Project design document form
(Version 11.0)

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION	
Title of the project activity	Mwenga Hydro Power Project
Scale of the project activity	☐ Large-scale ☒ Small-scale
Version number of the PDD	18
Completion date of the PDD	24/11/2020
Project participants	Mwenga Hydro Limited (United Republic of Tanzania) Swedish Energy Agency (Sweden)
Host Party	United Republic of Tanzania
Applied methodologies and standardized baselines	AMS-I.F: Renewable Electricity Generation for Captive use and Mini Grid (version 3.0) AMS-I.D: Grid connected renewable electricity generation (version 18.0) Standardized baselines – Not Applicable
Sectoral scopes	Sectoral scope I: Energy industries (renewable / non-renewable sources)
Estimated amount of annual average GHG emission reductions	**10,695 tCO_2e**

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The current small scale project is a 3.486 MWe run-of-river hydro power plant from the Mwenga river, located in Mufindi District of the Iringa Region in Southern Tanzania. The project has been developed by Mwenga Hydro Ltd (MHL) and since 2012 generates electricity to meet the (back up) electricity requirements of the nearby Tea Processing Factories [1] and a number of local communities along the route of the various power lines, as well as exports any surplus electricity to the Tanzanian power grid.

Being renewable energy project with capacity as 3.486 MWe, the project activity qualifies as micro scale project activity and Type I: Renewable Project Activity. Project activity involves two components i.e Component # 1: Production and transport of electricity to meet the requirements of the Processing Factories (Methodology AMS I.F) and Component # 2 Production and transport of electricity by the hydropower plant to a point where it can be exported to the Tanzanian National Grid (Methodology AMS I.D). These components are discussed in section B of PDD.

The project has been constructed a greenfield project and no power plant existed at the site prior to implementation of the project. The processing factories were (and still are) mainly supplied with electricity from the Tanzanian grid and the local communities used diesel and kerosene for their power needs. The Tanzanian grid is mainly supplied with electricity from hydroelectric and thermal power plants. The baseline scenario for the project is the same as the scenario existing prior to implementation of the project.

As a result of the project activity, processing factories are able to displace around 2,910 MWh/year of electricity from the national grid with renewable electricity. Initially 2,600 households located in surrounding rural villages are also be connected to an electricity grid for the first time and benefit from access to a modern and clean form of energy. It is anticipated that the rural network will further grow in an organic manner towards other neighbouring villages over time.

The local communities used diesel and kerosene for their domestic power and lighting needs. However, because the current baseline usage per household is so low, and essentially impossible to validate because of poor or non-existent recordkeeping among currently off-grid rural village residents, their estimated annual usage of around 2,537 MWh/year is excluded from the emissions reduction calculations.

Electricity of approximately 18,553 MWh/year are to be sold onto the national grid through TANESCO, the national electricity utility, and are thus enable the displacement of electricity which would otherwise be obtained from fossil fuel power plants connected to the grid as well as fossil fuel plants that are likely to be constructed in the future.

It is estimated that the project enables 24,000 net MWh of electricity to be generated per year and resulting in emissions reductions estimated at 10,695 tCO_2e/yr and 74,865 tCO_2e over the second seven-year crediting period, when accounting only for the power sold to processing factories and TANESCO, totalling estimated 21,463 MWh/year at a grid emission factor (GEF) of 0.4983 tCO_2e/MWh.
Details on metering capabilities and practices appear in Section B.7, below.

The run–of–river hydro power scheme diverts some of the water from the main river course and run the diverted water through a 340 m long steel pipe (penstock) to the power house. A Francis type turbine is used to generate electricity, from a water head of 60 metres and a flow of 7m^3/s

[1] The project activity may supply electricity to one or more processing factories. The processing factories will be using either electricity from national grid (baseline scenario) or consuming electricity generated from the project activity (as back-up or part-time supply, in case of national grid failure or grid instability) at their own discretion.

(cubic meters per second) to generate approximately 3.486 MWe. This power is generated at 6.6kV and transformed up to 33 kV for evacuation into the grid.

The major activities which undertaken during project implementation (construction) included the following:

- Construction of a hydropower generation plant on the Mwenga River (completed late August 2012)
- Construction of a power distribution network to transport electricity from the hydropower plant to:
    - Currently few villages located in the project region (Vikula, Ihalimba, Ugesa, Nundwe, Wamimbalwe, Usokami, Igomtwa, Kibengu, Igeleke, Ilogombe, Kipanga, Mapanda ,Chogo, Uhafiwa, Ihimbo, Ludilo, Ilasa, Mlevelwa, Ikanga, Mpanga, Igoda, Luhunga, Ikaning'ombe, Iyegeya , Mkonge, Igoda, Ipafu, Kilosa, Ihanu, Lulanda, Ibwanzi, Nandala, and Isipii village). (The network was built in 2 stages (between 2010-2016)
    - The processing factories (applicable to project activity)
    - The Tanzanian National Grid, TANESCO (completed early August 2012)

Since the initial validation site visit in October of 2011, construction of the plant has been completed, the plant was commissioned on 1 September, 2012, and begun to export electricity to TANESCO and different Tea Processing factories.

How the project reduces Greenhouse Gas Emissions:
As indicated above, the project leads to a reduction in CO_2 emissions by displacing Electricity that would otherwise be obtained from fossil fuel power plants connected to the grid.

Contribution to Sustainable Development:
The Project activity meets the Tanzanian Sustainable Development requirements, as shown in Table A1.

Table A.1. Mwenga hydro project characteristics comparing to the DNA requirements

TANZANIA DNA REQUIREMENTS	THE CASE OF MWENGA HYDRO
The CDM project activity should be consistent with National Strategy for Growth and Reduction of Poverty, 2005 and that it should aim at poverty alleviation by generating additional employment and improving standards of living.	The project is in line with the National Strategy for Growth and Reduction of Poverty (NSGPR), 2005, that aims at putting emphasis in rural development, especially creating access to modern energy services to the rural majority in the country. The project also, through provision of electricity power to the surrounding communities, helps in poverty reduction by generating additional employment to the community directly working in the power provision facilities and indirectly through the productive end-uses in micro/small enterprises supported by the generated power. The project also improves standard of living of the communities around by improving social services.
The CDM project activity should bring an additional financial investment and should be consistent with the Vision, 2025 for Tanzania mainland.	The project activity brings in additional financial investment in the form of developer equity, commercial capital and from the sale of CERs. The project is also consistent with the Vision, 2025 of Tanzania mainland, which aims at reducing the current extreme poverty and hunger and enhancing quality of life for all

	Tanzanians.
The project activity should be consistent with the Environmental Management Act (EMA), 2004 and its EIA and Audit Regulation, 2005. The project should reflect resource sustainability and resource degradation if any, impact on biodiversity, human health and other environmental issues.	The project activity is consistent with the Environmental Management Act (EMA), 2004 and its EIA and Audit Regulation, 2005. The project does not have any impact on biodiversity, human health and other environmental issues.
The CDM project activity should lead to transfer of environmentally benign and sound technologies to Tanzania.	Despite the fact that Tanzania is endowed with substantial hydro resources, especially in the southern highlands where this project is located, little has been done to tap this resource. Installation of the Mwenga hydro plant will add value to awareness creation, skills transfer and technology transfer to the local people.

The project currently provides electricity to surrounding rural communities, located along the route of the 270 km power line (including the associated spurs) (the network expands organically over time, subject to funding). These villages connected had no grid-connected electricity access, and only limited access to electricity through diesel gensets. Lack of electricity deprived these villages of the amenities provided by power, including lighting (currently met in many cases by Kerosene), communications, information, etc. Social services were also limited and substandard in the absence of electricity, resulting in poor education and poor quality health care. Lack of modern forms of energy therefore weighs down the communities' development prospects on several counts. The project activity thus constitutes a vehicle for local communities to improve their wellbeing, and does so in a sustainable manner.

