SOUBRÉ HYDROPOWER PROJECT

Document Prepared By

ecosur afrique
POWERING SUSTAINABLE DEVELOPMENT

Project Title	Soubré Hydropower Project
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PROJECT DETAILS

1.1 Summary Description of the Project

The Soubré Hydro Power Plant (hereafter referred to as "Soubré HPP") is a greenfield project located on the Sassandra river about 5 km from Soubré village, Côte d'Ivoire. The Soubré HPP is composed of a run-of-river hydropower plant with a capacity of 270 MW and a micro-hydro power plant of 5.5 MW with a total estimated average gross electricity generation of 1,170 GWh per year, fed by a 17.3 km² reservoir. The plant will be connected via three 225 kV transmission lines to the national grid: the transmission line Soubré-Buyo, Soubré-San Pedro and Soubré-Taabo.

To date, electricity in Côte d'Ivoire is mainly generated from fossil fuels (natural gas and fuel oil) which leads to considerable greenhouse gas emissions. The project activity will therefore substitute fossil-fuel intensive grid-electricity and cut down GHG emissions by an estimated annual reduction of 607,720 tCO_{2e}.

1.2 Sectoral Scope and Project Type

The Project belongs to sectoral scope 1: Energy (renewable/non-renewable), as it consists in Grid connected electricity generation from renewable sources. It is not a grouped project. □

1.3 Project Proponent

Organization name	CI-ENERGIES
Contact person	M. Amidou TRAORE
Title	General Manager
Address	01 BP 1345, Abidjan, 1345 Côte d'Ivoire
Telephone	+225 20 20 62 01
Email	info@cinergies.ci

1.4 Other Entities Involved in the Project

Organization name	AERA Goup
Role in the project	CDM Developer
Contact person	Aurélie Lepage
Title	COO
Address	69, Rue de Rennes, 75006 Paris
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1.5 Project Start Date

The starting date of the project activity is 01/01/2017 when the renewable electricity production to the grid is expected to start.

1.6 Project Crediting Period

The Project crediting period will start on 01/01/2017 and will end on 31/12/2026, totalling 10 years of operation.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	
Large project	x

Year	Estimated GHG emission reductions or removals (tCO_2e)
2017	351,198
2018	636,222
2019	636,222
2020	636,222
2021	636,222
2022	636,222
2023	636,222
2024	636,222
2025	636,222
2026	636,222
Total estimated ERs	6,077,196
Total number of crediting years	**10**
Average annual ERs	**607,720**

1.8 Description of the Project Activity

The project is a run-off-river hydropower plant with reservoir, consisting of a capacity of 270 MW besides a micro-hydro power plant of 5.5 MW,that will supply the electricity to Soubré substation. The project will use three new turbines Francis type of 90 MW and three new generators provided by French manufacturer Alstom, as well as a smaller 5.5 MW Kaplan turbine and associated generator.

Total average energy to be generated is estimated at 1,170 GWh (gross) per year, including 44 GWh/yr from the micro-hydro powerplant. The corresponding plant load factor is 48,5%, or 4,247 hours per annum at nominal power, as determined by feasibility study from third party engineering company and provided to the banks.

The key technical indicators of the power plant are shown below:

Specifications of the power plant:				
Turbines	**Manufacturer**	**Type**	**Rated Power**	**Rated flow**
3	Alstom	Francis	90 MW	238 m^3/s
Generator	**Manufacturer**	**Type**	**Rated Power**	**Rated rotation speed**
3	Alstom	-	98 MVA	120 r/min
Specifications of the micro-hydro power plant:				
Turbines	**Manufacturer**	**Type**	**Rated Power**	**Rated flow**
1	Alstom	Kaplan	5.5 MW	50 m^3/s
Generator	**Manufacturer**	**Type**	**Rated Power**	**Rated voltage**
1	Alstom	-	6.5 MVA	6.6 kV

The project facilities include a 1,730 ha reservoir delimited by a 4.5 km dam with a maximal height of 19.5 m along Sassandra river, in the vicinity of the Nawa falls. It makes full use of the total 42 m denivellation

of the natural falls, and also benefits from the regulated inflows from Buyo existing reservoir, built in 1978 and located 90km upstream. The expected operational lifetime of the project equipment is 30 years.

The project is the installation of a new run-off-river hydro power plan to supply the grid; it displaces the electricity generated by power plants in the electricity system of the national grid. The estimated amount of emissions reductions is calculated based on the expected net energy generated to feed into the grid and the combined margin emission factor of 604.2 tCO_2/GWh for the national grid.
Please refer to registered CDM-PDD section B.4 for further details.

1.9 Project Location

The project is located about 5 km from Soubré village on the river Sassandra, San Pedro Province, NAWA region, Côte d'Ivoire. The geographical coordinates of the project extension limits are 5°48'33" W, 6°39'28" S (Northernmost point of the dam) and 5°46'56" W, 6°36'55" S (Easternmost point). The physical location of the project is shown in Figure 1.

Figure 1 – The project location

1.10 Conditions Prior to Project Initiation

To date, electricity in Côte d'Ivoire is mainly generated from fossil fuels (natural gas and fuel oil) which leads to considerable greenhouse gas emissions. Before implementation, the project site is a largely deforested area (since cocoa exploitation in the 70's, outside of any protected area. The 22,2 km^2 surface to be potentially flooded includes the current water body of Sassandra river and falls, Mounts Kourabahi forest area and two inhabited rural areas.

Economically speaking, Côte d'Ivoire is among the Developing Countries. It ranks 171 of 199 countries on the Human Development Index (UNDP, 2014)[1]. The World Bank has estimated that 42.7% of Ivoirians live under national poverty line (World Bank, 2014)[2]. Reliability and coverage of electricity is one of the challenges to be faced by the country. It has increased over the past years, however the national coverage rate is still very low with only 33% of Ivorian locations connected (Ministry of Mining, Oil and

[1] *Human Development Report*

[2] *World Development Indicators*. Retrieved from World bank website: data, Côte d'Ivoire. www.worldbank.org/

Energy, 2012)[3] and only 26% of households have access to electricity in December 2011 (Agence Ecofin, 2014)[4].
In 2005, the decision to establish a Renewable Energy Directorate has set a distinctive hallmark in the official Renewable Energy development policy. The Electricity Code adopted by the Assembly in March 2014 should promote, among other, the development of the Renewable Energy sub-sector in Côte d'Ivoire; the set target being 15% by 2020.

The project is expected to help the country meet its increasing demand for power reliably in a cost-effective and environment-friendly manner.
The implementation of the project activity contributes to sustainable development in Côte d'Ivoire. In particular, the project:

- diversifies sources for electricity generation and decreases dependence on imported energy sources, above all natural gas and fuel oil.
- supports the Ivorian's government to achieve the goal of accessible and adequate energy supply at competitive costs.
- increases employment opportunities to local people (more than 1,500 direct jobs (20% SINOHYDRO, 80% local) and 2,500 indirect expected during construction, and 50 permanent positions during operation of the project),
- improves the regional facilities through the implementation of new schools, health center and housing, in addition to the creation of a fishing are in the area where the project is located, opening a new revenue stream for local populations, and the development of agriculture and tourism (with the promotion of Nawa falls).
- includes state-of-the-art socio-environmental mitigation measures for an estimated cost of 50 billion F CFA (15% of total investment).

Continuation of current practice for power generation in Côte d'Ivoire involves a significant share of fossil fuel consumption, including in capacity additions to meet the demand increase, as reflected by the rather high Combined Margin emission factor of 0.6042 tCO2/MWh calculated in registered CDM-PDD section B.6.1.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

Currently, there are no specific regulations or incentives for renewable energy, nor any form of legislative framework[5]. The project is developed under the cooperation of the National Authority for the Regulation of the Electricity Sector (L'Autorité Nationale de Régulation du secteur de l'Electricité de Côte d'Ivoire, ANARE, http://www.anare.ci/)

1.12 Ownership and Other Programs

1.12.1 Right of Use

The right of use is evidenced by:

- The 'Public Interest Decree' promulgated by the President of Cote d'Ivoire
- The Power Purchase Agreement between the Project Proponent and the utility company

1.12.2 Emissions Trading Programs and Other Binding Limits

Not applicable as the project's GHG emission reductions activity is not included in an emissions trading program or any other mechanism that includes GHG allowance trading.

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[3] *National seminar on Energy, November 2012* (in French: « *Séminaire national sur l'énergie 2012 »).* Ministry of Mining, Oil and Energy

[4] Agence Ecofin, May 21st 2014, Retrieved from Agence Ecofin website: http://www.agenceecofin.com/ , Article: "*Côte d'Ivoire: only 26% of households are duly connected to the grid*"

[5] http://www.reegle.info/countries/cote-d-ivoire-energy-profile/CI

1.12.3 Other Forms of Environmental Credit

The project has not sought or received any other form of GHG-related environmental credit, as confirmed by written declaration of the Project Proponent.

