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Validation Report

VALIDATION OPINION FOR POST REGISTRATION CHANGES
TO THE PROJECT ACTIVITY:
SMALL-SCALE HYDROPOWER PROJECT SAHANIVOTRY IN
MADAGASCAR

REPORT NO. 1182342

02nd September 2013

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Validation opinion for post registration changes to the Project Activity:
Small-Scale Hydropower Project Sahanivotry in Madagascar



South Asia

Date of first issue of this report	Revision No. of this report	
17-09-2012	6	
Project Participant(contractor): Hydelec 15, Avenue de l'Independence Analakely Antananarivo Madagascar	Project Site(s): Sahanivotry, Vakinankaratra, Antananarivo GPS coordinates: longitude: 47.133333° (47° 08') East latitude: 20.200000° (20° 12') South Host Country: Madagascar	
Applied Methodology / Version:	ACM0002 version 13	Scope(s): 1 Technical Area(s): 1.2
First PDD Version (GSP as A.M.S. ID version 13): PDD version date: 13-05-2008 Version No.: 01 Starting Date of GSP 17-05-2008	Final PDD version (ACM0002 version 13): PDD version date: 25-08-2013 Version No.: 04.3	

POST REGISTRATION CHANGES - VALIDATION OPINION

TÜV SÜD has performed the validation of post-registration changes of the aforementioned CDM project activity.

Standard auditing techniques have been used for the validation of the project.

The review of the project design documentation, subsequent follow-up interviews, and further verification of references have provided TÜV SÜD with sufficient evidence to determine the fulfilment of stated all applicable criteria. TÜV SÜD confirms that the project activity complies with the requirements of the methodology applied in the context of these post-registration changes. An analysis, as provided by the applied methodology, demonstrates that the proposed project activity is confirmed not to be a likely baseline scenario. Emission reductions attributable to the project are confirmed additional to any that would occur in the absence of the project activity. The project is likely to achieve the estimated amount of annual emission reductions of 44,196 tCO₂e and a total estimated of 441,960 tCO₂e as specified within the final PDD version for the crediting period.

The assessment of post-registration changes has been performed following the requirements of the latest version of the CDM VVS and on the basis of the contractual agreement. The single purpose of this report is its use during the process of post registration permanent changes requiring Prior Approval by the CDM EB. Based on the work described in this report, nothing has come to our attention that causes us to believe that any project component or issue has not been covered by the validation process.

Pune, 02/09/2013



Shivraj Sharma
Member of Certification Body "Environment and Energy"
TÜV SÜD South Asia

Abbreviations

ACM	Approved Consolidated Methodology
AfDB	African Development Bank
AMS	Approved Methodology Small scale
BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM EB	CDM Executive Board
CER	Certified Emission Reduction
CM	Combined Margin
CMP	Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol
CR / CL	Clarification Request
DNA	Designated National Authority
DOE	Designated Operational Entity
EF	Emission Factor
ER	Emission Reduction
FAR	Forward Action Request
FSR	Feasibility Study Report
GHG	GreenHouse Gas(es)
IPCC	Intergovernmental Panel on Climate Change
IRL	Information Reference List
IRR	Internal Rate of Return
KP	Kyoto Protocol
MP	Monitoring Plan
NGO	Non Governmental Organisation
OM	Operational Margin
PDD	Project Design Document
PP	Project Participant
SSC	Small Scale
TÜV SÜD	TÜV SÜD Industrie Service GmbH
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Validation and Verification Standard

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1 INTRODUCTION

1.1 Objective

In the context of the procedure defined in the CDM Project Cycle Procedure (CDM-PCP), the validation objective is the performance of an independent assessment done by a DOE on the permanent changes identified and informed to the PPs during the verification process between the information on the project activity described in the registered small scale PDD (IRL 57) and the actual project activity in operation (see IRL 95 for updated PDD). The validation assessment is carried out as per the requirements outlined in CDM Validation and Verification Standard (CDM-VVS) in line with the procedure defined under the CDM Project Cycle Procedure.

A validation assessment is required after identifying and informing the PPs of any concerns related to the conformity of the actual project activity and its operation with the registered project design document. The assessment results consist in a conclusion by the executing DOE whether the revised documents are appropriate to allow the acceptance of the changes.

The ultimate decision on the acceptance of the changes rests at the CDM Executive Board.

The project activity discussed by this validation report is registered under the CDM reference number 3558 with the project title:

“Small-Scale Hydropower Project Sahanivotry in Madagascar”.

1.2 Scope

The scope of any assessment is defined by the underlying legislation, regulation and guidance given by relevant entities or authorities.

The core requirements on changes from the project activity as described in the registered project design document are given by VVS §247 to §282. The validation is not meant to provide any consulting towards the client. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the project design.

2 METHODOLOGY

The project assessment aims at being a risk based approach and is based on the requirements and guidelines provided on the VVS §247 to §282.

2.1 Appointment of the Assessment Team

According to the technical scopes and experiences in the sectoral or national business environment, TÜV SÜD has composed a project team in accordance with the appointment rules of the TÜV SÜD certification body “Climate and Energy”.

The composition of an assessment team has to be approved by the Certification Body (CB) to assure that the required skills are covered by the team. The CB TÜV SÜD operates four qualification levels for team members that are assigned by formal appointment rules:

- Assessment Team Leader (ATL)
- Validator (V)
- Validator Trainee (T)
- Technical Expert (E)

It is required that the sectoral scope/s and the technical area/s linked to the methodology and project have to be covered by the assessment team.

Name	Qualification	Coverage of scope	Coverage of technical area	Coverage of financial aspect	Host country experience	Conducted On-site visit
Karin Wagner	ATL	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-	-
Khalid Mahmood [*]	-	-	-	-	-	<input checked="" type="checkbox"/>
Riccardo Arena	V	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>
Luciano Grugni	V	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			

Technical Reviewer:

Name	Qualification	Coverage of scope	Coverage of technical area	Coverage of financial aspect
Katrin Hartmann	TR	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Rachel Zhang [†]	TR	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Nevena Pingarova [‡]	-	-	-	-

2.2 Review of Documents

The revised documents provided by the PP and additional background documents related to the impact of the changes on the additionality, the scale of the project activity and/or the applicability/application of baseline methodology aspects were reviewed and assessed as part of this validation process.

2.3 Follow-up Interviews

Furthermore, TÜV SÜD discussed the changes with the project participants during the 1st verification visit on 11th – 13th April 2011 and afterwards by email and telephone communication.