A.2. Location of project activity

United Republic of Tanzania

Region/State/Province: Iringa Region in southern Tanzania

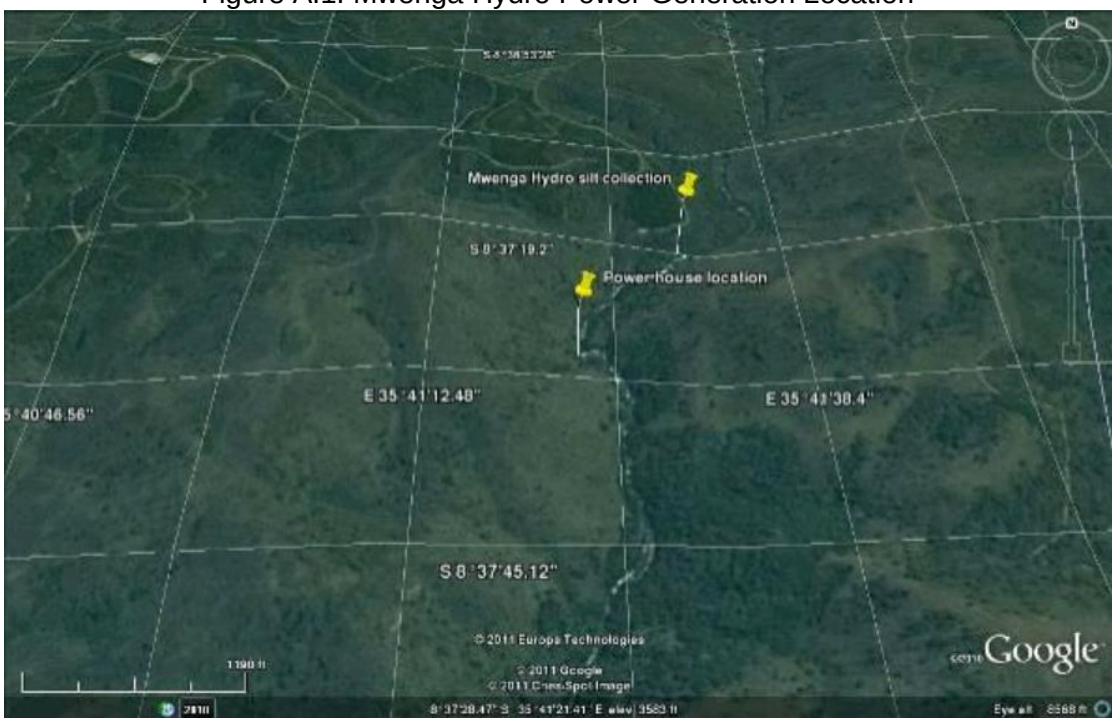
City/Town/Community: Mufindi District

Physical/Geographical location

The hydro power plant site is located on the Mwenga River, at approximately 8°37'18.63" S 35°41'30.54" E for the weir and silt collection, and approximately 8°37'27.07" S 35°41'22.82" E for the powerhouse. The site is about 55km by dirt and gravel road from the MTC headquarters, which in turn is located some 30km by dirt and gravel road from the Mafinga Junction, which is the nearest paved road. Access to the site is available only by dirt and gravel roads in isolated mountainous terrain.

There is a small unpaved airstrip approximately 52 km by air from the site, but the site is still only accessible from there by dirt and gravel roads or by foot. The nearest public airport is the Iringa airport, which is approximately170 km away by road. The nearest train station is at Makambako, about 100 km by air, and 160 km by road. The railway line—without a stop—passes within 20km of the site through the village of Mpanga, but the project site is accessible from there only by foot.

Figure A.1. Mwenga Hydro Power Generation Location



A.3. Technologies/measures

The small-scale project is a 3.486MW (at generator terminals) run-of-river hydro power plant.
The project has been developed as a greenfield project and no power plant existed at the site prior to implementation of the project. The processing factories were supplied with electricity from the Tanzanian grid and the local communities used diesel and kerosene for their power needs. The Tanzanian grid is mainly supplied with electricity from hydroelectric and thermal power plants. The baseline scenario for the project is the same as the scenario existing prior to implementation of the project.

Technical Details

Hydrology: Considerable hydrological data have been recorded since 1957 by various entities, including the Tanzania Ministry of Water and MTC. According to the feasibility study conducted by Niham Shand in July 2008, a flow rate of 7 m^3/s is exceeded 70% of the time (on an annual basis)[2].

Flow and the power potential: Based on a flow of 7m^3/s, using the design recommended in the feasibility study, the estimated annual power generation of 24,000 MWh can be achieved as given in Table A.1[3], for a plant load factor of 82.8%, which has been determined in accordance with the ex-ante definition of the plant load factor detailed in EB 48 Annex 11, paragraph 3(a), as substantiated in the accompanying letters in Appendix 8 to this document.

Table A.2 - Estimated Annual Electricity Generation @ 7 m^3/s

	MWh/year
Maximum generation	29,000
Maintenance Outages	0
Unplanned Outages	450
Unplanned Outages	1,159
Inefficiencies (11.7%)	3,377
Average Generation	24,000
Plant Load Factor	82.8%

Justification for each figure:
Maximum generation: The maximum output at the generator terminals at 7 m^3/sec is 3.486 MW. However, in accordance with the feasibility study dated July 2008, 10 days have been set aside where it is anticipated that flows may fall below the required levels for operation, and 240 hours have therefore been excluded from the maximum output calculation. This results in a maximum of 8,520 operating hours at flow of >= 7 m^3/s. 3.486 MW at 7 m^3/s * 8,520 = 29,700 MWh. To be conservative, this figure has been rounded down to the nearest 1,000 MWh, to 29,000 MWh/year. This is the figure used as the maximum plant output to calculate the plant load factor.

Maintenance outages: As noted above, the 7 m^3/s design is expected to result in an average of more than 10 days each year during which the flow is insufficient for power generation. This provides an opportunity to undertake planned maintenance, therefore there is no loss of generation on account of the maintenance outages. Unplanned outages are expected on the other hand to occur during periods of maximum flow (during the rainy season) and maximum electricity generation.

Unplanned outage hours are based upon a feasibility study conducted by a third-party engineer in July of 2008.

Line losses are also based on this same third-party feasibility study.

Inefficiencies were considered to account for plant downtime and reduced output resulting from grid load shedding or TANESCO outages that would require switching the plant in and out of island mode. Furthermore, when running in island mode, the plant has a lower output. To be conservative, this inefficiency figure was adjusted upward to reduce the average generation figure to the lowest figure acceptable to support commercial financing.

Thus, Average Generation (24,000) = Maximum generation (29,000) – Maintenance Outages (0) –

[2] Mwenga River Hydro Project Feasibility Study Report Niham Shand, July 2008

[3] This corresponds to net generation output detailed in the financial model submitted to banks to justify financing.

Unplanned Outages (450) – Line Losses (1,159) – Inefficiencies (3,377)

Plant Load Factor = Average Generation (24,000) / Maximum Generation (29,000) = 82.8% (rounded to nearest 0.1%).

Project design:
The project is a run-of-river scheme diverting water from the main river course to a small water channel/ headrace running 70m to the forebay tank, where water flows through a 340m long steel penstock pipe to the power house, and finally discharged back into the river via a draft tube and tail race. A single unit Francis turbine is installed in the powerhouse. The water drops a gross head of 60m from the forebay tank to the turbine.

