has been rectified and the revised PD is submitted to DOE 3. Typo-error in the equation has been rectified and the revised PD is submitted to DOE				
Documentation provided by project participant				
Revised PD				
DOE assessment				Date: 28/12/2019

1. PP corrected the same. Now only Energy generation from Noor II has been included.
 2. The Reference to Noor III has been removed now.
 3. This is now corrected. Now only value of **EGNOORo II,y** has been provided in the PD.
- CL is closed

CL ID	03	Section no.		Date: 17/12/2019
Description of CL				
.In section 3.4 of PD, the project emission is estimated at 3,487.5 tCO ₂ . However in the emission reduction summary table, the project emission is considered 0 for all the years throughout the crediting period. Clarify				
Project participant response				Date: 25/12/2019
<i>Since there is auxiliary fuel consumption in the project, there are project emissions that will happen during the operation of the plant, project emissions are calculated as per the tool and the same has been made consistent with PD and the revised PD is submitted to the DOE</i>				
Documentation provided by project participant				
<i>Revised PD</i>				
DOE assessment				Date: 28/12/2019
The PD is corrected considering auxiliary fuel consumption. PP has considered diesel as auxiliary fuel consumption. In the PD and ER sheet the project emission due to auxiliary fuel consumption has been estimated and the same is verified and found to be appropriate for the ex-ante estimation.				
CL is closed.				

Table 1. CAR from this validation

CAR ID	01	Section no.		Date: 17/12/2019
Description of CL				
The start date of the project activity is mentioned as 24 th April 2018. However, no justification is provided for the start date. Also the project start date provided in the PD is not consistent with commissioning certificate of the project activity.				
Project participant response				Date: 25/12/2019
<i>Start date of the project has been changed to 25th April 2018 as per the commissioning certificate and the same date has been made consistent in the revised PD and the same has been submitted to DOE with commissioning certificate.</i>				
Documentation provided by project participant				
<i>Revised PD.</i>				
DOE assessment				Date: 28/12/2019
The date is corrected to 25 th April 2018 which is the date of commissioning of the project activity. Which is also now mentioned in the revised PD. Validation team also checked the commissioning certificate and found that the start date mentioned in the PD is consistent with commissioning certificate.				
CAR is closed .				

CAR ID	02	Section no.		Date: 17/12/2019
Description of CL				
In section 1.11 of the PD, all relevant Laws & statutory requirements are given. However no justification is provided on how the project is in compliance with the relevant laws and statutory requirements.				
Project participant response				Date: 25/12/2019
<i>Source is mentioned in the revised PD and the same is submitted to DOE</i>				
Documentation provided by project participant				
<i>Revised PD</i>				
DOE assessment				Date: 28/12/2019
The Project obtained all relevant approvals in compliance with the laws & statutory requirements. The same is now justified in the revised PD CAR is closed.				

CAR ID	03	Section no.		Date: 17/12/2019
Description of CL				
Under the additionality section it is claimed that only CSP plant in operation in Morocco is NOORo I with its 160 MW which is smaller than the 2% of the total installed capacity ($160 / 7,993.6 = 0.02$). However, no evidence provided to support the claim.				
Project participant response				Date: 25/12/2019
<i>Evidence and the source is submitted to DOE. (Electricity Information 2019, data.iea.org)</i>				
Documentation provided by project participant				
<i>Electricity Information 2019, data.iea.org</i>				
DOE assessment				Date: 28/12/2019
The source for the total power plant installed capacity and solar thermal plant installed capacity are provided. Also the details in the PD is corrected as per the IEA data. The IEA database is checked and the value provided in the PD is found to be correct. The same value also cross verified from the ONEE 2018 electricity statistics. CAR is closed.				

CAR ID	04	Section no.		Date: 17/12/2019
Description of CL				
1. In section 3.1 of PD, it is mentioned that the emission factor is calculated based on data provided by ONEE in accordance and also refers the emission factor calculation in the Annex. However, no reference to the source document for the emission factor estimation is given. 2. In section 4.1 of PD, it is mentioned that OM, BM & CM are estimated based on official statistics released by the national power utility (ONEE), reliable data source, latest data available (2009, 2010, 2011, 2013, 2015 & 2018). However, as per the Annex of the PD, the OM, BM & CM are estimated based on the data available until year 2011. Clarify why latest year data are not used for the emission factor calculation.				
Project participant response				Date: 25/12/2019
1. Evidence is submitted to DOE and the same is revised in the PD 2. ER calculation sheet is submitted to the DOE with the latest data available till 2018 and the same is revised in the PD				

Documentation provided by project participant	
Revised PD Emission factor calculation sheet	
DOE assessment	Date: 28/12/2019
PP has submitted emission factor calculation sheet which is estimated based on the 2016, 2017 & 2018 electricity data provided by ONEE. The same is verified and found to be correct and in line with the tool to calculate emission factor of an electricity system. The revised emission factor is now referred in the revised PD and revised emission reduction calculation. CAR is closed,	