2.4 Internal Quality Control

As a final step of this validation, the validation report has to undergo an internal quality control procedure by the Certification Body “climate and energy”, i.e. each report has to be approved either by the head of the certification body or his deputy. In case one of these two persons is part of the assessment team, the approval can only be given by the other one.

It rests at the decision of TÜV SÜD’s Certification Body whether the revised documents will be submitted for approval to the EB or not.

^{*} Khalid Mahmood was the former ATL (and also conducted the on-site visit). However, he was no longer working for TÜV SÜD at the time of submission of this project and Karin Wagner took over the ATL role.

[†] Rachel Zhang was the former TR of this project. However, she was no longer working for TÜV SÜD at the time of submission of this project and Katrin Hartmann took over the TR role.

[‡] Nevena Pingarova was a validator and helped the former TR for financial aspects of the project. However, she is no longer working for TÜV SÜD Carbon Management Service. Katrin Hartmann took over her function since she also covers the financial aspects.

3 OVERVIEW OF POST REGISTRATION CHANGES

As per VVS §248 the DOE has determined whether the changes, identified under the categories defined in section 12.8 of CDM Project Standard (version 02.1, CDM-EB65-A05-STAN, hereinafter "PS"), do not require approval by the Board in accordance with the provisions presented under Appendix 1 of the same document.

Type of post registration changes (section 12.8 of CDM Project Standard)		Is prior approval by CDM EB required*?
Temporary deviations from the registered monitoring plan or monitoring methodology (section 12.8.2. of PS)		<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not applicable
Permanent changes: (i) Corrections (section 12.8.3.1. of PS)		<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not applicable
Permanent changes: (ii) Changes to the start date of the crediting period (section 12.8.3.2. of PS)		<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not applicable
Permanent changes: (iii) Permanent changes from the registered monitoring plan or applied methodology (section 12.8.3.3. of PS)		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable
Permanent changes: (iv) Changes to the project design of a registered project activity (section 12.8.3.4. of PS)	<input checked="" type="checkbox"/> (a) Changes in the effective output capacity due to increased installed capacity or increased number of units, or installation of units with lower capacity or units with a technology which is less advanced than that described in the PDD (§221 (a) of PS); <input type="checkbox"/> (b) Addition of component or extension of technology (§221 (b) of PS); <input type="checkbox"/> (c) Removal or addition of one site (or more) of a project activity registered with multiple-sites (§ 221 (c) of PS); <input type="checkbox"/> (d) Actual operational parameters which are within the control of project participants differing from the expected parameters (§ 221 (d) of PS); <input type="checkbox"/> (e) Any consequential changes to the baseline methodology, including changing or adding another baseline methodology or applying a baseline scenario that is more appropriate as a	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable

* Refer to Appendix 1 to the CDM Project Standard

Type of post registration changes (section 12.8 of CDM Project Standard)		Is prior approval by CDM EB required*?
	result of the proposed or actual modifications to the project activity (§ 221 (e) of PS).	

It's concluded that Prior approval by the CDM EB is required.

3.1 Temporary deviations from the registered monitoring plan and/or monitoring methodology

Not applicable.

3.2 Corrections

Not applicable.

3.3 Changes to the start date of the crediting period

Not applicable.

3.4 Permanent changes from the registered monitoring plan or applied methodology

The increase in installed capacity (from 15 MW to 16.5 MW) as described in Section 3.5 necessarily requires a change in the applied methodology (from SSC methodology AMS I.D. version 13 to ACM0002 version 13 in post registration changes). A valid version of the relevant tools is applied (i.e. additionality tool and the emission factor tool, IRL 78, 79). However, the application of the version 03 of the emission factor tool did not lead to any changes in the emission factor.

3.5 Changes to the project design of a registered project activity

As per VVS §269, the DOE shall determine whether there are proposed or actual changes to the project design of a registered SSC PDD (IRL 57 version 03, dated 27/01/2010), hereinafter "registered SSC PDD". The following paragraphs provides respective opinion as per reporting requirement VVS §279.

a) A description of the proposed or actual changes as compared to the description in the registered PDD;

The project activity is a run-off river hydropower plant. As per registered SSC PDD, the installed capacity is 15 MW (i.e. 3 pelton turbines 5.5 MW each matching with 3 x 5 MW generators).

Actual installed capacity based on the equipment as effectively installed and found on site is however higher, reaching 16.5 MW as resulting from 3 pelton turbines 5.676 MW each matching with 3 x 5.5 MW generators. This information could be confirmed at the time of first verification carried out in April 2011.

b) An assessment on when the changes occurred, reasons for these changes taking place, whether the changes would have been known prior to registration of the project activity, and how the changes would impact the overall operation/ability of the project activity to deliver emission reductions as stated in the PDD;

There were no changes that have occurred after the implementation of the project activity. The actual capacity of the hydropower station is 16.5 MW since project completion. This change from the

registered SSC PDD was noticed during the first verification of the project activity (carried out in April 2011).

The project activity has been registered as a CDM activity on 28/08/2010 after the project started operation on 01/10/2008. At the time of site visit on May 2008, main equipment (i.e. turbines and generators) were still not installed at project site even if respective purchase contract was already signed on 24/04/2007: however the same does not explicitly mention the installed capacity of the turbines and generators which based on the financial model issued by the AfDB (20/08/2006), on the 2nd Amendment to Power Purchase Agreement (16/10/2006) and then on the Project Brief description by AfDB (28/05/2007) was meant to be 15 MW. Still on 16/08/2008, the 3rd Amendment to Power Purchase Agreement referred to a 15 MW capacity hydropower plant.

The model of 5.5 MW turbines as actually installed ("Turbine type" CJA237-W-140/2 x 18), seen during the 1st verification, has been confirmed consistent with the equipment mentioned in respective purchase agreement which was considered at validation (dated 24/04/2007).. It shall be clarified that the 5.5 MW rated power of each turbine, as explained, does not explicitly appear neither in the equipment purchase contract nor in project documentation issued later on (e.g. Project Brief description by AfDB (28/05/2007), and 3rd Amendment to Power Purchase Agreement 16/08/2008).

The reasons for this difference in capacity between registered SSC PDD and the project as actually implemented have been investigated and explained by PPs as a way "[...] to protect the turbines, secure the operation and to fulfil the environmental conditions in dry season"^{*}. This necessarily results in a more conservative Plant Load Factor. Furthermore, the expected power production is mainly based on the rated flow and the efficiency of the turbines which have not been changed (see IRL 87).