1.12.4 Participation under Other GHG Programs

The project has not been registered under any other GHG program, although it is simultaneously developed as a CDM Project activity to be registered under the UNFCCC.

1.12.5 Projects Rejected by Other GHG Programs

The project has not been rejected by any other GHG programs, as confirmed by written declaration of the Project Proponent.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

Not applicable as the project is not a grouped project.

Leakage Management

No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport). These emissions sources are neglected.

Commercially Sensitive Information

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

Further Information

N/A

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

The approved baseline and monitoring methodology that is applied to the proposed Project is ACM0002 (version 16.0, EB 81, Annex 9) Large Scale Consolidated Methodology "Grid-connected electricity generation from renewable sources".

In line with the application of the ACM0002 methodology, the project refers to the following tools:

- "Tool to calculate the emission factor for an electricity system" (version 05.0, EB 87, Annex 9),
- "Tool for the demonstration and assessment of additionality" (version 07.0.0, EB 70, Annex 8),
- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02, EB 41, Annex 11).

In addition, the following methodological tools/tools are also employed:

- "Investment analysis" (version 06.0, EB 85, Annex 12)
- "Common practice" (version 03.1, EB 84, Annex 7)
- "Guidelines for the reporting and validation of plant load factors" (version 01, EB 48, Annex 11).

2.2 Applicability of Methodology

The ACM0002 (version 16.0) methodology is applicable to grid-connected renewable power generation project activities that: (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).

It therefore applies to Soubré HPP, as Greenfield hydropower project providing electricity to Soubré's substation.

Furthermore, the following table shows how the project activity meets the applicability conditions:

Table 1 - Applicability of the project regarding ACM0002 conditions

Applicability conditions of the methodology ACM0002	**Project activity specifications**
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 ;	The project is the installation of a new run-off-river hydro power plant; it is a Greenfield project with reservoir. The project activity results in new single reservoir and the power density calculated using equation (3), is greater than 4 W/m^2 (Installed capacity is 275.5 MW and expected reservoir area, net of the original river bed, is 13.8 km^2 thus resulting into power density of 20 W/m^2 (see detailed PD calculation in 3.2).
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 the start date of minimum historical reference period of five years, used for 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 ;	
In case of hydro power plants, one of the following conditions shall apply: • The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of reservoirs; or • The project activity is implemented in an existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density calculated using equation (3), is greater than 4 W/m^2; or • The project activity results in new single or multiple reservoirs and the power density calculated using equation (3) is greater than 4 W/m^2 ; or • The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m^2, all of the following conditions shall apply: - The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/m^2; - Water flow between reservoirs is not used by any other hydropower unit which is not part of the project activity; - Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m^2 shall be: a. Lower than or equal to 15 MW; and	

b. Less than 10 per cent of the total installed capacity of integrated hydro power project.	
In the case of integrated hydro power projects, project proponent shall: - Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or - Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.	N/A, as the project activity is not an integrated hydro power project.
The methodology is not applicable to: (e)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; (f) Biomass fired power plants/units	N/A, as the project activity is neither a fuel switch nor a biomass fired power plant.
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"	N/A, as the project activity does not involve any retrofits, rehabilitations, replacements, or capacity additions.

The monitoring methodology is used in conjunction with the approved baseline methodology ACM0002.

In addition, the applicability conditions included in the tools referred to above apply.

Table 2 - Applicability of the project regarding methodological tools conditions applied in the PDD

Applicability conditions of the "Tool to calculate the emission factor for an electricity system" (version 050.0)	**Project activity specifications**
This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).;	The project is the installation of a new run-off-river hydro power plan to supply the grid; it displaces the electricity generated by power plants in the electricity system of the national grid.
Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, two sub-options under the step 2 of the tool are available to the project participants, i.e. option IIa and option IIb.	The emission factor for the project electricity system is calculated for grid power plants only.
In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	The project is not located in an Annex I country.
Applicability conditions of the "Tool for the demonstration and	**Project activity**

assessment of additionality" (version 07.0.0)	**specifications**
Applicable geographical area should be the entire host country.	The geographical area selected is the host country
Measure (for emission reduction activities) is a broad class of greenhouse gas emission reduction activities possessing common features. Four types of measures are currently covered in the framework: (a) Fuel and feedstock switch; (b) Switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies); (c) Methane destruction; (d) Methane formation avoidance.	The project activity is covered under (b) switch of technology.
Output is good/services produced by the project activity.	The output is electricity
Applicability conditions of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02)	**Project activity specifications**
This tool provides procedures to calculate project and/or leakage CO_2 emissions from the combustion of fossil fuels. It can be used in cases where CO_2 emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted and its properties. Methodologies using this tool should specify to which combustion process *j* this tool is being applied.	CO_2 emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted

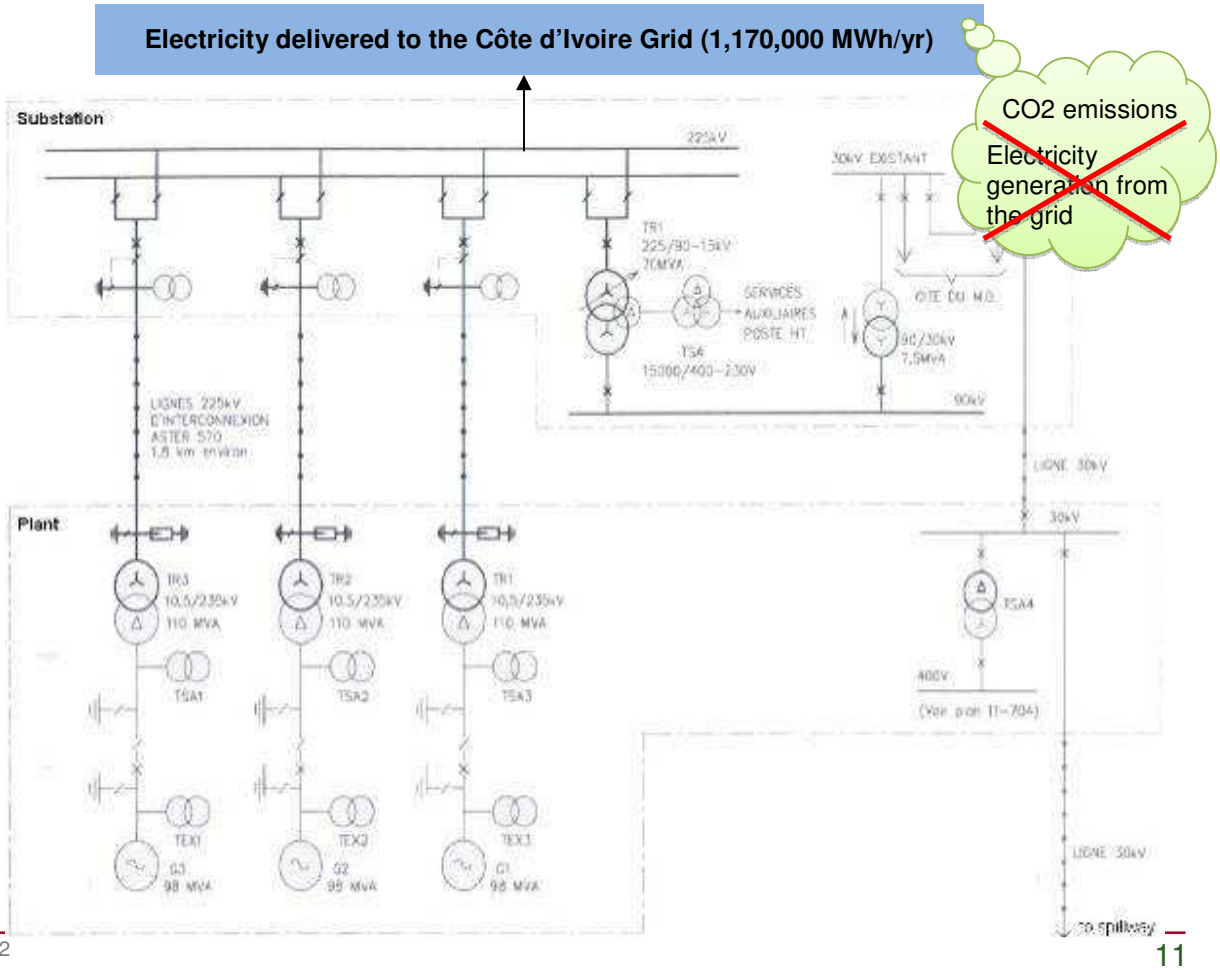
2.3 Project Boundary

Source		Gas	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source (fossil fuel-fired power plants of national electricity grid of Côte d'Ivoire)
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
		Other	N/A	No other gas is generated in the project baseline
	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	For all renewable energy power generation project activities, emissions due to use of fossil fuels for the backup generator can be neglected.
		CH_4	No	Neglected because Power density higher than 10 W/m^2
		N_2O	No	Minor emission source
		Other	N/A	No other gas is generated in the project baseline
Project	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to	CO_2	No	Main emission source (fossil fuel-fired power plants of national electricity grid of Côte d'Ivoire) will be avoided by the project activity
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
		Other	N/A	No other gas is generated in the project baseline

Source		Gas	Included?	Justification/Explanation
	the project activity			
	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	For all renewable energy power generation project activities, emissions due to use of fossil fuels for the backup generator can be neglected.
		CH_4	No	Neglected because Power density higher than 10 W/m^2
		N_2O	No	Minor emission source
		Other	No	No other gas is generated in the project baseline

In accordance with the methodology ACM0002 (Version 16.0) Large Scale Consolidated Methodology "Grid-connected electricity generation from renewable sources": "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 electricity displaced by the project is the electricity generated within the interconnected Ivorian grid. The spatial scope of the project boundary covers the project site including the area of influence of the power line up to the substation and all power plants connected physically to Ivorian grid.