Design Details of Project Components: Power Generation Facilities
The power generation facility consists of a diversion weir, a de-silting chamber, approximately 70m of a headrace conduit and a 340m long steel penstock leading to the powerhouse, which is to be located immediately above the return point to the Mwenga River. The river between the extremities of the scheme includes a steep waterfall and a series of small rapids. The headrace canal effectively bypasses this normal watercourse and facilitates a controlled drop of approximately 60m through the penstock.

Diversion Weir/Weir Structure
The location of the diversion weir is on a natural rock outcrop above the waterfall. An edge in the rock, some 50m upstream of the falls, forms a natural weir with a solid foundation. This is ideal for the construction of a concrete weir. The valley sides at this position are relatively steep, facilitating a narrow and compact structure. A 2.5 m high concrete gravity weir structure has been constructed on top of the natural rock to allow for adequate water draw-off facilities. A tongue wall extends into the hillsides at each end of the weir to provide for seepage cut off around the structure. The total crest length is approximately 25m. Draw off facilities take the form of a top entry inclined and grated channel feeding the headrace.

Headrace and Conduit
The sides of the valley at the level of the headrace are in the order of 1.5H:1.0V and steeper. Based on observed road cuttings in similar areas, a cutting into the hillside to facilitate the conduit is likely to be constructed. A 70m long (2 m x 2 m at a slope of 1V:750H) low-head closed conduit has been constructed to convey water from the weir to the top of the penstock. It allows for soil, debris, and storm water flow to pass over the conduit and further provides the benefits of reduced excavation compared to an open canal. The conduit is graded to match the hydraulic losses at the design flow and take a gently winding route around the hill to the headrace. The conduit has been formed of in situ concrete.

Inspection manholes has been provided at regular intervals, built up above the small head expected in the conduit. It is expected that the conduit is shallowly excavated. Where necessary, adequate cross drainage, at regular intervals to prevent buoyancy, has been provided. Drainage take the Inspection manholes are provided at regular intervals, built up above the small head expected in the conduit. It is expected that the conduit has been shallowly excavated. Where necessary, adequate cross drainage, at regular intervals to prevent buoyancy, is provided. Drainage will take the form of a no-fines blinding layer and or wick drains on the up-slope side of the structure.

Joints has been provided by sealed PVC water bar at 6m intervals. The closed conduit operates as a low-pressure conduit and different gradients make any significant difference if they are flatter than the energy gradient. The following is suggested based on a target flow velocity of 1.5m/s and following the energy grade line.

Sediment Trap
A sediment trap has been constructed that slows the flow rate of the water down to 0.25 m/s to allow settling to occur within the tank. The tank has been equipped with flushing facilities to drain

accumulated debris. A spillway has been built into the side of the sediment tank in order to cater for varying powerhouse operation conditions which transmit surges through the penstock to the canal. These surges drain safely over the spillway back to the nearby river.

Penstock

The 340m-long penstock has been constructed from 1.5m diameter buried steel pipes, provided with regular anchor blocks to ensure stability on the steep slope. This layout is suitable in view of the remoteness of the site for ease of construction.

Powerhouse Flow Requirements

For run-of-river type hydropower projects where stream flow passes through without much modification, specific flow release requirements are generally not required. However, this specific scheme diverts a portion[4] of the water from the Mwenga River which reduces flow over a stretch of some 0.45km of waterfalls and rapids. The length of river, which can potentially be deprived of flow during dry season is of the order of 450m and consists mainly of a high waterfall and some subsequent small rapids. In determining the appropriate installed capacity for the turbines, 2.5m^3/s was set aside initially for maintenance of the river during periods of low flow.

After some testing and environmental monitoring, the final Water Use Permit was issued with a requirement of 1m^3/s environmental flow for maintenance of the river during periods of low flow.

Electromechanical Equipment

A Francis type turbine has been implemented for the project. This type of turbine is capable of operating at flow rates as low as 40% of their rated flow. A compact turbine system is envisaged. The turbines provide significant benefits in terms of space usage, efficiency, ease of installation and operation.

Key technical characteristics of the technology applied in this project are given in Table A.3

Table A.3.: Technical characteristics[5]

Hydrology	
Design flow	7 m^3/sec
Design Head	60m
Turbine	
Type	Francis
Number of units	1
Power (turbine axis) @ 100% flow	3.612MW[6]
Power (at generator Terminals)	3.486 MW[7]
Generator	
Type	Synchronous 3 Phase
Interlinked Voltage	6.6 KV
cos φ	0.9
Frequency	50 Hz

Civil Structures

The site for the powerhouse is on the inside of a curve of the Mwenga River where a slight flattening in the terrain is evident. Earthworks have been required to provide a platform to construct

[4] From the flow data of Mwenga River the flow of 7m^3/s will be insufficient only in three months i.e. October, November & December. The volume of water to be diverted to the power channel is 7m^3 running every second. From the EIA conducted it is recommended that since there is no specific In-stream or Environmental Flow Requirements (EFR) defined for Tanzania, it is proposed that 10% of the observed annual minimum flow be left flowing to the normal river course which is 0.45m^3/s as indicated in pg 130 of the Environmental Impact Statement, EIS report.

[5] Serman Energy S.RL. Technical Specification for Hydroelectric Turbine and Generator Package. Mufindi, Iringa District, Tanzania.

[6] Maximum instantaneous power estimated at 3.850 MW after operational testing at very high water flow conditions.

[7] Maximum instantaneous power measured at 3.750 MW after operational testing at very high water flow conditions.

the powerhouse facility and transformer yard. The powerhouse, with a floor plan of 140m2, is a conventional concrete portal type structure, with brick infilling and metal sheet roofing, housing the turbine, generator and the operational control room.

Access

Existing access roads to the power house site consist of dirt and gravel roads that presently provide access to the coffee plantations near the site and that are used for transportation of crops and equipment by 8-ton trucks. The final 10km is a smaller track, without gravel wearing course, which has been improved to provide more permanent access to the site.

Project Layout

Figure A2 below presents the layout for the main project components.