Based on sector expertise it's also confirmed that the installation of 16.5 MW as a result of an increase in capacity of generators (from 5 MW in registered SSC PDD to 5.5 MW as actually installed) does not in principle lead, given a specific hydrological context, to an increase in power production: the estimated production of 80.65 GWh (as per Hydrological study IRL 87) as used in at the time of investment decision remain valid as the same is mainly function of the rated flow and efficiency of the turbines which have not been changed (the model of turbines is CJA237-W-140/2 x 18 same as in registered small scale PDD based on respective purchase contract, IRL 09[†]). It's accordingly confirmed that potential output of the hydropower plant is not changed as no substantial changes in the key parameters resulting in an increased power output actually occurred.

Furthermore as explained and demonstrated below based on actual operational data (demonstrating that power generation is not higher and even lower than as expected based on the 15 MW installation), the different installed capacity of the plant does not impact the overall operation and ability of the project activity to deliver emission reductions as stated in the PDD.

^{*} In particular the written explanation provided by PPs to the CDM EB in the form of a letter sent on May 2011 (IRL 75) quotes as well that:

"with the natural data/information on the site (hydrology, topography, waterfall height), the maximum power plant with three generators is 15 MW). However, if only one generator works, case which arises every year because it is hydroplant run of the river, the loss of charge in the water intake and penstock reduce with an increase of the net head. This operating generator allows to generate about 10% of the power compared with rated one. It is the reason why we asked the manufacturer to size the generators to 6875 kVA or 5.5MW in order to protect the machine, secure operation and to fulfill the environmental condition. But, the maximum capacity of the three generators while working simultaneously remains 15 MW.

[†] The model of turbines has been confirmed on site to be CJA237-W-140/2 x 18 in line with the assumptions validated and reported in SSC PDD on the basis of respective equipment purchase contract (IRL 09) mentioning also technical specifications including a flow rate of 3.17 m³/s. However by checking respective nameplate data on site during first verification it has been noted that the flow rate is 3.12 m³/s which is slightly lower than 3.17 m³/s as validated and considered in SSC PDD and Hydrological study (IRL 87). This does not anyway change the conclusion (the flow rate is even lower than the one used in designing the project) and it's confirmed that the turbines as found on site provide an output comparable (or even lower) than the expected.

c) An assessment regarding whether the changes would adversely affect the conclusions of the validation report of the registered PDD with regard to

i. Additionality of the project activity;

The project participant in the registered SSC PDD had demonstrated the additionality based on the investment barrier analysis indicated in the Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities and the barrier analysis.

The input values of investment barrier analysis were assessed (Validation Report n.1182342) and was confirmed a return on investment of the project activity of 12.45%, which was validated to be below the applied AfDB benchmark of 15%. Under none of the variations applied in sensitivity analysis the financial indicator would have cross the outlined benchmark.

Considering the actual installed capacity of 16.5MW, would lead the additionality assessment to same results. In particular, the additionality of the project has been presented in the revised PDD (version 04.2, dated 12/10/2012) by applying a valid version of the Tool for demonstration and assessment of additionality. It's confirmed that background information, assumptions, data as presented in revised PDD in discussing additionality properly reflects the same as presented in the registered SSC PDD of small scale project: these information has been the basis for the decision to invest in the project as a CDM in May 2006 (IRL 5).

According to the above no further assessment on the validity and appropriateness of the assumptions applied in revised PDD (IRL 84) are herewith presented. In addition it shall be considered that the registered SSC PDD went beyond a simple application of small scale requirements, thus presenting an IRR calculation according to the latest Additionality tool available at the time: the revised PDD includes the same analysis and present it as "Step 2: investment analysis" (instead of "Investment barrier").

The next table presents how all the information included in registered SSC PDD has been considered and adapted to formal layout of revised PDD applying the steps and requirements of large scale methodology and respective "Additionality tool".

Additionality discussion and steps of Additionality Tool	PDD Version 03, 27/01/2010 (Registered SSC PDD)	PDD Version 04.3, 25/08/2013 (Revised PDD)
Step 1: Identification of alternatives to the project activity consistent with current laws and Regulations	Information included in section B.4.	Information included in Section B.5 as part of Step 1 of Additionality Tool. Steps 1a and 1b correctly applied and information consistent with that of registered SSC PDD.
Step 2: Investment analysis	Information included in Section B.5 as in terms of one of the identified barriers (i.e.: "Investment barriers") applying and calculating project IRR comparing then it with financial benchmark (as per AfDB model – IRL 41).	Information included in Section B.5 as Step 2 of Additionality Tool. Option III (Benchmark analysis) has been applied in Sub-step 2b in consistency with the approach adopted in registered SSC PDD. The change in installed capacity does not furthermore affect the Investment costs and the revenues via the generation amount: it's confirmed that investment cost as per the AfDB financial model did not decrease as a result of the upsizing foreseen at the time of investment decision*.

* As per the details provided by AfDB (IRL 81), Hydelec cumulated investments on Sahaniivotry project finally amounted to 40,736 M. Ariary, which is even greater than the 35,433 M. Ariary.

		<p>In addition, actual power generation over a 41 months period (from Oct. 2008 to Feb. 2012) resulted 8% below the predicted power generation.</p> <p>Sub-step 2c (calculation and comparison of financial indicators) and Sub-step 2d (Sensitivity analysis) fully reflect the information and approach included in Registered SSC PDD.</p> <p>In addition the revised PDD based on large scale methodology presents an appropriate project benchmark calculated as WACC and resulting in a value of 13.23% (see below further information and assessment).</p>
Step 3: Barrier Analysis	Information included in Section B.5 in terms of “critical project financing”, “policy barriers” and “barriers due to prevailing practice”.	<p>Information included in Section B.5 as Step 3 of Additionality Tool (“Barrier analysis”).</p> <p>The revision fully reflect the information and approach included in registered SSC PDD and argumentations are further supported by making reference to the document “Madagascar action Plan 2007-2012” (MAP). The DOE has checked the MAP (IRL 76).</p>
Step 4: Common practice analysis	No information and discussion was included in registered SSC PDD as what concern Common practice analysis.	<p>Revised PDD presents Common Practice Analysis based on Guidelines on common practice Version 02.0 (IRL 93). It's confirmed there are only two hydropower plants exceeding 15 MW installed capacity in the country and that one (Mandraka – 24 MW) was commissioned in 1956 and the other (Andekaleka G1&G2 – 62 MW) was commissioned in 1982. These plants have been developed respectively 51 and 25 years before the proposed project activity: accordingly the project is not considered to be a common practice as it has been developed in a different regulatory framework and investment climate.</p>

It's confirmed that the revision of the PDD based on the application of ACM0002 (version 13.0.0) and of respective additionality tool (Version 06.0.0) does not lead to substantial changes in terms of both quality and quantity of information presented.