Therefore, the project boundary will include all the direct emissions related to the electricity produced by the power plants connected to Ivorian grid that will be replaced by the proposed project activity as it is shown below.



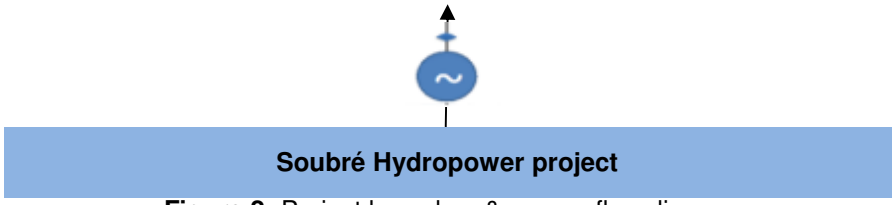


Figure 2: Project boundary & energy flow diagram

2.4 Baseline Scenario

According to methodology ACM0002 (Version 16.0) and since the project is the installation of a new grid-connected renewable power plant the baseline scenario is the following:

"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."

According to the Ministry of Mines, Oil and Energies (Seminaire Nationale sur l'energie, 2012), the current trend in the energy sector is the development of fossil fuel power plant. Simultaneously, there has been a decrease in the proportion of hydroelectric power generation leading to a greater reliance on thermal production.

So, continuation of current practice for power generation in Côte d'Ivoire involves a significant share of fossil fuel consumption, including in capacity additions to meet the demand increase, as reflected by the rather high Combined Margin emission factor of 0.6042 tCO_2/MWh calculated in section 3.

2.5 Additionality

According to the definition of the VCS, the start date of the project is 01/01/2017 when the renewable electricity production to the grid is expected to start.

In accordance with ACM0002 (version 16.0), the additionality of the project activity is demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality".

Step 0: Demonstration whether the proposed project activity is the first-of its-kind

This step is optional; it is not applied as it is considered that the proposed project activity is not the first-of-its-kind.

Step 1: Identification of alternatives to the project activity

According to Para. 7.12.8.3. of VVS version 07.0 (CDM-EB65-A04-STAN), the identification of alternatives is not required since the baseline scenario has already been prescribed in the applied methodology ACM0002 version 16.0.

Step 2: Investment analysis

Under step 2, it will be demonstrated that project activity is not economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs)

Sub-step 2a: Determine appropriate analysis method

Since the proposed project will generate other financial/economic benefits than CDM related income, the simple cost analysis method (Option I) is not appropriate. Also, investment comparison analysis method (Option II) is only applicable to projects whose alternatives are similar investment projects. Indeed, if the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate. Therefore the benchmark analysis (Option III) is applied.

Sub-step 2b: Option III. Apply benchmark analysis

The financial/economic indicator identified as most suitable for the project type and decision context is the Internal Rate of Return on equity (post-tax Equity IRR).

This indicator allows for effective comparison of the project returns with an appropriate benchmark. Therefore, the financial analysis is based on parameters that (a) are standard in the market and (b) consider the specific characteristics of the project type, but not linked to the subjective profitability expectation or risk profile of a particular project developer. The benchmark represents the minimum rate of return that would justify the financial viability of the project and therefore its implementation.

Expected return on equity is estimated using default values stated for various countries in the Appendix of the methodological tool Investment Analysis. For renewable energy projects which fall under the sectoral scope 1. Energy Industries, the default approach relies on the value defined for Group 1, which is 14.55% for Côte d'Ivoire in real terms, i.e. 14.55 + 2,1 = 16.65 % in nominal terms.

Sub-step 2c: Calculation and comparison of financial indicators

Equity IRR is calculated as the discount rate that makes the present value of the future after-tax cash flows equal the investment outlay (only the portion of investment costs which is financed by equity).

$$\sum_i \frac{CF_i}{(1+IRR)^i} = Investment\ Outlay$$

With:

CF_i	the annual after-tax free cash flow to equity expected from the proposed project activity in the year *i*
Investment Outlay	this includes all costs required to set the power plant operational): land cost, project development costs (e.g. consultancy fees, license fees, engineering costs), equipment cost, construction costs, etc.

Table 3: *Parameters for IRR calculation*

Parameter	Value	Unit	Sources/comments
First spending year	2013		Feasibility study & financial model schedule introduced to Exim Bank of China (BUSSINESS PLAN SOUBRE Excel)
First operation year	2017		
Project lifetime	30	year	Expected operational lifetime of the project equipments, as per usual hydropower industry standards. Cf. Coyne-et-Bellier feasibility study report Table 10-1 p.101

Annual power export	1,170,000	MWh	As per guidelines for the reporting and validation of plant load factors[6], i.e. as per feasibility study from third party engineering company, also provided to banks. Cf. Coyne-et-Bellier feasibility study report Tableau 6-7 p.68
Electricity tariff	35	F CFA/kWh	Power Purchase Agreement p.8
Inflation	2,1	%/year	Central Bank of West African States (BCEAO) medium-term inflation forecast (2012-2015) , conservative compared to World Bank latest estimate of 1.3 %
Investment outlay financed by equity	91,991 M.	F CFA	Financial terms publicly agreed with Exim Bank of China, cf. tab 'capital structure' and EPC amendment p.5
Investment outlay financed by debt	238,784 M.	F CFA	
Operation & Maintenance Cost	4,990 M. (real)	F CFA/year	Financial model introduced to Exim Bank of China, cf. tab 'BUSINESS PLAN' cells I14-16-18-20 & AG50
Salvage value of assets	44,103 M.	F CFA	
Insurance	0.25	% of Capex	As per actual project circumstances, i.e. as accounted in financial plan agreed with Exim Bank of China. Cf. tab 'BUSINESS PLAN' row 16, row 33 and tab 'amortization table' cell G12
Debt interest rate	2	%	
Income tax rate	25	%	
Depreciation period	30	years	The fair value of project activity assets at the end of the assessment period is included as a cash inflow in the final year.
Calculated post-tax equity IRR	11.0	%	See financial spreadsheet's yellow calculations (row 52) provided to the DOE
Applicable benchmark	16.65	%	Default approach of the Appendix of the methodological tool Investment Analysis, for renewable energy projects which fall under the sectoral scope 1. Energy Industries (14.55%), adjusted in nominal terms

Outcome of Step 2b: As the CDM project activity has a less favourable indicator than the financial benchmark, then the CDM project activity cannot be considered as financially attractive for CI-ENERGIES.

Sub-step 2d: Sensitivity analysis

In line with the guidance on the assessment of investment analysis, only variables, including the initial investment costs and the revenue due to net electricity generation, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation. Consequently a variation of +/-10% in the critical assumptions (i.e total investment, annual O&M cost, and power sales revenues) have been included in the sensitivity analysis:

Results for variations of Soubré HPP equity IRR are presented below:

[6] Equivalent to 48,7% plant load factor, or 4,270 hours per annum at nominal power.