Figure A.2. Mwenga Hydropower Project Layout

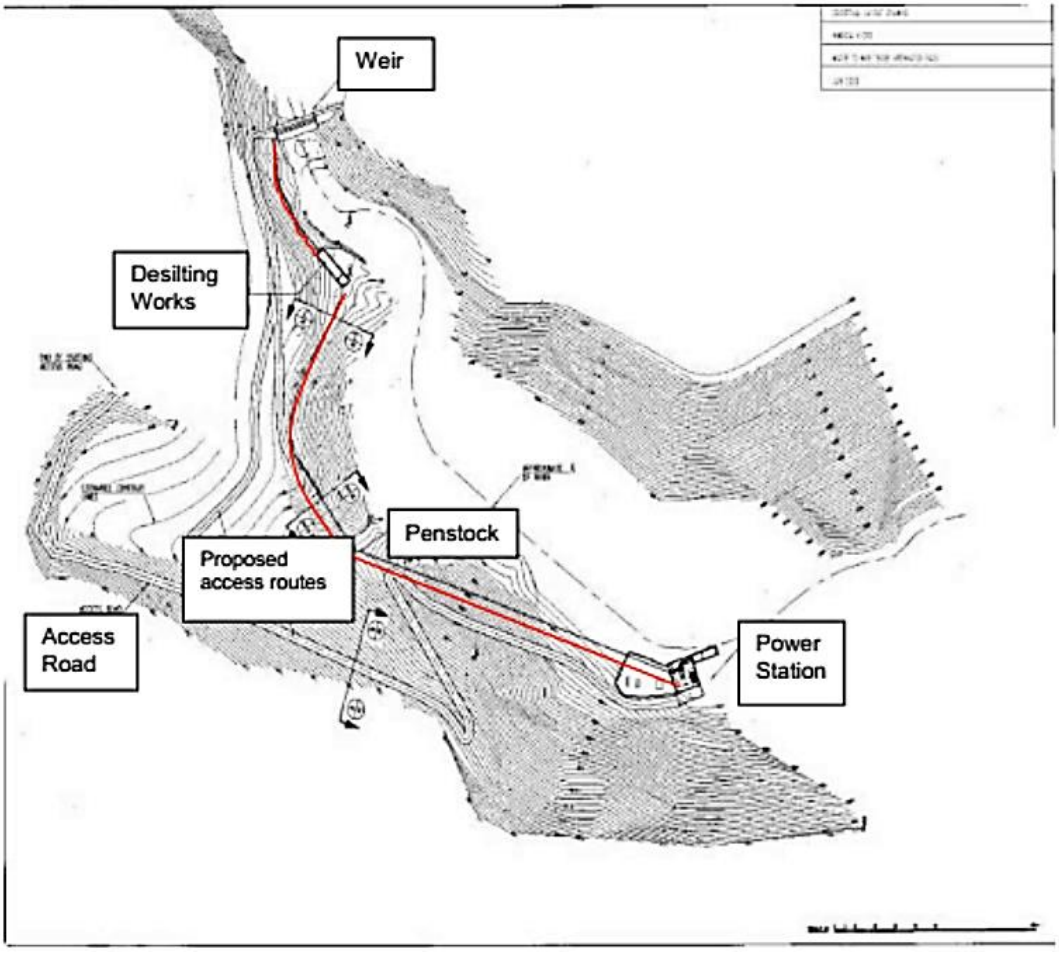


Figure A.3. Mwenga river falls and downstream view of the hydropower plant site[8]

[8] Mwenga Hydropower Environmental Impact Statement. July 2009. Nyinisaeli K Palangyo

Distribution Network

Electricity produced by the Hydropower plant is transported along a 33 kV transmission line to the Processing Factories. These villages along the path of this line and to an extended network in the Kihansi basin were connected and approximately a total of 470 km of HV and LV power lines have been installed for this purpose.

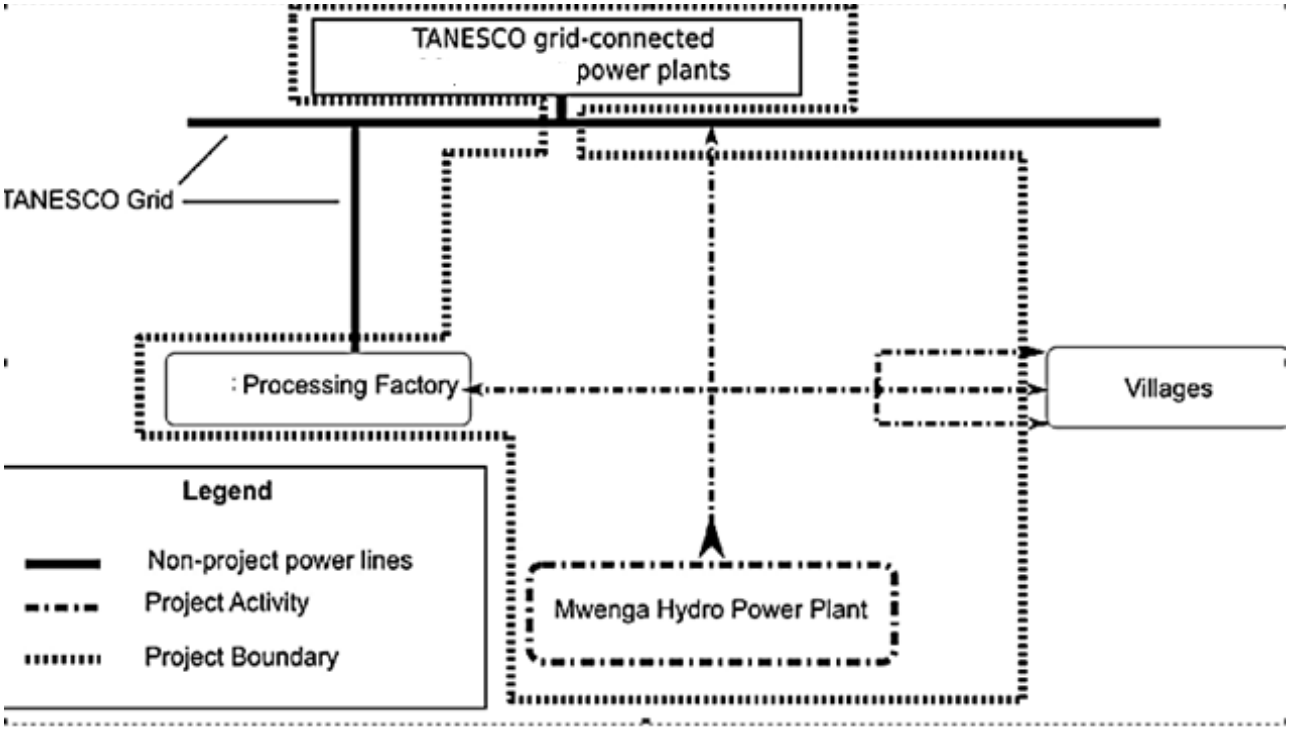
Figure A.4. Sample processing Factory (MTC Tea Farm)

The average amount of electricity consumed by the end users located in the various villages that are supplied by the Hydropower plant is approximately 2,540 MWh/yr. The currently 5000 end users include households, shops, schools, clinics/dispensaries, hospitals and SME's.

Figure A.5. Example of one of the villages (Isipii) and a local Dispensary to be supplied by Hydropower plant

Interconnection with the TANESCO grid, for export into this grid, takes place at the Mufindi Tea Estate processing factories. This network is presented in a simplified form in Figure A.6.

Figure A.6 Simplified schematic diagram illustrating project electricity flow



Note: Diagram is not to scale. The processing factories are not specific and numbers (of additional processing units) may change in future. Please refer section B.7.3 for monitoring equipment's (i.e Energy meters) locations.

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
United Republic of Tanzania (host Party)	Private entity: Mwenga Hydro Limited	No
Sweden	Public entity: Swedish Energy Agency	No The Swedish DNA and the Swedish CDM Procurement Programme are completely separate entities under the Swedish Energy Agency. The DNA is not in any way involved in the purchase of CERs. Although the Swedish Energy Agency (SEA) is a project participant and it is part of the Government of Sweden, SEA is an independent entity under the Government and does not represent the entire Government of Sweden before the United Nations with respect to Sweden's obligations under the Kyoto Protocol. Because the Government of Sweden is a Party to the Kyoto Protocol, but the Swedish Energy Agency is not a Party, then the table in section A.3 accurately identifies SEA as a project participant, and also confirms that the larger Government of Sweden does not wish to be considered a project participant."

A.5. Public funding of project activity

This small-scale project activity has received public funding from the European Union. The European Union delegation to Tanzania has confirmed that the public funding provided by the European Union was specifically intended to support this small-scale project activity. This letter appears in Appendix 2 to this document. The funding received from the European Union has been used only to support the project activity. The project has not received or otherwise used, in whole or in part, any other public funding from an Annex 1 country.

Therefore, no public funding from an Annex 1 country has been used in the small-scale project activity that would result in a diversion of official development assistance.

A.6. History of project activity

The current CDM project activity is registered as a CDM project activity with UN reference number as UN9550.
This project activity is not included as a component project activity (CPA) in a registered CDM programme of activities (PoA).
This CDM project activity is not a project activity that has been deregistered.
The current CDM project activity is not a CPA that has been excluded from a registered CDM PoA.
No registered CDM project activity or CPA under a registered CDM PoA whose crediting period has or has not expired exists in the same geographical location as this current registered CDM project activity.