As what concerns the benchmark used in the context of investment analysis, revised PDD presents in addition to the investment analysis based on the previously registered SSC PDD, the calculation of a more appropriate WACC project benchmark resulting in a figure of 13.23%.

In particular the financial indicator is calculated as follows:

$$r = w_d \cdot K_d \cdot (1 - T) + w_e \cdot K_e$$

Where:

r = WACC

* As per power invoices (IRL 59 to 73) and summary by AfDB (IRL 81) 251,288 MWh of real generation against 272,000 MWh of generation as predicted.

w_d = Percentage of debt financing
 w_e = Percentage of equity financing
 k_d = Average cost of debt financing
 k_e = Average cost of equity financing
 T = Applicable corporate tax rate

Based on financial expertise the DOE confirms that the formulae applied is correct and consistent with international financial practice. In addition, the figures applied by project participants in calculating it have been checked and verified based on financial and local expertise and considering project context.

Financial Parameter	Value applied	Assessment
w_d - percentage of debt financing	50%	The PPs chosen the default option as reported in Guidelines on the Assessment of Investment Analysis (v. 05). It's confirmed that in Madagascar information on typical debt/equity financial structure is not readily available. The assumption done is considered accordingly correct and compliant with the latest requirements on investment analysis.
w_e - Percentage of equity financing	50%	The same as above applies.
k_d - Average cost of debt financing	18.2%	Average cost of debt financing has been derived from publicly available and official statistics from the Central Bank of Madagascar (IRL 86) which can be considered as official and authoritative source of information. The calculated value reflects the average registered in 2006, at the time of the CDM decision to invest in the project. This approach is consistent with §18 of Guidelines on the Assessment of Investment Analysis (v.5).
k_e - Average cost of equity financing	13.75%	Default value as per Table in Appendix of Guidelines on the Assessment of Investment Analysis (v. 05) has been used.
T - Applicable corporate tax rate	30%	The figure has been crosschecked and confirmed in the context of previously carried out validation activity for the SSC project. It's here confirmed that the same applied in Madagascar at the time of CDM investment decision in 2006 and that the same was considered in the Financial Model by African Development Bank in 2006 (IRL 41)

Accordingly the result obtained by PPs, i.e. WACC = 13.23%, is considered correct.

By comparing to this project "WACC" benchmark the project IRR as calculated in PDD of 12.45% (based on the input values and information available at the time of investment decision in 2006) it's confirmed that the project is still additional: project IRR = 12.45%, against a WACC = 13.23%.

Based on its local, sectoral and financial expertise, the audit team confirms that the applied benchmark 13.23% is appropriate and applicable to the project activity and is suitable to be compared with project IRR.

As a further essential aspect in validating whether the changes would definitely impact the additionality of the project activity the DOE checked if the actual operational data of the power plant as built would lead the Project IRR to cross the defined WACC benchmark of 13.23%. Based on the information acquired in the context of Validation and 1st verification and of subsequent assessment (IRL 81), the actual power generated over first 3 years and 5 months of operation (period October 2008 to February 2012) has been checked and compared with expected annual net power generation as

reported in PDD (both registered SSC PDD and revised PDD) of 80.65 GWh. The actual average net annual production in the considered 41 months period results 251,288 GWh which is about 7,61% lower than the expected power which can be obtained by applying the AfDB model to the same period of time (i.e. 272,000 GWh). Accordingly it's confirmed that the increase in installed capacity does not lead to increments in power production that could undermine the additionality based on investment analysis.

Sensitivity analysis is also presented in PDD; the applied benchmark of 13.23% is met and crossed for decreases of total investment (in PDD a decrease of 10% is applied resulting in project IRR = 14.21%) and for increases in Power sales supply (in PDD 5% and 10% are applied resulting in 13.35% and 14.23% respectively). The DOE, as per §20 of Guidelines on the Assessment of Investment Analysis (version 5), has checked the probability of occurrence of both scenarios (decrease in total investment, increase in power sales revenue), taking into account that the plant is in operation since October 2008 and actual data for key financial/operational parameters are available:

1. decrease of total investment: the actual final investment, as provided by AfDB, has been 40,746 Million MGA (IRL 81) which is 15% higher than the estimation of 35,433 Million MGA available and used as reference at the time of the decision to invest in the project as a CDM taken in May 2006 (IRL 5) and reference in respective investment analysis;
2. Increase in power sales revenue: as above described, actual total net production in the considered 41 months period results 251,288 GWh resulting in an annual which is about 7.61% below the projected generation (272,000 GWh). The electricity tariff was subject to an increase from 136 MGA/kWh (reference value in investment analysis) to 142 MGA/kWh in 2007; however this increase is not sufficient to make the project meet the benchmark of 13.23% as it is more than balanced by the fact that, as reported, power production has been substantially lower than expected (7.61% lower in 41 months period analyzed).

Further confirmation on the fact the additionality based on investment analysis would not be affected by the actual figures of the 16.5 MW project comes from a comparison between the total investment as per AfDB model and the actual investment undertaken: the former is 35,433 Million MGA which is lower than the actual investment resulting 40,746 Million MGA (IRL 81).

Based on the assessment carried out in validating the assumptions included in the Registered SSC PDD and on the basis of this additional assessment it's confirmed that the changes in installed capacity does not impact the additionality of the project activity.

ii. Scale of CDM project activity;

The installed capacity of the plant as actually built (16.5 MW) lead the same to exceed the 15 MW limit for classifying the project as a Small Scale CDM project in line with UNFCCC requirements. Accordingly a new PDD based on ACM0002 Version 13.0.0 has been prepared by PPs.

iii. Applicability and application of approved baseline methodology under which the project activity has been registered or the later version of the applied methodology

The project was registered as a 15MW project in line with small scale methodology AMS I.D. version 13.

Given the actual plant is 16.5 MW thus exceeding the limit for application of small scale methodology (15 MW), a new PDD was prepared by PPs under ACM0002 Version 13.0.0.

Compliance with each applicability condition as listed in the chosen baseline and monitoring methodology has been demonstrated. The validation team assessed by checking the UNFCCC webpage

that the baseline and monitoring methodology selected by the project participants are the valid versions of those approved by the Board.

Applicability criteria from ACM0002 Version 13.0.0.

The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;.