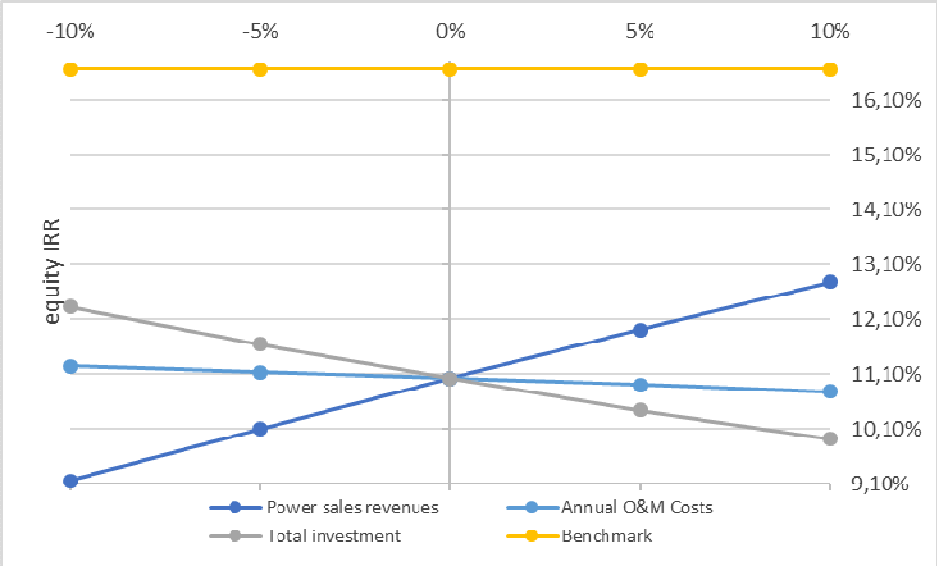


Figure 3 – Sensitivity analysis results

Sensitivity analysis	-10%	-5%	0%	+5%	+10%
Power sales revenues	9,15%	10,10%	11,02%	11,91%	12,78%
Annual O&M Costs	11,25%	11,13%	11,02%	10,90%	10,78%
Total Investment	12,32%	11,64%	11,02%	10,44%	9,91%
Benchmark	**16.65 %**				

The project's equity IRR remains below the expected benchmark in all circumstances, even for a significant increase in power sales revenues (+10%) which is unlikely to occur due to the existence of a fixed price per kWh already signed in the Power Purchase Agreement.

Outcome of Step 2:

It can be concluded that the proposed project activity is unlikely to be financially/economically attractive (post-tax equity IRR remaining in all circumstances below the appropriate benchmark).

Step 3: Barriers analysis;

Project proponent can use either investment analysis or barrier analysis step. As project proponents already apply the investment analysis it is not required to elaborate on barriers analysis.

Step 4: Common practice analysis.

The latest version of the *methodological tool Common practice* is applied:

Step 1: Calculate applicable capacity or output range as +/-50% of the design capacity or output of the proposed project activity.

From a project activity capacity of 270 MW, the applicable output range is calculated as 135 to 405 MW of power generation capacity.

Step 2: Identify similar projects (both CDM and non-CDM) which fulfil all of the following conditions:

(a) The projects are located in the applicable geographical area;

(b) The projects apply the same measure as the proposed project activity;

(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;

(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;

(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;

(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

In the host country of Côte d'Ivoire, the power plants operating before the start date of the project and belonging to the 135 - 405 MW output range are:

Power plant[7]	Installed capacity	Commissioning date	Technology
Buyo	165 MW	1980	Hydro
Kossou	174 MW	1972	Hydro
Taabo	210 MW	1979	Hydro

Step 3: within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}.

All of the projects identified in Step 2 are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation.
Therefore $N_{all} = 3$.

Step 4: within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff}.
The technology used in the project activity is not different from **all** with regard to its energy source/fuel which is hydraulic. Therefore $N_{diff} = 0$.

Step 5: Calculate factor $F=1- N_{diff}/N_{all}$ representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

$F=1- N_{diff}/N_{all} = 1-0/3 = 1$

$N_{all} - N_{diff} = 3$.

The proposed project activity is a "common practice" within a sector in the applicable geographical area if the factor F is greater than 0.2 and $N_{all}-N_{diff}$ is greater than 3.

➔ Since F = 1 but $N_{all}-N_{diff} = 3$, it can be concluded that **the project activity is not common practice** i.e. that its technology has not diffused in the relevant sector and region.

N.B. The hydro power plants identified as similar were implemented more than 30 years ago. The experience of implementing such projects is lacking nowadays; moreover the context (economic and technological context) in which it was developed was different.

Outcome of Step 4:

[7] Please refer to Annex 3.

Step 4 is satisfied, i.e. the proposed project activity is not regarded as "common practice". In conclusion of the overall additionality demonstration, the proposed project activity is deemed additional

2.6 Methodology Deviations

N/A

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired 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:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$

Where:

BEy	=	Baseline emissions in year y (tCO_2/yr)
EGPJ,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/yr)
EFgrid,CM,y	=	Combined margin CO_2 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*" (tCO_2/MWh).

Calculation of EGPJ,y

Since the project activity is *the installation of a new grid-connected renewable power plant at a site where no renewable power plant was operated prior to the implementation of the project activity*, it verifies the case of a Greenfield renewable energy power plant of the ACM0002 methodology Version 16.0 whereby:

$$EG_{PJ,y} = EG_{facility,y} \quad \textbf{(4)}$$

Where:

$EG_{PJ,y}$	=	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/yr)
$EG_{facility,y}$	=	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)

EGfacility,y is therefore the quantity of net electricity supplied by the project plant to the Ivorian electricity grid . It is determined as a difference between (i) quantity of electricity supplied by the project plant to the grid and (ii) quantity of electricity delivered to the project plant from the grid (please refer to section B.7 for monitoring details). The methodology ACM0002 Version 16.0 assumes that all project electricity generation above baseline levels would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in *EFgrid,CM,y*.

Calculation of EFgrid,CM,y

According to the "*Tool to calculate the emission factor for an electricity system*" Version 05.0, the combined margin (CM) emission factor shall be calculated by applying the following six steps:

STEP 1: Identify the relevant electricity systems;

STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional);
STEP 3: Select a method to determine the operating margin (OM);
STEP 4: Calculate the operating margin emission factor according to the selected method;
STEP 5: Calculate the build margin (BM) emission factor;
STEP 6: Calculate the combined margin (CM) emission factor.

Step 1: Identify the relevant electricity systems

The project activity will sell electricity to the national grid of Côte d'Ivoire. The national grid of Côte d'Ivoire consists of 10 power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints; instead, regional grids currently are all interconnected. According to para 18 of the tool, national grid can be used by default.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)
"Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation.

Option I is chosen.

Step 3: Select a method to determine the operating margin (OM)

The "Tool to calculate the emission factor for an electricity system" (version 04.0.0) mentions four options for calculating the operating margin emission factor (*EFgrid,OM,y*):
a) Simple OM, or
b) Simple adjusted OM, or
c) Dispatched data analysis OM, or
d) Average OM.

For the proposed project, Option (a) Simple OM has been selected. According to the methodology the simple OM is suitable when any one of the following requirements is satisfied:
(a) low-cost/must run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, and the average of the five most recent years shall be determined by using one of the approaches described below; or (2) based on long-term averages for hydroelectricity production (minimum time frame of 15 years).

(i) Approach 1

$$\text{Share}_{LCMR} = \text{average}\left[\frac{EG_{LCMR_{y-4}}}{total_{y-4}}, \ldots, \frac{EG_{LCMR_y}}{total_y}\right]$$

(ii) Approach 2

$$\text{Share}_{LCMR} = \frac{average\left(EG_{LCMR_{y-4}}, \ldots, EG_{LCMR_y}\right)}{average\left(total_{y-4}, \ldots, total_y\right)}$$

Table below shows that average production delivered to the grid over last five years of installed capacity of the low-cost/must run resources constitutes less than 50% as per Approach 1.

Table 5 – Constitution of low-cost/must run resource in national Ivorian grid for the period 2011-2015 *(Source: CI-ENERGIES, 2016)*

Year	2011	2012	2013	2014	2015
$total_y$ (MWh)	6,027,719	6,944,830	7,570,089	8,201,703	8,607,864

EG_{LCMRy} (MWh)	1,773,627	1,795,032	1,605,677	1,913,491	1,352,480
$Share_{LCMR,y}$ (%)	29.4%	25.8%	21.2%	23,3%	15,7%
$Share_{LCMR}$	**23.1%**				

The emission factor can be calculated using either of the two following data vintages:

1. Ex ante option: if the ex-ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emission factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation;

2. Ex post option: If the ex-post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is only available later than six months after the end of the year y, alternatively the emission factor of the previous year y-1 may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year y-2 may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

For the Project, option (1) ex-ante data will be used for calculating the OM emission factor (EFgrid, OM,y) based on data from the years 2013 - 2015.