A.7. Debundling

According to TOOL 20, Methodological tool "Assessment of de-bundling for small scale project activities"[9] version 04.0, the small-scale project activity is not a de-bundled component of a large-scale project activity since no small scale CDM project activity has been registered nor is in the process of applying for CDM registration:

- With the same project participants;
- In the same project category and technology measure; and
- Has been registered within the previous 2 years, and
- Whose boundary is within 1 km of the project boundary of the small-scale activity at the closest point

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

The project activity comprises the following components:

1. The production and transport of electricity to meet the requirements of the Processing Factories; and
2. The production and transport of electricity by the hydropower plant to a point where it can be exported to the Tanzanian National Grid

Additionally, Mwenga Hydro Limited also supplies and distributes power to rural villages (surrounding the power transmission lines and in the Kihansi basin). The villages were not grid-connected. And would likely have not have become grid-connected in the foreseeable future without the project activity. Therefore, to be conservative, the baseline emissions in the villages were considered to be zero, therefore, distribution of power to the villages is outside of the project boundary.

The project boundary includes only power generation and distribution to the Processing Factories and the Tanzanian National Grid. The Processing Factories are supplied via a mini grid that is also connected to the villages, and thus falls under Methodology I.F., as a captive use and mini grid renewable electricity generation project.

[9] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-20-v1.pdf

With respect to power distributed to the National Grid, Methodology I.D. is being applied.

Hence, the following small-scale baseline and monitoring methodologies are applied:

Component	Type	Type
1. Production and transport of electricity to meet the requirements of the Processing Factories,	I (Renewable Energy Projects)	I.F Renewable Electricity Generation for Captive use and Mini Grid (version 3.0),
2. Production and transport of electricity by the hydropower plant to a point where it can be exported to the Tanzanian National Grid	I (Renewable Energy Projects)	I.D Grid connected renewable electricity generation (version 18.0),

AMS I.D Version 18 is available at
https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTXFQQOFQQH4SBK
AMS IF Version 03 is available at
https://cdm.unfccc.int/methodologies/DB/9KJWQ1G0WEG6LKHX21MLPS8BQR7242

In addition, the following tools are relevant/applicable for project activity:

- Methodological TOOL07: Tool to calculate the emission factor for an electricity system_V07.0 https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf.
- TOOL 11: Methodological Tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" Version 03.0.1 https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf
- TOOL 19: Methodological tool "Demonstration of additionality of microscale project activities" Version 9.0

B.2. Applicability of methodologies and standardized baselines

The project activity is a 3.486 MW (at generator terminals) run-of-river hydropower plant, and is thus a Type I Renewable Energy project activity.

According to the hydrology and power feasibility studies upon which this project is based, and the power generation equipment design parameters, the output of the project activity does not exceed 5 MW.
The project is thus conceived as and remain below the limit for Small Scale Type – I Project activities during every year of the crediting period, i.e. it shall not exceed 15 MW. Moreover, it shall remain below the 5 MW limit set under the "Guidelines for Demonstrating Additionality of Microscale Project Activities" (EB68, Annex 26).

AMS-I.F version 3.0 is applied to the portion of electricity that is sold to meet the requirements of the Processing Factories (Component # 1, initially estimated 2,910 MWh/year, as described in Section B.6) whereas AMS-I.D version 18.0 is applied to the portion of electricity generated which is sold onto the grid, i.e. to TANESCO (Component #2, estimated 18,553 MWh/year, as described in Section B.6) pursuant to the Standardized Power Purchase Agreement between TANESCO and the Project Participant signed in December of 2009. As discussed below, these methodologies are applicable to the referred components of the project activity.

Component # 1: Production and transport of electricity to meet the requirements of the Processing Factories

AMS-I.F is deemed applicable as the following relevant criteria are met:

	Relevant Applicability Criteria to be met	Reason for criteria compliance
1.	This methodology comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind geothermal and renewable biomass that supplies electricity to user (s). The Project activity will displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel generating unit i.e., in the absence of the project activity users would have been supplied electricity from one or more sources listed below: a) A national or a regional grid b) Fossil fuel fired captive power plant c) A carbon intensive mini grid	The hydropower plant supplies electricity to one (potentially more) industrial user(s), in this case, nearby Processing Factories, to meet their electricity requirements. The nearby Processing Factories electricity requirements are expected to be met by project activity. The processing factories and MHL have power purchase agreement. In the absence of the project activity, the processing factories would have been supplied electricity from the national grid, which is the baseline scenario. Note that in the baseline scenario, in times of grid outages, power to meet the requirements of the factory is supplied by on-site diesel generators. In the PDD however, to be conservative, all power is assumed to be provided by the grid. This is conservative as demonstrated in section B.6. The grid emission factor is 0.4983 tCO_2e/MWh, whereas the CO_2 emission factor for diesel gensets (according to para 18, table 2 of AMS-I.F) is between 0.8 and 2.4 tCO_2e/MWh depending on the size of the gen set and the load factor.
2.	Illustration of respective situations under which each methodology (AMS-I.D and AMS-I.F and AMS-I.A) applies is included in Table 3.	Through the project, a portion of the electricity generated is sold to meet the requirements of the nearby Processing Factories, displacing grid electricity consumption. According to point 2 of table 3, AMS-I.F should be applied in this situation.
3.	"Hydropower plants with reservoirs that satisfy at least one if the following conditions are eligible to apply this methodology: a) The project activity is implemented in an existing reservoir with no change in the volume of reservoir. b) The project activity is implemented in an existing reservoir, where the volume of the reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2. c) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m^2.	This applicability condition is not applicable to the project activity component because the hydropower plant is a run-of-river plant and does not involve a reservoir.
4.	"This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition, (c) involve a retrofit or (an) existing plant (s), or (d) involve a replacement of (an) existing plant (s)"	The new hydropower plant is located at a site where no hydropower plant has existed. Therefore, it is a Greenfield plant.
5.	"In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generating facility, the	Not applicable. The project activity does not involve a capacity addition of renewable energy generation to an existing

	added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units"	power generating facility. No power generation facility exists at the site where the project is to be built.
6.	"In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW"	Not applicable. The project activity is neither a retrofit nor a replacement.
7.	"If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small scale CDM project activity applies only to the renewable component. If the unit added co fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW"	Not applicable. The project does not have non-renewable components.
8.	"Combined heat and power (cogeneration) systems are not eligible under this category"	Not applicable. Project activity is not a Combined Heat and Power project
9.	"If electricity and/or steam/heat produced by the project activity is delivered to a third party, i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered that ensures that there is no double counting of emission reductions."	Part of the electricity produced is sold to meet the (back up) requirements of the nearby Processing Factories. A contract between the supplier and the processing factories are entered into, specifying that only the supplier of the electricity can claim emissions reductions for the electricity displaced. Electricity not delivered to processing factories are delivered to TANESCO or the villages, as appropriate.
10.	"In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply."	Not applicable. Project activity is not a biomass-based power generation.