Information from PDD:

The project is the installation of a new run-off-river hydro power plant; it is a Greenfield project and does not involve any reservoir.

Assessment:

The following information presented in PDD was confirmed valid at the time of site visit carried out on 19 and 20 May 2008: the project activity consists in the installation of new (Greenfield) run-off-river hydropower plant (does not involve any reservoir).

The project does not involve any capacity additions, retrofit or replacements.

Accordingly no additional applicability criteria shall be considered.

Validation opinion:

The documentation content is correctly quoted and interpreted in the PDD.

The applicability criterion is met by the project activity.

TÜV SÜD confirms that the chosen baseline and monitoring methodology is applicable to the project activity.

iv. The compliance of the monitoring plan with applied monitoring methodology

The Monitoring Plan as proposed under the ACM0002 methodology complies with respective requirements in terms of monitored parameters and monitoring approaches.

The following aspects have been modified or parameters added in revised PDD (compared to Registered SSC project) and have been herewith considered against requirements of ACM0002 version 13:

- EG_y "Electricity supplied by the project to the grid in year y " has been properly re-proposed in revised PDD as $EG_{facility,y}$ "Quantity of net electricity generation supplied by the project plant to the grid in year y ". In particular it's confirmed that both meters M1 and M2 are bi-directional and monitor net electricity generated. A third meter (M3) has been also mentioned for completeness (used by grid owner JIRAMA at the downstream substation and a fourth meter (M4) measuring power delivered to HOLCIM cement factory. Net electricity generated by the project will be crosschecked with that obtained as a sum of M3 and M4. Description of the parameter has been checked and confirmed compliant with the monitoring methodology.
- Following parameters have been added as "Data and parameters to be monitored" reflecting the provisions of the applied methodology including respective tools (i.e. Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion v.02):

- $NCV_{diesel,y}$ = Weighted average net calorific value of diesel fuel in year y ;

- $EF_{CO_2, diesel, y}$ = *Weighted average CO₂ emission factor of diesel fuel in year y;*

- CAP_{PJ} = *Installed capacity of the hydro power plant after the implementation of the project activity* and A_{PJ} = *Surface area of the reservoir measured at full supply level after the implementation of the project activity* have been included for completeness, however the calculation of power density, in line with the methodology, is not required given that the project activity consists in a run-off-river hydropower plant.

A summary of the electricity meters involved has also been added in revised PDD. The same properly refers to the four meters involved including respective ownership (operator), serial numbers, labelling and characteristics and a new – more complete – grid connection and meter diagram including also meters M3 and M4 has been added, replacing the same as was included in registered SSC PDD. It's confirmed that the revised information both reflect the actual situation as well as the requirements of the applied methodology.

v. The level of accuracy of the monitoring compared with the requirements contained in the registered monitoring plan

Level of accuracy of the monitoring has in general remained same as a result of the adaptation to ACM0002 of the previously registered monitoring plan. More transparent and detailed information has been furthermore included in revised PDD in terms of functionality of M1 and M2 (giving net measurements as result of the difference between quantity of electricity supplied by the project to the grid and quantity of electricity delivered to the project from the grid) reflecting in parameter $EG_{facility, y}$ which has been correctly defined and described in line with ACM0002 v.13.

Accuracy of Meters M1 and M2 in revised PDD is 0.5% and 1% in order to reflect actual accuracy of the installed electricity meters: this necessarily reflects in a slightly lower level of accuracy.

4 VALIDATION OPINION

TÜV SÜD has performed the validation of the changes from project activity as described in the registered project design document for the CDM project 3558:

“Small-Scale Hydropower Project Sahanivotry in Madagascar”


The review of the revised documentation and the subsequent follow-up interviews has provided TÜV SÜD with sufficient evidence to determine the fulfillment of all stated criteria. In our opinion, the revised documentation provides sufficient evidence to determine that the changes do not raise concerns with respect to the additionality of the project activity.

Pune, 02-09-2013




Shivraj Sharma
Member of Certification Body "Environment and Energy"
TÜV SÜD South Asia


Annex 1: Information Reference List

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		<p>Onsite interview (19.05.2008 - 20.05.2008) carried out by TÜV SÜD: Validation Team: Luciano Grugni TÜV Italia – TÜV SÜD Group, GHG Auditor Riccardo Arena TÜV Italia – TÜV SÜD Group, GHG Auditor</p> <p>Interviewed Persons: Elvira Lutter Pöry Energy GmbH Jean Pierre Sanchis Hydelec Madagascar SA</p>		On site audit
0.	TÜV SÜD netinform webpage	<p>“Sahanivotry Hydro Power Plant, Madagascar” http://www.netinform.de/KE/Wegweiser/Guide2_1.aspx?ID=4890&Ebene1_ID=26&Ebene2_ID=1506&mode=1 </p>	17/05/2009	GSP webpage
1.	Pöry Energy GmbH	Project Design Document for CDM project “Sahanivotry Hydro Power Plant, Madagascar“, version 01	13/05/2008	GSP - PDD
2.	UNFCCC	Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories, AMS-I.D., version 13		UNFCCC SSC Methodology
3.	TÜV SÜD	Participant list of on-site interview	19/05/2008	On site audit
4.	Hydelec	Project Idea Note (PIN): Madagascar – Sahanivotry Hydro Power Plant	09/07/2007	Timeline: CDM continuous action
5.	Pöry Energy GmbH	Proposal for Developing the hydropower plant Sahanivotry (Madagascar) under the CDM	24/05/2006	CDM consideration
6.	Ministry of Environment, Water and Forests, National Focal Point for the Climate Change Convention	Lettre d'éligibilité pour le document d'idée de projet (DIP) relative à la Centrale hydroélectrique de Sahanivotry de la Société HYDELEC	18/09/2007	CDM consideration