Step 4: Calculate the operating margin emission factor according to the selected method

According to the "Tool to calculate the emission factor for an electricity system", the Simple OM emission factor (EFgrid,OM,y) is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (t CO_2 /MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.
The simple OM may be calculated by one of the following two options:
a) Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or
b) Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Based on the grid data received from the CI-ENERGIES, no CO_2 emission factor per power unit is available therefore "Option A" under step 4 of the "tool to calculate the emission factor for an electricity system" cannot be applied. As there are data on the electricity generation and the fuel consumption of each power unit, the calculation is based on the net electricity generation and the fuel consumption of each power unit, the calculation is based on the net electricity generation and a type of fuel and fuel consumption of each power unit (Option B). The simple OM emission factor ($EF_{grid,OMsimple,y}$) of each grid is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants/units.

Option B – Calculation based on total fuel consumption and electricity generation of the system.
Under this option, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y}$$

Where:

EFgrid,OM,simple,y Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh),

$FC_{i,y}$	Amount of fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit)
$NCV_{i,y}$	Net calorific value (energy content) of fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$	CO_2 emission factor of fuel type *i* in year *y* (tCO_2/GJ)
EG_y	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year *y* (MWh)
i	All fuel types combusted in power sources in the project electricity system in year *y*
y	The relevant year as per the data vintage chosen in Step 3

EFgrid,OM,y = 0.6244 t CO2/MWh

Step 5: Calculate the build margin (BM) emission factor

In terms of vintage of data, one of the following two options can be chosen:

Option 1: for the first crediting period, calculate the build margin emission factor *ex ante* based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewable of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, *ex post*, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emission factor shall be calculated ex-ante, as described in option 1. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

For the purposed project, option 1 is chosen to calculate the Build Margin emission factor.

The build margin is calculated according to the "Tool to calculate the emission for an electricity system".

The sample group of power units *m* to calculate the build margin should be determined as per the procedure, consistent with the data vintage selected:

a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$);

The set of five power units that started to supply electricity to the grid most recently is listed in Table below. In year 2015, this sample group $\mathbf{AEG_{SET\text{-}5\text{-}units}}$ comprises an annual electricity generation of 2,111,390 MWh.

Table 4 – The five most recently built power plants in National Ivorian grid

Name of power plant	Fuel	Commissioning date	Installed capacity (MW)	Power Generation 2015 (MWh)	Cumulative share
CIPREL 4 TAV	Thermal	Dec-2015	111	11,911	0,1%
AZITO TAV	Thermal	Apr-2015	296	662,430	7,8%
Ciprel 4 TAG10	Thermal	2013	111	613,788	15,0%
Aggreko TAG	Thermal	2013	52	438,390	20,1%

5					
Aggreko TAG4	Thermal	2013	48	384,871	24,5%
Total			**618**	**2,111,390**	**24,5%**

b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET-\geq 20\%}$);

AEG_{total} = 8,607,864 MWh and the set of power capacity additions in the electricity system that comprise 20% of the system (i.e. 1,721,573 MWh in 2015) and that started to supply electricity to the grid most recently corresponds to a total set of **$AEG_{SET-\geq 20\%}$ = 1,726,519 MWh**.

c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

The set of power units that comprises the larger annual generation is **$SET_{5\text{-units}}$ > $SET_{\geq 20\%}$.**

Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin.

As none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, thus SET_{sample} is used to calculate the build margin.

Calculation of the build emission factor:

The build margin emission factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, is calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

EGm,y	is the net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
EFEL,m,y	is the CO2 emission factor of power unit *m* in year *y* (tCO2/MWh)
m	are the power units included in the build margin
y	is the most recent historical year for which power generation data is available.

According to the "Tool to calculate the emission factor for an electricity system", the CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) should be determined as per the guidance in step 4 (a) section 6.4.1 for the simple OM, using options A1, A2 or A3, using for *y* the most recent historical year for which electricity generation data is available, and using for *m* the power units included in the build margin.

For the proposed project, option A1 is chosen to calculate the CO2 emission factor. The emission factor is determined as follows:

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{m,y}}$$

Where:

FCi,m,y	is the amount of fossil fuel type *i* consumed by power unit *m* in year *y* (Mass or volume unit)
NCVi,y	is the net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/ mass or volume unit)
EFCO2,i,y	is the CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)
EGm,y	is the net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
m	are all power units serving the grid in year *y* except low-cost / must-run power units
i	are all fossil fuel types combusted in power unit *m* in year *y*
y	is either the three most recent years for which data is available at the time of submission of the CDM-PDD (ex-ante option) or the applicable year during monitoring (ex-post option)

EF_{BM} = 0.5840 t CO2/MWh

Step 6: Calculate the combined margin emissions factor

According to the "Tool to calculate the emission factor for an electricity system" the calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average CM; or
(b) Simplified CM.

The weighted average CM method (option a) is used as the preferred option.

Therefore the combined margin emission factor (*EFgrid,CM,y*) is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times \omega_{OM} + EF_{grid,BM,y} \times \omega_{BM}$$

Where:

W_{OM} is the weighting of operating margin emissions factor (%)
W_{BM} is the weighting of the build margin emissions factor (%)
$EF_{grid,BM,y}$ is the Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$ is the Operating margin CO_2 emission factor in year y (tCO_2/MWh)

Where the weights W_{OM} and W_{BM}, by default, are 50 % (i.e. wOM = wBM = 0.5) as mentioned in the "Tool to calculate the emission factor for an electricity system" (version 04.0.0) for the first crediting period, and wOM = 0.25 and wBM = 0.75 for the second and third crediting period unless otherwise specified in the approved methodology which refers to this tool.

$EF_{grid,CM,y}$ = 0.6042 tCO_2/MWh

3.2 Project Emissions

Project emissions shall be accounted by using the following equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad \textbf{(2)}$$

Where:

PE_y	=	Project emissions in year *y* (tCO_2e/yr)
$PE_{FF,y}$	=	Project emissions from fossil fuel consumption in year y (tCO_2/yr)
$PE_{GP,y}$	=	Project emission from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO_2/yr)
$PE_{HP,y}$	=	Project emission from water reservoirs of hydro power plants in year y (tCO_2/yr)

Project emissions from fossil fuel consumption ($PE_{FF,y}$)

No project emissions are expected as the project activity only involves renewable electricity generation from the run-of-river hydroelectricity power plant without fossil fuel consumption, and according to para 31 of ACM0002 "for all renewable energy power generation activities, emissions due to the use of fossil fuels for the backup generator can be neglected, hence $PE_{FF,y} = 0$.

Project emission from the operation of geothermal power plants due to the release of non-condensable gases ($PE_{GP,y}$)

Project is hydro power plant hence inapplicable and $PE_{GP,y} = 0$.

Emissions from water reservoirs of hydro power plants ($PE_{HP,y}$)

The power density (PD) is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$

Where:

PD	=	Power density of the project activity (W/m^2)
Cap_{PJ}	=	Installed capacity of the hydro power plant after the implementation of the project activity (W)
Cap_{EL}	=	Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero
A_{PJ}	=	Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2)
A_{BL}	=	Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero.

Installed capacity is 275,500,000 W and expected reservoir area, net of the original river bed[8], is 17,300,000 – 3,522,000 = 13,778,000 m^2 (BNETD topographical analysis, 2014). Therefore the resulting power density is:

PD = 275,500,000 / 13,778,000 = 20 W/m^2 > 4 W/m^2

For hydro power project activities that result in new single or multiple reservoirs and hydro power project activities that result in the increase of single or multiple existing reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoirs, estimated as follows:

[8] According to the proceeds of request for clarification AM_CLA_0049193, the surface of the natural river is not to be considered "flooded surface area", thus the implied Power Density calculation principle relies on the "increased flooded area measured in the water surface". The exclusion of the original river bed surface does not impact the Power Density threshold conclusion as PD would still equal 15.8 W/m^2 otherwise neither would the Highest Water Level (PHE) area of 2,220 ha nor the Exceptional Highest Water Level (PHEE = PHE + 1m) area of 2,970 ha, which would only reduce the PD to respectively 15.8 W/m^2 and 10.5 W/m^2.

According to para 39: "if the power density of the project activity is greater than 10 W/m^2, $PE_{HP,y} = 0$".

Consequently $PE_{HP,y}$ is not monitored.

3.3 Leakage

According to ACM0002 version 16.0, no leakage emissions are considered. The emissions potentially due to activity such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport etc.) are neglected.