CAR ID	05	Section no.	Date: 17/12/2019
Description of CL			
1. For the parameters $FC_{i,y}$, $NCV_{i,y}$ & $EF_{CO2,i,y}$, the type of fuel is not specified. 2. For the parameter $EF_{CO2,i,y}$ the data source for option C is given as Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 which is not correct.			
Project participant response			Date: 25/12/2019
1. Diesel is the alternate fuel used for auxiliary consumption, the same is revised in the PD 2. Typo-error has been rectified and the revised PD is submitted to DOE			
Documentation provided by project participant			
Revised PD			
DOE assessment			Date: 28/12/2019
1. The auxiliary fuel to be used in the project is diesel and the same is now referred in the revised PD. 2. The correct reference to the $EF_{CO2,i,y}$ is given in the revised PD. CAR is closed.			

Table 1. FAR from this Validation

CAR ID	01	Section no.	Date: 28/12/2019
Description of CL			
As per the requirements of the Para 29 of applied methodology ACM0002, version 19, the PP shall submit the actual project cost of the project at the time of first verification. The verifying DOE shall check the same.			
Project participant response			Date: -
NA			
Documentation provided by project participant			
NA			
DOE assessment			Date: -
NA			

APPENDIX 3: COMPETENCE OF TEAM MEMBERS

<u>Certificate of Competence</u>						
Name	☒ Mr. ☐ Ms.	Ma Paa Puratchikkanal				
Qualification Procedure	Fulfils the requirement as per the appointment of personnel procedure of 4KES for Validation and Verification of CDM/VCS/GS/GHG Projects.					
Appointed to work as:						
	CDM Validator/Verifier	Team Leader	Team Member	Technical Expert	Technical Reviewer	Financial Expert
Appointed	Yes	Yes	Yes	Yes	Yes	No
Appointed Date	29-07-2019					
Authorized to work as Technical Expert for:						
Authorized Technical Area	Sectoral Scope		TA Code	Technical Area within the scope		
	Energy industries (renewable - / non-renewable sources)		1.1	Thermal energy generation		
	Energy industries (renewable - / non-renewable sources)		1.2	Renewables		
	Energy demand		3.1	Energy demand		
	Construction		6.1	Construction		
	Waste handling and disposal		13.1	Solid waste and wastewater		
	Agriculture		15.1	Agriculture		
Authorized to work as Local Expert for:						
Country/Countries	India					
Compliance check by: Anand S. R.						

<u>Certificate of Competence</u>						
Name	☒ Mr. ☐ Ms.	Narendra Kumar .R				
Qualification Procedure	Fulfils the requirement as per the appointment of personnel procedure of 4KES for Validation and Verification of CDM/VCS/GS/GHG Projects.					
Appointed to work as:						
	CDM Validator/Verifier	Team Leader	Team Member	Technical Expert	Technical Reviewer	Financial Expert

Appointed	Yes	Yes	Yes	Yes	Yes	No
Appointed Date	29-07-2019					
Authorized to work as Technical Expert for:						
Authorized Technical Area	Sectoral Scope	TA Code	Technical Area within the scope			
	Energy industries (renewable - / non-renewable sources)	1.1	Thermal energy generation			
	Energy industries (renewable - / non-renewable sources)	1.2	Renewables			
	Energy demand	3.1	Energy demand			
	Waste handling and disposal	13.1	Solid waste and wastewater			
Authorized to work as Local Expert for:						
Country/Countries	India					
Compliance check by: Anand S. R.						

APPENDIX 4: ABBREVIATIONS

ABT	Availability Based Tariff
ACM	Approved Consolidated Methodology
BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CL	Clarification Request
CSP	Concentrated Solar power
DPR	Detailed Project Report
EB	Executive Board
EISA	Environmental and Social Impact Assessment
EPC	Engineering and Procurement Contractor
ER	Emission Reductions
FAR	Forward Action Request
GHG	Greenhouse Gases
IPCC	Intergovernmental Panel for Climate Change
ISO	International Organization for Standardization
JMR	Joint Meter Readings
LCS	Local Controller System
MP	Monitoring Period
MR	Monitoring Report
MW	Mega Watt
MWh	MegaWatt hour
NCV	Net Calorific Value
OM	Operating Margin
O&M	Operation & Maintenance
ONEE	Office National de l'Electricité et de l'Eau Potable (National power utility)
PD	Project Description
PP	Project proponent
PPA	Power Purchase Agreement
QA/QC	Quality Assurance/Quality Control
SPC	Solar Project Company
tCO ₂	Tonnes of Carbon Dioxide
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard
VCSA	Verified Carbon Standard Association
VCU	Verified Carbon Unit