Component # 2 Production and transport of electricity by the hydropower plant to a point where it can be exported to the Tanzanian National Grid

AMS-I.D is deemed applicable as the following relevant criteria are met:

	Relevant Applicability Criteria	**Reason for criteria compliance**
1.	"This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: a) Supplying electricity to a national or a regional grid; or b) (b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	The hydropower plant supplies electricity to TANESCO, the operator of the Tanzanian National Grid, in a quantity currently estimated to be 18,553 MWh per year. The power is provided to TANESCO pursuant to the Standardized Power Purchase Agreement between TANESCO and the Project Participant signed in December of 2009. The plant also provides electricity to meet the requirements of the Processing Factories, but that component of the project is addressed by applying AMS-I.F as discussed above.
2.	Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A) applies is included in appendix.	The project supplies a portion of the electricity generated to the Tanzanian National Grid. This is currently estimated to be 18,553 MWh per year. This is as per Point 1 of Appendix of AMS I.D
3.	This methodology is applicable to project activities that: a) Install a Greenfield plant; b) Involve a capacity addition in (an) existing plant(s); c) Involve a retrofit of (an) existing plant(s); d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or e) Involve a replacement of (an) existing plant(s).	Applicable. The new hydro plant is located at a site where no hydro plant has existed, nor currently exists. This is therefore a Greenfield plant.
4.	Hydro plants with reservoirs that satisfy at least one if	This condition is not applicable to the

	the following conditions are eligible to apply this methodology: a) The project activity is implemented in an existing reservoir with no change in the volume of reservoir. b) The project activity is implemented in an existing reservoir, where the volume of the reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2. c) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.	project activity component because the hydro plant is a run-of-river plant that does not involve a reservoir.
5.	If the new unit has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small scale CDM project activity applies only to the renewable component. If the new unit co-fires fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	Not applicable. The new unit does not have any non-renewable component.
6.	Combined Heat and Power (cogeneration) systems are not eligible under this category	Not applicable. Project activity is not a Combined Heat and Power project.
7.	"In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generating facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units"	Not applicable. The project activity does not involve a capacity addition of renewable energy generation to an existing power generating facility. No power generation facility exists at the site where the project is to be built.
8.	"In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW"	Not applicable. The project activity is neither a retrofit nor a replacement.
9.	"In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category. If the recovered methane is used for electricity generation for supply to a grid then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as "AMS-I.C.: Thermal energy production with or without electricity" shall be explored."	Not applicable. The project activity is not a methane recovery project.
10.	"In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply."	Not applicable. The project activity is not a biomass-based power project.

In addition to applicability of methodology, the applicability of below tool is as below
Methodological TOOL07: Tool to calculate the emission factor for an electricity system_v7.0

1. 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 activity that substitutes grid electricity that is where a project activity supplies electricity to a grid, thus TOOL 07 is applicable

2. 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.

The EF calculations are used for grid connected power plants, thus tool 07 is applicable.

3. 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 electricity system is not located partially or totally in an Annex I country, hence this para is not applicable.

4. Under this tool, the value applied to the CO_2 emission factor of biofuels is zero.

For EF calculations, CO_2 emission factor of biofuels is zero.

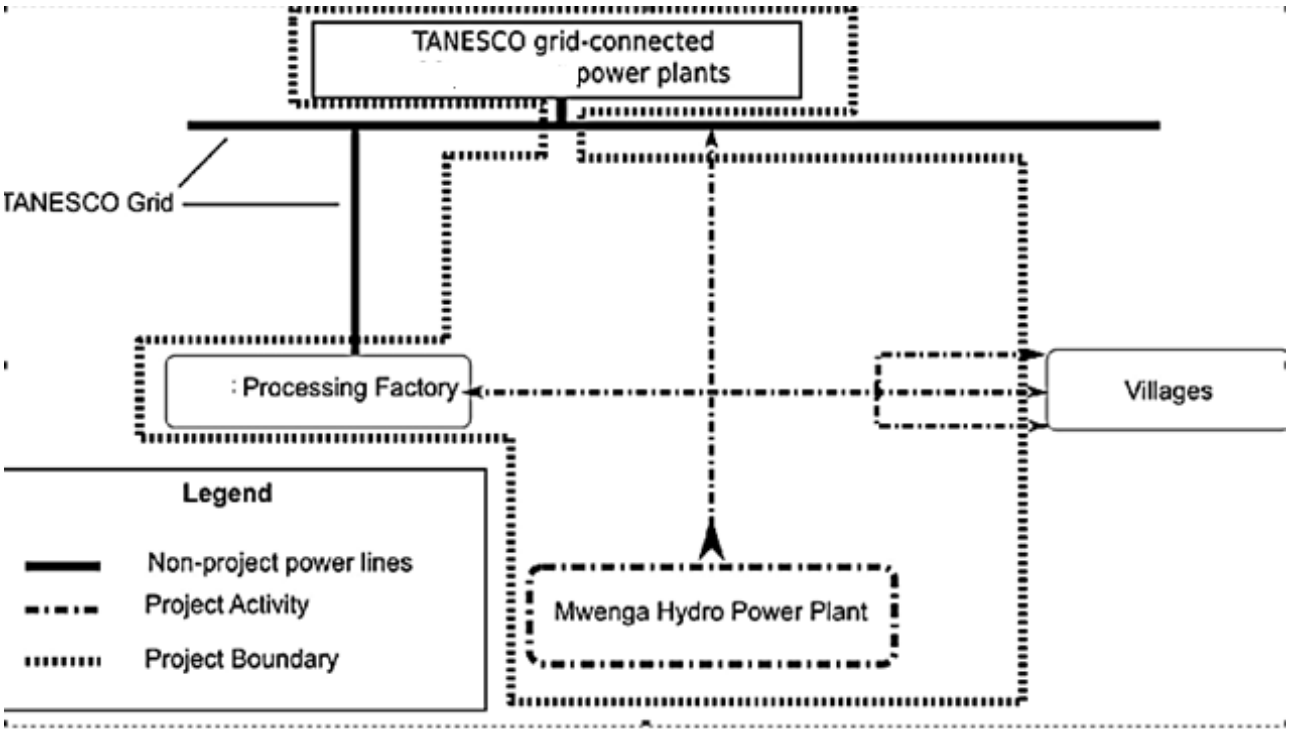
The applicability of Tool 11 is explained in section B.4 of PDD. The Tool 19 is related to additionality and same is demonstrated during registration of project for first crediting period. Please refer section B.5 for applied tool for additionality.

As demonstrated above, the selected methodologies, methodological tools and guidelines applied in accordance with the selected methodologies are applicable to the CDM project activity. Standardized baseline is not applicable for project activity. CDM project activity complies with all the requirements of the applied methodologies and other applied methodological regulatory documents. This is in line with para 55 and 56 of PS version 02.

As per para 279 of PS version 2.0, to support a request for renewal of crediting period of a registered CDM project activity, the project participant used the valid version of the applicable PDD form, update
the sections of the PDD of the project activity relating to the baseline, estimated GHG emission reductions or net anthropogenic GHG removals, the monitoring plan and the crediting period, and applied methodologies with valid version of the methodologies and methodological tools applied in the registered PDD, that is, the latest version at the time of the submission of the request for renewal of crediting period

B.3. Project boundary, sources and greenhouse gases (GHGs)

Component	Project Boundary
(1) AMS-I.F - Production and transport of electricity to meet the requirements of the Processing Factories	Physical, geographical site of the Project Hydropower plant and transmission / distribution lines up to the metering point of the nearby factories and including its power requirements, but excluding its diesel backup power systems. Note that the project is not claiming emissions reductions for power provided to villages or to offset emissions of diesel backup generators for the processing factories. The meters to villages are included within the project boundary to allow crosschecking of consumption by TANESCO and processing factories, and also to identify and quantify potential transmission losses.
(2) AMS-I.D -Production and transport of electricity by the hydropower plant to a point where it can be exported to the Tanzanian National Grid	Physical, geographical site of the Project Hydropower plant and transmission lines up to the metering equipment before power enters the National Grid, but also including TANESCO's grid-connected power plants with CO_2 emissions that the project activity offsets.