3.4 Net GHG Emission Reductions and Removals

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
01/01/2017 – 31/12/2017	351,198	0	0	351,198
01/01/2018 – 31/12/2018	636,222	0	0	636,222
01/01/2019 – 31/12/2019	636,222	0	0	636,222
01/01/2020 – 31/12/2020	636,222	0	0	636,222
01/01/2021 – 31/12/2021	636,222	0	0	636,222
01/01/2022 – 31/12/2022	636,222	0	0	636,222
01/01/2023 – 31/12/2023	636,222	0	0	636,222
01/01/2024 – 31/12/2024	636,222	0	0	636,222
01/01/2025 – 31/12/2025	636,222	0	0	636,222
01/01/2026 – 31/12/2026	636,222	0	0	636,222
Total	**6,077,196**	**0**	**0**	**6,077,196**

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,CM,y}$
Data unit	t CO_2/MWh
Description	Combined margin CO_2 emission factor for grid connected power generation in year y
Source of data	Calculated using the latest version of the "Tool to calculate the emission factor for an electricity system"
Value applied:	0.6042
Justification of choice of	As per the "Tool to calculate the emission factor for an electricity system" step-by-step method described in B.6.1 above. The

data or description of measurement methods and procedures applied	weighted average CM method (Option a) is used: w_{OM} = 0.5 and w_{BM} = 0.5 Côte d'Ivoire national grid is the project boundary of the project.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	Cap_{BL}
Data unit	W
Description	Installed capacity of the hydro power plant before the implementation of the project activity.
Source of data	Project site
Value applied:	0
Justification of choice of data or description of measurement methods and procedures applied	For new hydro power plants, this value is zero.
Purpose of Data	Calculation of project emissions
Comments	This parameter is used to calculate the power density. However calculation of power density is not required for this proposed project activity (no reservoir).

Data / Parameter	A_{BL}
Data unit	m^2
Description	Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2).
Source of data	Project site
Value applied:	0
Justification of choice of data or description of measurement methods and procedures applied	For new hydro power plants, this value is zero.
Purpose of Data	Calculation of project emissions
Comments	This parameter is used to calculate the power density.

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{facility,y}$
Data unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project

	plant/unit to the grid in year *y*
Source of data	Electricity meter(s)
Description of measurement methods and procedures to be applied	This parameter should be calculated as difference between (a) the quantity of electricity supplied by the project plant/unit to the grid, and (b) the quantity of electricity delivered to the project plant/unit from the grid. In case it is calculated then the following parameters shall be measured: (a) The quantity of electricity supplied by the project plant/unit to the grid (225 kV); and (b) The quantity of electricity delivered to the project plant/unit from the grid (33 kV) Meters will be installed at the substation of the hydro power plant to measure directly and continuously the electricity supply to (and, if any, import from) the grid. The metering instruments will be calibrated annually in accordance with manufacturers specifications. Accuracy class of the expected Huyan Weisheng meters (DTSD341-MB3 model) is 0.2
Frequency of monitoring/recording	Continuous measurement and at least monthly recording
Value applied:	581,262 (in 2017, due to progressive commissionning of 5,5 MW turbine from end 2016 + 90 MW from 08/02/2017 after 1-month commissioning & testing period + 90 MW from 21/06/2017 + 90 MW from 19/09/20172017) 1,053,000 (from 2018 onwards)
Monitoring equipment	Electricity meter calibrated as per manufacturer's requirements.
QA/QC procedures to be applied	Cross check measurement results with records for sold electricity
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	The information will be provided monthly by CI-ENERGIES

Data / Parameter	CAP_{PJ}
Data unit	W
Description	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data	Project site
Description of measurement methods and procedures to be applied	Determine the installed capacity based on manufacturer's specifications or commissioning data or recognized standards
Frequency of monitoring/recording	Once at the beginning of each crediting period
Value applied:	275,500,000
Monitoring equipment	-
QA/QC procedures to be	-

applied	
Purpose of data	Calculation of project emissions
Calculation method	-
Comments	This parameter is used to calculate the power density.

Data / Parameter	A_{PJ}
Data unit	m^2
Description	Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data	Project site
Description of measurement methods and procedures to be applied	Measured from topographical surveys, maps, satellite pictures, etc.
Frequency of monitoring/recording	Once at the beginning of each crediting period
Value applied:	13,778,000
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of project emissions
Calculation method	-
Comments	This parameter is used to calculate the power density.

4.3 Monitoring Plan

This monitoring plan outlines the principles which shall be followed in monitoring the parameters listed in section B.7.1. A monitoring manual with detailed procedures will be prepared on the basis of the principles outlined below. The monitoring manual may be updated to reflect that the actual implementation of the project will not deviate from the monitoring plan as presented in this section.

Monitoring of net electricity supplied by the project to the grid

The proposed project activity is connected via a transformer and a 225 kV transmission line to the national grid. The data to be monitored is the net electricity supplied to the grid.

The electricity delivered from Soubré HPP to the national grid will be continuously monitored through metering equipment installed on the project site. The monitoring is based on real-time transmission of the generation data by means of a fully automatic data acquisition system.

Staff will watch the operation status of metering equipments daily on site. Furthermore, designated staff will collect the measured electricity monthly and complete the corresponding record. These records will be checked by the company administrator or supervisor.

Monitoring Organisation

The project operator CI-ENERGIES will take the responsibility of the monitoring plan implementation; CI-ENERGIES will appoint a CDM manager, who will be responsible for the supervision of the monitoring process, the data measuring, collection and recording, QA/QC, audit and reporting.

The staff from technical and financial departments will undertake the monitoring tasks including watching metering equipments periodically, collecting electricity data and completing records, checking and analyzing the data, archiving relevant records, reporting to the CDM manager.

Quality assurance and quality control

The electricity delivered by Soubré HPP to the national grid will be monitored trough metering equipment at the project site. The data will be cross-checked against electricity sales receipt and/or records from the grid for quality control.

Calibration of meters will occur annually according to manufacturers' specifications.

All relevant data records obtained from the monitoring will be kept by the project owner during the crediting period and for at least two years after for DOE's verification.

Verification
It is expected that the verification of the emission reductions generated from the project will be conducted annually.

5 ENVIRONMENTAL IMPACT

Legal context

Environmental Framework Law (Law n ° 96-766 of 3 October 1996 on the Environmental Code) states (Article 39) that "any project which may have significant impact on the environment should undertake a preliminary impact study." Environmental framework law article 7 refers to hydropower in its scope.

Following articles are directly relevant to the project :
- Article 13 refers to the protection of sampling points of water intended for human consumption (given that the water from the city of Soubré can be influenced by management);
- Articles 21 and 22 refers to the need to protect the environment in the choice of industrial sites and article 24 states that "(...) dams, may be subject to an environmental impact";
- Article 51 provides protection areas for the conservation (...) of (...) monuments, sites and landscapes, with reference to Article 54 which states that "It is a list of sites and monuments which protected specific measures to be taken for the protection of architectural, historical or cultural ";

Moreover, the Law 96-894 determined the rules for procedure applicable to study regarding Environmental impact assessment of development project that details procedures to observe for realizing Environmental Impact Assessment. Hydro power plants are quoted under annex I listing of projects for which EIA are requested.

The Office for EIA (Bureau d'étude d'impact environnemental BEIE) is in charge of EIA procedures including i) technical assistance, ii) definition of term of reference for EIA, iii) registration of EIA for approbation, iv) audit and monitoring of measures described under EIA, v) organizing public interviews.

Origin of the impacts
Flooding of the reservoir area: the surface mobilized is 17.3 km^2 (1,730 hectares). This area includes the Sassandra water current and unwatered land, spread over agricultural land (a majority), classified forest area of Kourabahi mountains and some village-way.

Electricity generation regime: the maximum turbine flow is 800 m3/s compared with average intakes of 636 m3/s (reserved flow deducted). The flow transiting Soubré site is already regulated by Buyo flow. The regime of power generation and downstream flows will be closely linked to those of Buyo. Downstream conditions due to the Soubré hydraulic regime are not fundamentally different from those that currently prevail.

Construction and operation nuisances: worksites of such projects are a source of pollution and land encroachment due to facilities hold and construction right-of-access, the presence of a large working staff population, a pull effect of the project on spontaneous migrants and various risks and nuisance from noise, possible damage to the quality of air and water, social and economic impacts.

Impacts on the natural resources and protected areas

- Land impacts: Flooded areas represent about 2,070 ha of land for agricultural use, 840 ha of water area of 60 ha and Sassandra classified forest Mountains Kourabahi.

- Protected areas: The encroachment on protected forest has been minimized. The 60 ha at stake are essentially riparian forest formations, south of the Kourabahi forest, in areas that the satellite image indicated as relatively dense at the time. Faced with widespread degradation of forest resources (estimated at 70% for the forest mountains Kourabahi), partial unclassification could be decided, offsetted by the reclassification of the southern area of the forest that would be isolated by the reservoir and a Sassandra affluent. Management of the classified forest could be backed by a contribution to the implementation of SODEFOR management plan and the enhancement of forest resources.