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
7.		E-mail exchange between Bernard Meunier and DG Hydelec "Dossier Fond Carbone / Hydelec Madagascar"	10/04/2007	CDM consideration
8.	Autorité Nationale de l'eau et de l'Assainissement	Permis de Prélèvement d'eau au droit de la station hydroélectrique à Sahanivotry sur la rivière Sahanivotry,	21/05/2007	Timeline: project implementation approval
9.	Hunan Lingling Hengyuan Generating Equipment Co.,Ltd and Hydelec Madagascar S.A.	Purchasing Contract for Turbine and Generator between Hunan Lingling Hengyuan Generating Equipment Co.,Ltd and Hydelec Madagascar S.A. dated 24/04/2007, n°132-07	24/04/2007	Timeline evidence
10.	BP Automation	Facture Pro Forma from BP Automation related to the purchasing of "Etude, Cablage et Automatization d'une Centrale Hydroelectrique de 3x5.5 MW Sur Le Site de Sahanivotry"	25/06/2007	n.a.
11.	Ministère de l'Energie	Decision n° 046 – ME/SG/DG/DEN/SRSA.CE portant Autorisation Environnementale	21/06/2007	Environmental Authorization
12.	Ministère de l'Energie à Monsier le Directeur Général Société Hydelec Madagascar	Letter n°40 ME/SG/DG/DEN. Confirmation of the validity of the project authorization previously signed in 2001 (see IRL 45).	07/03/2007	Timeline evidence: starting construction authorization
13.	Ministère de L'Energie et de Mines	Arrêté N° 21-016/2007 aurorisant une augmentation de la puissance de la central hydroélectrique de Sahanivotry (augmentation de 5 MW)	28/11/2007	Formal authorization to the 5MW capacity addition
14.	Ministère de l'Environnement, Des Eaux et Forêts (Madagascar DNA)	Lettre d'éligibilité pour le document d'idée de projet (DIP) relative à la Centrale hydroélectrique de Sahanivotry de la Société HYDELEC	16/10/2007	Timeline: continuous consideration of the CDM
15.	Jirama S.A. et Hydelec	Avenant n° 3 Au contract d'achat d'énergie de la Centrale de Sahanivotry	16/08/2007	Timeline: 3 rd amendment to

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
	Madagascar S.A.			PPA. Investment barrier analysis: grid price assumptions
16.	Entre L'Institut Supérieur De Technologie D'Antananarivo et L'Entreprise Hydeléc Madagaskar S.A.	Convention Validant l'inscription de n° 04/04/IST-T/DG	27/01/2004	Training evidence for Mr. Dimbinasandratoatsoa,
17.	Sahanivotry Municipality /Hydeléc Madagascar S.A.	Land Compensation Evidence	9/01/2004	Land compensation
18.	Government Document	Public information regarding the absence of negative impacts for the agriculture, deriving from the proposed project activity	25/04/2007	Environmental Impacts
19.	Sahanivotry Municipality	List of the persons that took part in the public consultations meetings	20/05/2008	Stakeholder involvement
20.	Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management	Letter of Approval for the CDM Project Activity "Small-Scale Hydropower Project Sahanivotry in Madagascar"	02/02/2010	Letter of approval Austrian DNA
21.	Jirama S.A.	Load forecast 2008/2009, Peak load per month 2006/2007, Load curve 11/06/2006 resp. 18/06/2007	24/03/2008	n.a.
22.	BFV-Society General, The Mauritius Commercial Bank (Madagascar) and	Loan agreement between BFV-Society General, "The Mauritius Commercial Bank (Madagascar) and Hydeléc Madagascar	06/09/2007	Bank Loan

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
	Hydelec Madagascar			
23.	Jirama S.A. and Hydelec Madagascar S.A.	Contrat d'achat d'énergie	17/02/2001	Power Purchase Agreement
24.	Energy Engineering Investment Ltd. and Hydelec Madagascar	Confirmation on Change of Project Participant	11/03/2009	Change of PP from Energy Engineering Investment Ltd. to Hydelec Madagascar SA
25.	Jirama S.A.	Production per existing power plant in RITANA	11/01/2008	Baseline emissions (EF calculation)
26.	Web Portal – Tafatafa tafatafa.eu.org	La centrale hydroélectrique de Sahanivotry	16/06/2005	Barrier analysis: critical project financing. Initial involvement of German bank Deutsche Investitions- und Entwicklungsgesellschaft mbH (DEG)
27.	Jirama S.A.	Production park RI TANA 2008-2030 per power plant	11/01/2008	n.a.
28.	Hydelec Madagascar SA	Grid connection and meters diagram	01/04/2009	Project boundary
29.	African Development Bank Group	Project Brief – Madagascar, Sahanivotry Small Hydro Power	28/05/2007	Timeline: CDM continuous consideration

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
30.	Hydelec Madagascar SA	Operation manual	01/04/2008	n.a.
31.	Hydelec Madagascar SA	Training schedule incl. list of participants	14/10/2009	Monitoring Plan: training schedule
32.	Jirama S.A.	Electricity Demand Forecast	11/01/2008	n.a.
33.	Ministry of Energy and Mines	Least Cost Development Plan for the grid , hydropower project and other energy sources, final report.	01/08/2005	Identification of the baseline scenario – baseline calculation
34.	African Development Bank	Projected annual electricity generation	2006	Investment analysis: 12 months power production
35.	Jirama S.A.	Structure of existing production Park RITANA	11/01/2008	Baseline emissions (EF calculation) Barrier analysis: hydro plants park
36.	Hydelec / Kommunalkredit Public Consulting	Modalities of Communication Form	10/2009	Modalities of Communication
37.	Jirama S.A. et Hydelec Madagascar S.A.	Avenant n° 1 Au contract d'achat d'énergie de la Centrale de Sahanivotry	27/06/2001	Timeline: 1 st amendment to PPA Investment barrier analysis: grid price assumptions.

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
38.	Jirama S.A. et Hydelec Madagascar S.A.	Avenant n° 2 Au contract d'achat d'énergie de la Centrale de Sahanivotry	16/10/2006	Timeline: 2 nd amendment to PPA. Investment barrier analysis: grid price assumptions.
39.	Pöyry Energy GmbH	Sahanivotry project IRR	11/2009	Investment barrier analysis: IRR calculation spreadsheet
40.	Pöyry Energy GmbH	Comparison of AfDB 2006 financial model and the PDD investment analysis	09/11/2009	Investment barrier analysis: IRR data source crosscheck
41.	African Development Bank	AfDB_Sahanivotry project IRR 20060820	20/08/2006	Investment barrier analysis: financial model (IRR calculation data source)
42.	Ministry of Environment, Water and Forests, National Focal Point for the Climate Change Convention	Letter of Approval of the Small Scale Hydropower Project Sahanivotry in Madagascar (doc. No. 487-09/MEF/SG/DGE/UCPCC)	04/11/2009	Letter of Approval of Madagascar DNA
43.	Sagetec	Etude d'impact Environnemental De la Centrale Hydroelectrique de Sahanivotry	12/2001	Environmental Impact assessment
44.	EGBE and Hydelec Madagascar S.A.	Starting construction order including 30% payment	19/03/2007	Timeline: starting date of the project activity.
45.	Le Ministre de L'Energie et de Mines	Décret N° 2001-182 Approbation du contrat de concession de production d'énergie électrique de 10MW à Sahanivotry	05/03/2001	Concession contract approval for 10 MW project