Notes: Diagram is not to scale. There is a meter at the transformer from the project grid to each village. To keep this figure legible, only three village transformer meters are shown here. See Sections B.7.1 and B.7.2 for further details. The project activity supplies electricity to one or more processing factories.

Source		GHG	Included?	Justification/Explanation
Baseline	Emission due to grid connected power plants	CO_2	Yes	This is main emission source
		CH_4	No	This is excluded for simplification
		N_2O	No	This is excluded for simplification
Project activity	No Emissions during project activity operations	CO_2	No	Not applicable being renewable nature
		CH_4	No	Not applicable being renewable nature
		N_2O	No	Not applicable being renewable nature

B.4. Establishment and description of baseline scenario

The baseline has been updated for the second crediting period in line with the TOOL 11 Methodological Tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period." Version 03.0.1.

This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as per the modalities and procedures of the clean development mechanism of Project Standard version 2, para 286.

The tool stipulates the following steps to be carried out.

Step 1: Assess the validity of the current baseline for the next crediting period

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

The baseline scenario remains unchanged and is in compliance with all the relevant mandatory national and/or sectoral policies.

The baseline scenario comprises the baseline scenarios for the electricity, which is to be generated and sold to meet the requirements of the Processing Factories, the electricity that is to be exported to the TANESCO National Grid and the electricity that which will be sold to the villages located along the route of the power lines to be installed.

Component 1. The production and transport of electricity to meet the requirements of the Processing Factories. Conservatively, in the absence of the project activity the requirements of the Processing Factories would have been met by the Tanzanian National Grid.

Component 2. The production and transport of electricity by the hydropower plant to a point where it can be exported to the Tanzanian National Grid.

As per AMS-I.D version 18, paragraph 19 “The baseline scenario is that the 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 into the grid”.

Component 3 (related, but outside project boundary). The production and transport of electricity to serve nearby villages which in the absence of the project activity continue to be supplied partly by diesel fired engine generators and partly by kerosene lamps for lights because of the lack of access to a grid power supply .

Although not taken into account for the purpose of determining the emissions reductions, in the absence of the project, the electricity supplied to nearby villages would have continued to be supplied partly by diesel fired engine generators, and in certain cases, light would have been provided by kerosene lamps, because of the lack of access to a grid power supply. Not taking into account the emissions reductions resulting from the displacement of these sources of energy results in a conservative determination of the emissions reductions which are to be claimed for the project activity. Therefore, the baseline for this component related to the project activity is considered to be zero and this component related to the project activity lies outside the project boundary.

There are no any revised relevant mandatory national and/or sectoral policies in host country which have come into effect after the submission of the project activity for validation of the first crediting period and which have impact on current baseline. The relevant government websites as outlined below have been checked in order to confirm this.

1. Ministry of Energy of Tanzania: https://www.nishati.go.tz/en/

The Ministry of Energy is the government ministry of Tanzania which is responsible for facilitating the development of the energy sectors in Tanzania.

2. Energy and Water Utilities Regulatory Authority (EWURA) of Tanzania: https://www.ewura.go.tz/

EWURA is responsible for technical and economic regulation of the electricity, petroleum, natural gas and water sectors in Tanzania

3. Tanzania Electric Supply Company Limited (TANESCO): http://www.tanesco.co.tz/

TANESCO generates, purchases, transmits, distributes and sells electricity in Tanzania.

Thus, current baseline scenario continues for the project activity and complies with relevant mandatory national and/or sectoral policies in host country. The project activity baseline scenario remains same for second crediting period also.

Step 1.2: Assess the impact of circumstances

The baseline scenario identified at the validation of the project activity was the 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 into the grid.
The project activity also involves electricity supply to processing factories which would have been met by Tanzanian National Grid.

Thus, this project activity is a voluntary investment which replaces equivalent amount of electricity at grid from renewable source. PP was not bound to incur this investment; hence absence of project activity (i.e. the investment) does not lead to any continued baseline practice for PP within their scope whereas the continued operation of the project activity would continue to replace equivalent amount of electricity at grid. Hence, the same baseline as identified in the previous crediting period is still valid for the project. Therefore, the assessment of the changes in market characteristics is not required for the renewal of the project's crediting period under CDM.

Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested

As explained in step 1.2, the baseline scenario was the electricity import/generation from the power plants connected to the electricity grid. Therefore, this condition is not applicable to the project activity.

Step 1.4: Assessment of the validity of the data and parameters

This step stipulates that “Where emission factors, values or emission benchmarks are used and determined only once for the crediting period, they should be updated, except if the emission factors, values or emission benchmarks are based on the historical situation at the site of the project activity prior to the implementation of the project and cannot be updated because the historical situation does not exist anymore as a result of the CDM project activity.”

In the context of the present project activity, the emission factor has been updated along with the approach used to calculate the emission factor.

Step 2: Update the current baseline and the data and parameters

From the explanation provided above, the baseline scenario remains unchanged. Only the approach used to calculate the baseline grid emission factor is updated as per the latest version available at the time of PDD submission for renewal.

In line with the paragraph 284 of the project standard version 2.0, the impact of new relevant national and/or sectoral policies and circumstances, existing at the time of renewal of the crediting period; and the correctness of the application of an approved baseline methodology for the determination of the continued validity of the baseline or its update, and the estimation of emission reductions for the applicable crediting period.

The approved small scale baseline methodology, AMS I.D. (Version 18.0) and AMS I.F (Version 03.0), have been used to determine the baseline and the estimation of emission reductions for the applicable crediting period.

As referred in the methodology AMS I.F para 20 “For project activities that displace grid electricity and fossil fuel fired on-site captive electricity, the baseline emission factor should reflect the emissions intensity of the grid and the captive power plant in the baseline scenario i.e. the weighted average emission factor for the displaced electricity is calculated using values based on the historical, prior three year ratios of electricity from captive plants and the grid. For new facilities, the most conservative (lowest) of the emission factor for the two power sources should be used.”

For project activity grid emission factor is conservative as compared with emission factor for diesel generators as per table 2 of AMS I.F. The baseline scenario for AMS I.F component of project activity is “In the absence of the project activity, the processing factories would have been supplied electricity from the national grid”

As per para 19 of AMS I.F “Baseline emissions for other systems are the product of amount electricity displaced with the electricity produced by the renewable generating unit and an emission factor”
To be conservative, emissions from processing factories diesel backup generators are not included in the calculation of the emissions factor for this AMS I.F component. Thus Emission factor of a grid shall be calculated as per the procedures provided in AMS-I.D.

As per para 19 of AMS I.D “If the project activity is the installation of a Greenfield power plant, the baseline scenario is 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 into the grid, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”.

As per the approved small scale Methodology AMS-I.D (Version 18.0) “If the project activity is the installation of a Greenfield power plant, the baseline scenario is 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 7.0”.

As per para 23 of AMS I.D Version 18,
The emission factor shall be calculated in a transparent and conservative manner as follows:
(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the “Tool to calculate the emission factor for an electricity system”; or
(b) The weighted average emissions (in t CO_2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

The project activity followed option a) for second crediting period.

The baseline scenario comprises the baseline scenarios for the electricity, which is to be generated and sold to meet the requirements of the Processing Factories, the electricity that is to be exported to the TANESCO National Grid and the electricity that which will be sold to the villages located along the route of the power lines to be installed.

***Component 1*: The production and transport of electricity to meet the requirements of the Processing Factories**

Conservatively, in the absence of the project activity the electricity requirements of the Processing Factories would have been met by the Tanzanian National Grid.

***Component 2:* The production and transport of electricity by the hydropower plant to a point where it can be exported to the Tanzanian National Grid**

As per AMS-I.D version 18.0, paragraph 19 “The baseline scenario is that the 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 into the grid”.