- Water resources: the impacts associated with water regime of the reservoir are essentially a maximum rise of water during annual flood and water level fluctuations at short intervals. The reserved flow at the spillway is designed to avoid various potential negative impacts, especially the preservation of the Nawa Falls. The decomposition of organic matter in the grip of the reservoir will affect water quality during filling. Deforestation of the reservoir area will mitigate this effect. The proven presence of invasive aquatic plants, especially water hyacinth, should be taken into consideration. Successful experiments on biological control of other reservoirs in Ivory Coast may be utilized on Sassandra, including Buyo dam.

Resettlement

The main objective of the choice of the 152 m level was to minimize displacement and resettlement needs. Assessments led to the estimation of 4,130 persons, or 516 households involved.

Land resettlement will require the following:
- Development of village platforms, opening up and building of acceptable improved housing;
- Transfer of people and goods;
- Preparation of agricultural land, of accesses, support for cultivation according to improved crop management practises;
- Provision of food and/or compensation in lieu of crop losses;
- Construction of social infrastructure at national standards (education, health, water) and places of worship with initial support for the operation, replacement of other public or private facilities;
- Maintaining of socio-economic support means and monitoring and evaluation (10 years a priori) to regain economic conditions at least equivalent to those previously prevailing.

Non-land resettlement, which seems to be a priority for some groups, will take different forms:
- Urban and peri-urban resettlement. Kpéhiri village, which will likely be adapted according to the needs of the project, is a possible site, near the town of Soubré;
- Conversion to fishing activities in the reservoir, for young people (provided that spontaneous immigration of foreign fishermen is managed);
- Conversion towards non-agricultural activities.

Other mitigation measures

- Contribution to the expansion of public drinking water along the river, water treatment plant feeding directly from reservoir rather than by pumping in the water surface;
- Appropriate information measures to prevent spontaneous immigration linked with project announcement.

- Road access improvements, like (i) replacement of the right bank road under construction, (ii) completion of a peripheral road between left bank and reservoir, and (iii) improvement of secondary roads from villages to main roads.

The detailed environmental impact assessment was submitted to the Direction of Environment in February 2015 and approved by ANDE decree n°0078 of August 21st, 2015.

6 STAKEHOLDER COMMENTS

Stakeholder's consultations have been organized following the regulatory Ivorian laws regarding public consultation in the framework of Environmental Impact Assessment. A special care has been considered regarding the information, consultation and participation of stakeholders along the process. A Stakeholder consultation plan has been elaborated and its implementation has been done conjointly by project proponent, Tractebel Engineering France (a consultant company providing technical services to the project proponent) and the National Office for Technical Study and Development (BNETD).

A representative of Designated National Authority of Côte d'Ivoire, Mr Sylvain Amalaman, Environmental Impact Assessment study office chief has been designated to follow closely the implementation of the consultation process and has delivered an environmental license based on the conclusion that consultation requirements have been fulfilled.

Objectives of consultation's process have been defined into the consultation plan as follows[9]:

- Inform and communicate about social and environmental impacts of the project;
- Provide with information useful and easily understandable by people impacted by the project;
- Provide the opportunity to local stakeholders impacted by the project to provide with their opinion and to participate to the resettlement of communities displaced;
- Take into account the opinion expressed;

Stakeholders impacted by the project that will be consulted are all physical or moral person impacted directly or indirectly by the project (the power plant and associated equipment's including the transmission line), positively and/or negatively located within the study zone defined in the environmental impact assessment plan.

The study zone from which people have been consulted includes all territory where a project impact, direct or indirect is expected. It includes:

- The power plant of Soubré, the electricity production site, the dikes, the water canals;
- The reservoir area;
- The others construction zone for the needs of the site;
- Extension of the current electricity station, new transmission line and substations;

The study zone includes:

- The periphery of the tank;
- The downstream and upstream watershed;
- The urban commune of Soubré;
- The resettlement zone of displaced populations.

Characteristics and identification of stakeholders consulted for the project are as follows:

- Populations and groups of population in the cities, villages and camps impacted by the project i.e.:
    - Villages and camps located within the area of the study zone defined above;

[9] Consultation plan is provided to DOE.

  - Villages and camps located close to the transmission line corridors;
  - People who own land and property on which the project will have impacts;
  - People that use agricultural and or natural resources;
  - Migrants attracted by the project that expect to get a job;
  - Local populations that have special links and rights with the land;
  - Neighbouring villagers that can provide local workforce;
- National and local administration authorities:
  - Mr prefect of Nawa region, prefect of Soubré's department;
  - Sub-prefect of sub-prefecture of Soubré and Oupoyo;
  - Soubré's municipality's chief;
  - Environmental Authorities from the government including DNA;
  - Traditional representatives including villages' chiefs, religious chiefs and tribes' chiefs;
- Institutions:
  - Cooperatives, local organisations, NGOs and other groups;
  - Commercial and industrial enterprises;
  - Media;
  - National Park of Taï (PNT);

The chronology of Soubré HPP stakeholders' consultation process included:

- Preliminary consultations conducted as early as August 2-16, 2010, with regional and national stakeholders in Abidjan and Soubré, as well as local orientation meetings in Kopéragui and Nyapoyo villages.

- Further interviews held in April 2011 with:
  - A number of neighbor villages from both banks of the river, selected based on 3 main criteria: historical significance (Kopéragui, Kpéhiri), role in foreign communities' implantation (Gnamangui, Nyapoyo, Obrouayo) and geopolitical situation (Gueyo, Mayo-Soubouo),
  - Local representatives of public technical services such as ANADER, SODEFOR, the Water & Forests committee, Soubré health district
  - Resource persons from agriculture cooperatives, women groups, youth associations, fisheries and foreign communities.

- An official public meeting in Soubré with local authorities and local stakeholders on January 30th 2013 to launch the final consultation process.

- First series of consultations within all villages that will be impacted by the project, organized conjointly by national institutions (development agencies, TEF-BNETD and environmental ministry representative) and the project proponent (CI-ENERGIES) from 13th to 18th of March 2013, with the following objectives:
  - Inform stakeholders regarding the project and its project proponent;
  - Inform stakeholders regarding studies/surveys that will be conducted before the project's construction;
  - To create and maintain contact between local authorities, traditional chiefs and the project proponent;
  - To collect views and opinions regarding project design and implementation.

- Second series of consultations organized from 15th to 21st of May 2014, based on provisional study results including:
  - Modalities proposed for resettlement of displaced population for the project;
  - Description of project's impacts and mitigation planned to reduce and compensate social and environmental impacts;

Procedure followed to invite stakeholder comments at the final consultation process launch meeting

The launch meeting of overall consultation process consisted of a public meeting held on 30/01/2013 at Soubré's cultural center, Côte d'Ivoire with the following identified stakeholders[10]. In order to make sure each locality was represented, every locality was assigned a representative.

Local stakeholders were invited through mailing addressed to:

- CI-ENERGIES TEF
- ANDE & DNA representatives
- BNETD
- Local committees
- Neighbour institutions and industries
- Media
- NGOs
- Housewives
- University's professors and students
- Energy experts
- Priests Christian church and Muslim communities representatives
- Small and Medium Enterprise representatives (restaurants…)
- Communities' representatives (schools)

At the meeting, information leaflets have been distributed to participants. During the whole week before the consultation, a broad communication has been done including invitations sent to main stakeholders (sub-prefect of the region (Soubré, Okrouyo, Grand Zatry, Gueyo, Dabouyo, Buyo, Méagui and Oupoyo), to central administration directors and service's chiefs as well as traditional local chief through formal invitations. Moreover, communication banners have been posted on the ceremony's location to invite people to participate (please see picture below). Eventually, people have been hired to publicly announce the organization of the consultation in Soubré and its neighbouring villages.

To illustrate the massive participation, please see pictures and the list of attendance. For the meeting organization, project proponent rent height transportation vehicles and 500 chairs. Transportation from neighbouring villages has been organized by project participant and helped to reach massive participation. 410 participants have been recorded on the attendance lists. Below table provide with estimation of people per category:

Table 5 – Breakdown of public consultation meeting attendance

Type	Number	Percentage (%)
Public administration	48	12
Private administration	26	6
Elected people	7	2
Traditional Authorities	28	7
Population	298	72
NGO	3	1
Total	410	100

Program of the public meetings

Venue	**Cultural Center, Soubré**

[10] List of attendees has been provided to DOE.

Date	30/01/2013
Attendance	410 people
	(original attendance sheets available to the DOE)
Language	French
Meeting Objectives	- To present project's history and implementation steps
	- To locate the hydro power plant project
	- To present expected environmental and social impacts of the project
	- Present with environmental impact assessment study plan
	- To collect with questions and comments
Meeting procedure	- Introduction by Prefect of Nawa's region
	- Presentation of project proponent and consultants
	- Presentation of environmental impact assessment process and consultation process by ANDE (National Authority for the Environment and DNA)
	- Presentation of technical study and implementation plan
	- Questions and answers from participants
	- Conclusion

Figure 4: Picture of the participation table with municipality chief, experts and Prefect

Figure 5: Picture of sub-prefects and local authorities

Figure 6: Picture of traditional authorities

Figure 7: Picture of local population ouside the meeting room under the big top installed

Last series of consultations

The second series of consultations was based on the first study's results and elaborated resettlement plan as well as mitigation plan. Various options were presented to be discussed with local stakeholders in order to take into account comments and opinions of local stakeholders.