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
46.	African Development Bank and Hydelec	Loan Agreement	05/07/2007	First loan received by the PO for the project implementation
47.	AfDB/OECD	African Economic Outlook 2005-2006 - Madagascar	2006	Investment barrier analysis: context in terms of financial risks and weakness of the local grid company (JIRAMA)
48.	International Monetary Fund	Republic of Madagascar: Poverty Reduction Strategy Annual Progress Report – Joint Staff Advisory Note.	12/12/2008	Investment barrier analysis: context in terms of financial risks and weakness of the local grid company (JIRAMA)
49.	Hydelec Madagascar S.A.	Real Generation and Revenues 2008 - 2009	10/2009	Investment barrier analysis: crosscheck with actual electricity production and revenue.
50.	Hydelec Madagascar S.A.	Note d'information sur les kWh fournis (ref.: LH/023/HYD/SAHA)	19/10/2009	Investment barrier analysis: crosscheck with actual electricity production.
51.	World Economic Forum	Global Competitiveness Index 2007 – Competitiveness profiles, Madagascar	2007	Barrier analysis: critical project financing
52.	The World Bank Group	Doing Business 2009 - Madagascar	2009	Barrier analysis: critical project financing
53.	AfDB/OECD	African Economic Outlook 2009 – Madagascar, Macroeconomic Policy	2009	Barrier analysis: critical project financing. Inflation rates and development.

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
54.	Various newspapers	Midi Madagascar (11/01/2007) Madagascar Tribune L'Express de Madagascar (19/04/07 - 25/07/07 – 28/07/07 – 02/11/07)	Various dates 2007	Stakeholder consultation: public information regarding project implementation.
55.	Antsirabe Municipality	Public communication related to no risks for health and agriculture	25/04/2007	Stakeholder consultation
56.	Pöyry Energy GmbH	Project Design Document for CDM project “Sahanivotry Hydro Power Plant, Madagascar “, version 02	26/10/2009	Revised PDD sent to TÜV SÜD's CB quality control
57.	Pöyry Energy GmbH	Project Design Document for CDM project “Small Scale Hydropower project Sahanivotry in Madagascar “, version 03 http://cdm.unfccc.int/Projects/DB/TUEV-SUED1269612670.69/view	27/01/2010	Final SSC PDD (Registered on 28/08/2010)
58.	Hydelec Madagascar S.A.	Hydraulic Data Sahanivotry	2006	Excel Hydrological data
59.	Hydelec Madagascar S.A.	Facture N°HM01/SAHA/0810/JIR - Power invoice period 01/10/08 to 31/10/08	05/11/2008	Investment analysis: crosscheck electricity tariff and power generation
60.	Hydelec Madagascar S.A.	Facture N°HM02/SAHA/0811/JIR - Power invoice period 01/11/08 to 30/11/08	01/12/2008	Investment analysis: crosscheck electricity tariff and power generation
61.	Hydelec Madagascar S.A.	Facture N°HM03/SAHA/0812/JIR - Power invoice period 01/12/08 to 31/12/08	05/01/2009	Investment analysis: crosscheck electricity tariff and power generation
62.	Hydelec Madagascar S.A.	Facture N°HM04/SAHA/0901/JIR - Power invoice period 01/01/09 to 31/01/09	02/02/2009	Investment analysis: crosscheck electricity tariff and power generation

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
63.	Hydelec Madagascar S.A.	Facture N°HM05/SAHA/0902/JIR - Power invoice period 01/02/09 to 28/02/09	02/03/2009	Investment analysis: crosscheck electricity tariff and power generation
64.	Hydelec Madagascar S.A.	Facture N°HM06/SAHA/0903/JIR - Power invoice period 01/03/09 to 31/03/09	01/04/2009	Investment analysis: crosscheck electricity tariff and power generation
65.	Hydelec Madagascar S.A.	Facture N°HM07/SAHA/0904/JIR - Power invoice period 01/04/09 to 30/04/09	04/05/2009	Investment analysis: crosscheck electricity tariff and power generation
66.	Hydelec Madagascar S.A.	Facture N°HM08/SAHA/0905/JIR - Power invoice period 01/05/09 to 31/05/09	02/06/2009	Investment analysis: crosscheck electricity tariff and power generation
67.	Hydelec Madagascar S.A.	Facture N°HM09/SAHA/0906/JIR - Power invoice period 01/06/09 to 30/06/09	01/07/2009	Investment analysis: crosscheck electricity tariff and power generation
68.	Hydelec Madagascar S.A.	Facture N°HM09/SAHA/0907/JIR - Power invoice period 01/07/09 to 31/07/09	03/08/2009	Investment analysis: crosscheck electricity tariff and power generation
69.	Hydelec Madagascar S.A.	Facture N°HM11/SAHA/0908/JIR - Power invoice period 01/08/09 to 31/08/09	01/09/2009	Investment analysis: crosscheck electricity tariff and power generation
70.	Hydelec Madagascar S.A.	Facture N°HM12/SAHA/0909/JIR - Power invoice period 01/09/09 to 30/09/09	01/10/2009	Investment analysis: crosscheck electricity tariff and power generation
71.	Hydelec Madagascar S.A.	Facture N°HM13/SAHA/0910/JIR - Power invoice period 01/10/09 to 31/10/09	02/11/2009	Investment analysis: crosscheck electricity tariff and

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
				power generation
72.	Hydelec Madagascar S.A.	Facture N°HM14/SAHA/0911/JIR - Power invoice period 01/11/09 to 30/11/09	01/12/2009	Investment analysis: crosscheck electricity tariff and power generation
73.	Hydelec Madagascar S.A.	Facture N°HM15/SAHA/0912/JIR - Power invoice period 01/12/09 to 31/12/09	04/01/2010	Investment analysis: crosscheck electricity tariff and power generation
74.	AfDB	e-mail confirming the validity of the input values as included in AfDB financial model (IRL 41) at the time of the investment decision.	08/03/2010	Validity of the input values
75.	Hydelec Madagascar S.A.	Letter to Member of CDM Executive Board	25/05/2011	Letter sent to CDM EB in order to explain the increase in installed capacity in the project.
76.	Madagascar Government	Madagascar Action Plan 2007-2012	30/10/2006	Information on Barrier analysis
77.	UNFCCC	ACM0002 / 13 version "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"	EB 67 Annex 13	Methodology
78.	UNFCCC	Tool for the demonstration and assessment of additionality / version 7.0	23/11/2012	Additionality Tool
79.	UNFCCC	Tool to calculate the emission factor for an electricity system / version 03.0.0	23/11/2012	Emission Factor Tool
80.	UNFCCC	Guidelines on the assessment of investment analysis (version 05).	EB62 Annex 5	Investment analysis guidelines (update)
81.	AfDB	SAHANIVOTRY 120723.xls (excel summarizing actual net power production and actual total investment undertaken).	23/07/2012	Investment analysis: crosscheck actual final total investment