Sub-prefecture	Locality	Date (year 2014)	Time	Location	Targeted stakeholders
SOUBRE OUPOYO	Local Authorities, Technical services (Agriculture, Water and Forests, Health, Education, Urbanism, etc.)	Thursday 15 May	9h-12h	Sub-prefecture of Soubré	Administration, local authorities, technical services…
OUPOYO	GNAMAGUI ILE DE GNAMAGUI	Friday 16th May	8h30-11h30	GNAMAGUI	Local Population and Traditional
	AMARAGUI BAFLATCHETOU	Friday 16th May	12h30-15h	AMARAGUI	
	PETIT-TIEME				
SOUBRE	KOPERAGUI	Saturday 17th May	9h-12h	KOPERAGUI	
	KOUAMEKRO	Saturday 17th May	13h-16h	KOUAMEKRO	
	KPEHIRI	Monday 19th May	9h-12h	KPEHIRI	
	GALEA 1	Monday 19th May	13h-16h	GALEA 1	
	GALEA 2				
	MAYO	Tuesday 20th May	9h-12h	MAYO	

	GUEYO	Tuesday 20th May	13h-16h	GUEYO	chief
	SAYO KONANKRO ADINKRO	Wednesday 21st May	9h-12h	SAYO	
	DIOULABOUGOU/ SOKOURA/MAYO	Wednesday 21st May	13h-16h	DIOULABOUGOU	

Last but not least, a public survey has been conducted with National Authority for the Environment (ANDE), especially for fulfilling with regulatory requirements to present final results of this consultation process.

Several questions were raised after the presentation and answered by project participants. All questions were made in French apart one in local language Malinké.

Figure 8: Participants asking questions

Questions were mainly related to the below topics:

- Measures to protect the classified forests and mitigate the impacts of the project;
- Identification of people potentially impacted by the project;
- Compensation modalities of goods impacted (real estate, cultures, lands, economic activities…);
- Compensation period;
- Potential relocation sites for villages and camps that will be displaced;
- Project benefits for the local population, including electrification of neighbouring villages, construction of schools and infrastructure and health center;
- Situation of lands where owners were not identified;
- Protection measures of the Kourabahi Mount.

Answers and suggestions are provided below:

Soubré - Compilation of the Comments Received	
Local stakeholder hearing held on January 30th 2013 in Soubré	
Questions asked	**Answers provided**
Mme Kone Fatouma (NGO Femuna) She would like to know measures taken to avoid classified forests during the project's implementation. **Mr Gnahore Simplice** He would like to know the compensation method that will be used. **Mr Aloure** He would like to know the economic benefits of the power plants on the Soubré's city.	**Mr Pigeon** He reassures populations that measures for forests protection and conservation will be implemented. **Mr Sabenin** He informs stakeholders that more information will be provided directly to people concerned. **Mr Kassi** He informs stakeholders that Soubré's electrification measures are part of the mitigation plan suggested by

Soubré - Compilation of the Comments Received	
Local stakeholder hearing held on January 30th 2013 in Soubré	
Questions asked	**Answers provided**
	consultant.
Mr Kouadio Gildas He would like to know recruitment modalities of local workforce.	**Mr Kassi** He indicated that in collaboration with local authorities, SINOHYDRO, enterprise in charge of project implementation will proceed to hiring campaign destinated to youngers.
Mr Ghede Bada He wants to know more about the terms "assigns" and "operators" for land tenure.	**Mme Tagro and Mr Pigeon** They precised that epidemiological studies will be conducted.
Mr Zinon Gbi Jean He would like to know compensation period of planters.	**Mr Kassi** He indicated that studies over aquatic will be conducted and an hospital will be constructed at the workforce city level.
Mr Assiey Kouamé Evariste He would like to know if owners of economic activities will be taken into account in the compensation plan.	**Mr Kassi** He precised all type of people will be taken into account from all category.
Mr Sangare Lacina He would like to know the location of resettlement of plantors.	**Mr Pigeon** Only the study that will be realised will help determined the location of planters resettlement.
Doctor Kpaho Bernard He worries about the regional hospital that miss equipments	**Mr Kassi** He reassures participants that measures will be taken to rehabilitate the CHR. Mr Kassi affirmed that everything will be done in order to secure the dam.
M Lokoi Jean-Paul He would like to know what are the measures taken to mitigate future impacts of the project.	**Mr Bocquet** He reassures population that no change regarding the flow of the river despite the project implementation.
Mr Kouamala Amara He would like to know how project proponent will deal with people that were not identified at the previous land tenure census.	**Mr Sabenin** He indicated that land tenure situation will be updated.
Mr Kone Mamadou He would like to know if a monitoring committee has been set up.	**Mr Bocquet** He affirmed that no committee have been put in place yet and Mr Amalaman indicated will take engagements regarding monitoring of mitigation measures decided.
Mr Djikpa Sébastion He would like to know the projects's benefits regarding the sale of energy including over the local population of Soubré.	**Mr Kassi** He indicated that electricity price in Soubré will be the same as price of other city despite the power plant due to the fact that it is the state of Côte d'Ivoire that determines the electricity consumption cost.
Mr Esmel Akpa He would like to know more about compensation modalities for culture.	**Mr Kassi** He precised that compensation will be based on surface area and type of culture.
Mr Gokui Emmanuel He would like to know to who will be surrender	**Mr Kassi** He affirmed that only the workforce city will be part of the heritage of Soubré's city.

Soubré - Compilation of the Comments Received	
Local stakeholder hearing held on January 30th 2013 in Soubré	
Questions asked	**Answers provided**
the workforce city.	
Suggestion of the population	
Participants	**Project proponent**
Mr Koffi Kouamé Bernard He suggested to think about the streets of the city including the repavement of the main streets **Mr Yao Léla Modeste** He recommends to strengthen the school infrastructures. **Mr Dissia Mathurin** He suggested to take into consideration the village of Galéa located close to the city of managers of the project. **Mr Vaka Kplékpeule Noël** He provided a document listing the demands of the population to the project proponent's team. **Deputy Nedro** He encourages the population to provide all information to the project's team in the framework of data collection regarding land tenure. **Mr Zobre** He suggested to strengthen the security process for the power plant construction with the construction of a police station and public lighting of the city. **Mr Konate Yaya** He recommends to associate if possible the agricultural agents for delimitation of lands.	On a general manner, regarding suggestion proposed by the population, Mr Kassi precised that: ✓ Streets of the city and schools infrastructures will be reinforced and new one will be constructed. It is already foreseen in the project implementation plan. ✓ Impacted population will provide with their requests directly to the project proponent experts.

The stakeholders welcomed the Soubré HPP project development and mentioned that it would definitely improve the socio-economic situation of the affected local communities such as job creation, development of the region, promotion of social activities such as rehabilitation of existing infrastructure (routes, schools, medical centre, water irrigation etc.), social welfare and increasing living standard etc.

The stakeholders raised precised concerns regarding modalities of compensations, scarcity of land that raise the problem of availability of land for cultivation, use of local workforce for the project construction, construction and reinforcement of current infrastructure, risk for health and security at the construction site.

As response to the concerns raised by the local population in-depth study has been conducted and results have been presented during the second series of consultation including 11 consultations at the Soubré's prefecture and 10 consultations within the neighbooring cities between 15 and 22 May 2014. All

concerns are taken into consideration into final environmental impact assessment report and presented in details in the environmental impact assessment report[11].

Regarding security at the construction site, the project developer implemented the following measures:

- Training of employees for security at work
- Implementation of national and international security norms
- Provision of medical assistance.

Neither negative comments nor opposition opinions were received from the consulted public and the personal interviews. Besides, the project initiative was widely praised during the questions & answers closing the public consultations, both for its innovative socio-environmental characteristics and for its local employment potential.

As guaranteed to all participants, all recommendations were humbly and responsibly taken into account and included in their Project development and monitoring plan including full information availability.

Mechanisms for ongoing communication

Continuous inputs & grievance expression will be welcome through several methods, including:

- Reaching out to the project proponents (as per section 1.3 contact details, in writing, calling or physical meeting)
- Conveying comments or claims through the local authorities and the national environmental body (ANDE)

In return, the project proponent ensures with its local offices and presence that permanent contact with stakeholders, neighbors and public be guaranteed, under the regular control of Soubré officials.

[11] Provided to DOE