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
82.	Ecosur Afrique	Project Design Document for CDM project "Small Scale Hydropower project Sahanivotry in Madagascar ", version 04.0	14/06/2012	Large Scale meth – adapted PDD
83.	Ecosur Afrique	Project Design Document for CDM project "Small Scale Hydropower project Sahanivotry in Madagascar ", version 04.1	27/07/2012	Large Scale meth – adapted PDD - revised
84.	Ecosur Afrique	Project Design Document for CDM project "Small Scale Hydropower project Sahanivotry in Madagascar ", version 04.2	12/10/2012	Large Scale meth – adapted PDD – final version
85.	Ecosur Afrique	Weighted Average Cost of Capital calculation (WACC.xls)	12/10/2012	Investment Analysis: Calculation of new project benchmark based on WACC
86.	Banque Centrale de Madagascar	Central Bank of Madagascar – Evolution of interest rates (year 2006) http://www.banque-centrale.mg/index.php?id=m5_2_2_1	n.a.	Investment Analysis: WACC benchmark calculation. Assumption for Average cost of Debt financing (average year 2006) at the time of CDM investment decision.
87.	Hydelec Madagascar S.A.	Productible de la Centrale de Sahanivotry	2006	Hydrological study for the estimation of potential power production resulting in 80.65 GWh
88.	Hydelec Madagascar SA	Pictures of nameplates of turbines and generators	12/04/2011	Evidence for actual installed capacity of equipments
89.	UNFCCC	Clean Development Mechanism Validation and Verification Standard – version 03.0 and version 04	30/07/2010 and 29/07/2013	CDM Validation and verification Standard applied in the context of the assessment of the changes to the registered project activity under VVS

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
				Track.
90.	UNFCCC	Clean Development Mechanism Project Cycle Procedure, Version 03.1 and Version 04	03/12/2012 and 29/07/2013	CDM Project Cycle Procedure applied in the context of the assessment of the changes to the registered project activity under VVS Track.
91.	UNFCCC	Clean Development Mechanism Project Standard, Version 02.1 and Version 04	03/12/2012 and 29/07/2013	n.a.
92.	UNFCCC	Guidelines for Completing the Project Design Document (CDM-PDD) version 01.1	02/03/2012	PDD Guideline
93.	UNFCCC	Guidelines for objective demonstration and assessment of barriers Version 01.0 EB50 Annex13	16/10/2009	Guideline applied in the context of the assessment of the changes to the registered project activity
94.	UNFCCC	Guidelines on common practice Version 02.0 EB69 Annex08	13/09/2012	Guideline applied in the context of the assessment of the changes to the registered project activity under VVS Track.
95.	Ecosur Afrique	Project Design Document for CDM project "Small Scale Hydropower project Sahanivotry in Madagascar ", version 04.3	25/08/2013	Updated PDD wrt Incomplete

Annex 2: Appointment certificates



South Asia

CERTIFICATE OF APPOINTMENT

Ms. Wagner, Karin fulfills the requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd to participate in audits.

Qualification applicable to					
Standard	CDM	GS	VCS	VER	Other
Date	21.11.12				

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		21.11.12	21.11.12	21.11.12	21.11.12	1.2

Other qualification						
Country Expertise						
Region	1	2	3	4	5	Other
Date	21.11.12					
Further countries						
Financial Expertise						
Date	21.11.12					

Qualification in technical areas	
Technical Area	Date
1.2_Energy generation from renewable energy source	21.11.12

This appointment is valid until 28.02.2014 and is bound by internal requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd.

In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference no. CB-IND-CCP-0048/002.

Date	Signature
01.03.2013	



South Asia

CERTIFICATE OF APPOINTMENT

Mr. Arena, Riccardo fulfills the requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd to participate in audits.

Qualification applicable to					
Standard	CDM	GS	VCS	VER	Other
Date	21.11.12				

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		21.11.12	21.11.12			1.2

Other qualification						
Country Expertise						
Region	1	2	3	4	5	Other
Date	21.11.12					
Further countries						
Financial Expertise						
Date						

Qualification in technical areas	
Technical Area	Date
1.2_Energy generation from renewable energy source	21.11.12

This appointment is valid until 28.02.2014 and is bound by internal requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd.

In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference no. CB-IND-CCP-0005/002.

Date	Signature
01.03.2013	

CERTIFICATE OF APPOINTMENT

Mr. Grugni, Luciano fulfills the requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd to participate in audits.

Qualification applicable to					
Standard	CDM	GS	VCS	VER	Other
Date	21.11.12				

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		21.11.12	21.11.12			1.1, 1.2, 2.2, 4.10, 13.1

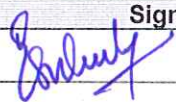
Other qualification						
Country Expertise						
Region	1	2	3	4	5	Other
Date	21.11.12					
Further countries						
Financial Expertise						
Date						

Qualification in technical areas	
Technical Area	Date
1.1_4.10_Thermal energy generation...	21.11.12
1.2_Energy generation from renewable energy source	21.11.12
2.2_Heat distribution	21.11.12
13.1_Waste handling and disposal	21.11.12

This appointment is valid until 28.02.2014 and is bound by internal requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd.

In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference no. CB-IND-CCP-0014/002.

Date	Signature
01.03.2013	



South Asia

CERTIFICATE OF APPOINTMENT

Ms. Hartmann Katrin fulfills the requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd to participate in audits.

Qualification applicable to					
Standard	CDM	GS	VCS	VER	Other
Date	21.11.12				

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		21.11.12	21.11.12	21.11.12	21.11.12	1.2

Other qualification						
Country Expertise						
Region	1	2	3	4	5	Other
Date	21.11.12					
Further countries						
Financial Expertise						
Date	21.11.12					

Qualification in technical areas	
Technical Area	Date
1.2_Energy generation from renewable energy source	21.11.12

This appointment is valid until 28.02.2014 and is bound by internal requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd.

In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference no. CB-IND-CCP-0018/002

Date	Signature
01.03.2013	