***Component 3 (related, but outside project boundary):* The production and transport of electricity to serve nearby villages which in the absence of the project activity continue to be supplied partly by diesel fired engine generators**

Although not taken into account for the purpose of determining the emissions reductions, in the absence of the project, the electricity that is supplied to nearby villages would have been continued to be supplied partly by diesel fired engine generators, and in certain cases, light would have been provided by kerosene lamps, because of the lack of access to a grid power supply. Not taking into account the emissions reductions resulting from the displacement of these sources of energy results in a conservative determination of the emissions reductions which are to be claimed for the project activity. Therefore, the baseline for this component related to the project activity is considered to be zero and this component related to the project activity lies outside the project boundary.

B.5. Demonstration of additionality

As described throughout this document, the TANESCO grid and the requirements of the processing factories would have continued to use current sources of electricity at the current GEF. The project activity reduces to zero the emissions resulting from electricity generation that would have been otherwise obtained from the TANESCO grid using current generation sources.

Prior Consideration

The project activity commenced on 26 July 2010, the date that complete financing for the project activity was secured[10]. According to UNFCCC document CDM-EB07-A04-GLOS, a project start date is defined as "the earliest date at which either the implementation or construction or real action of a CDM project activity or CPA begins." That document does not define "construction", "implementation," or "real action", so, per the FAQ listed at http://cdm.unfccc.int/faq/index.html, one must consult the clarification provided in EB 41Rep. page 17, par. 67, which deems the start date to be "the date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity. This, for example, can be the date on which contracts have been signed for equipment or construction/operation services required for the project activity. Minor pre-project expenses, e.g. the contracting of services /payment of fees for feasibility studies or preliminary surveys, should not be considered in the determination of the start date as they do not necessarily indicate the commencement of implementation of the project."

Thus, the start date in this case could be the date of financial closing, where funds have been committed for the purpose of the project (26/07/2010), or the signature of contracts obligating funds to be expended for the main purpose of the project (19/10/2010), as shown in the timeline below[11].

In either event, therefore, the project activity commenced on or after 2 August 2008. Because the project activity commenced on or after 2 August 2008, to demonstrate that CDM was "seriously considered in the decision to implement the project activity", Section II, paragraphs 2– 5 of EB 62 Annex 13,"*Guidance on the demonstration and assessment of prior consideration of the CDM*"[12] requires the project participant to demonstrate that notifications were made to the Host Party DNA and the UNFCCC Secretariat within six months of the commencement of the project activity.

As demonstrated in the table below and associated attachments, these notifications were made within six months of the project activity start date. Therefore, under the terms of EB 62 Annex 13, Section II., Paragraphs 2 – 5, CDM was "seriously considered in the decision to implement the

[10] The attached Loan Facility Letter is dated 30 June, 2010, but it was not accepted by the project participant until 26 July, 2010.

[11] The "example" of construction in EB47, using the commonly-accepted meaning of the word "example", should not be taken as limiting. Furthermore, because the start date can be any of "construction", "implementation", or "real action", there is a wide range of events that could be considered a "starting date", which clearly encompasses financial closure, contracting for necessary equipment, or even the commencement of actual construction.

[12] EB 62 Annex 13, available at http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid04.pdf

project activity."

Under the explicit terms of EB 62 Annex 13 Section III, which contains Paragraphs 6 – 9 of the guidance, Section III does not apply to the project activity, because the project activity commenced on or after 2 August 2008. Therefore, it is not necessary to demonstrate continuing "real action" in order to show "serious prior consideration." However upon the request of the DOE, the timeline below has been included for the sake of completeness, and it does demonstrate "serious prior consideration" under Section III, Paragraphs 6 – 9 of EB 62 Annex 13, even though under the terms of EB 62 Annex 13, this information is not required with respect to the project activity because the project activity commenced on or after 2 August 2008.

Events that are underlined represent the only events required to be documented by EB 62 Annex 13 for a project commencing on or after 2 August 2008. All other events are not required to be documented under EB 62 Annex 13, but they have been included only at the explicit request of the DOE.

Date	Event	Evidence
July 2008	Feasibility Study completed by Ninham Shand Consulting Services	Feasibility Study , filename including "Chron01 – Mwenga River H P - Feasibility Study Report (Final July 2008)"
July 2009	Non-binding Letter of Intent for the sale and purchase of CERs between Mwenga Hydro Ltd and the Swedish Energy Agency (SEA)	Letter of intent, filename including "Chron02 - SEA-MHLLOI 210709"
July 2009	Environmental Impact Statement completed by Nyinisaeli K Palangyo, submitted to National Environment Management Council (NEMC), and finalised	Environmental Impact Statement Report, filename including "Chron03 – Mwenga EIS Final"
11 November 2009	Notice of final amendment to EU Grant Contract specifying exact amount of funds to be allocated to the project	Contract addendum and signature page, filename including "Chron04 - EU Grant Contract 2nd Addendum"
20 November 2009	Environmental Impact Statement approved by NEMC.	Environmental Impact Assessment Certificate, filename including "Chron05 - EIA Certificate Mwenga Hydro", Registration Number EC/EIS/168.
16 February 2010	Signing of CDM Project Development Agreement between Camco and SEA/	Project Development Agreement, filename including "Chron 06 - Mwenga Hydro PDA title and sig page"
30 June 2010 (within six months of project Start Date)	Letter of No Objection from Tanzanian DNA issued (evidence of notification to Host Country DNA of intention to seek CDM status)	Letter of No Objection, filename including "Chron 07 - LONO_Mwenga_PIN_100705"
12 July 2010	Technical Specification Document finalised	Technical Specification Document, filename including "Chron 08 - SermanRev01"
26 July 2010	Effective date of commercial financing. Note this is the date of acceptance by Mwenga Hydro, but the Loan Facility was offered on 30 June, 2010.	Loan Facility Letter issued by CRDB Bank PLC, filename including "Chron 09 – CRDB Loan Facility Letter to Mwenga Hydro Limited"
19 October 2010	Project Start Date: Signing of contract for supply of turbine and	Serman Energy supply contract signature sheet, filename including

	power generating equipment	"Chron 10 – Serman Signature_2010 10 19"
20 October 2010	Signing of ERPA between SEA and MHL	Cover and signature pages of ERPA, filename including "Chron 11 – ERPA cover and signature page"
9 November 2010 (within six months of project activity commencement option 1 or 2)	UNFCCC confirmation of receipt of intention to seek CDM status (Tanzanian DNA notified 30 June, 2010, as noted above)	http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html - shows date of acceptance by UNFCCC; Prior Notification submitted 11 August 2010, filename including "Chron 12 - Mwenga Hydro Tanzania CDM Prior Consideration"; prior notification accepted by UNFCCC 2010-11-09, filename including "Chron 13 - Confirmation of Mwenga Hydro Power Project UNFCCC Prior Notification"
17 November 2010	Signing of agreement to build the base of the weir (start of construction)	Contract between owner and contractor, filename including "Chron14 – Foundation Contract.jpg"
3 May 2011	Signing of Validation Services Agreement with DOE	Contract between project participant and DOE, filename including "Chron15 – SGS signed agreement"
1 November 2011	Letter of Approval from DNA of Sweden	Filename including "Chron 16 - LOA from Swedish DNA"
29 November 2011	Letter of Approval from DNA of Tanzania	Filename including "Chron 17 - Letter of Approval from Tanzania DNA dated 2011-11- 29"
18 June 2012	Commercial lender confirms plant load factor submitted to support application for commercial financing	Appendix 8

Additionality

The CDM Executive Board at its 68th meeting published "Guidelines for Demonstrating Additionality of Microscale Project Activities" (version 4)[13].

According to Section II. Paragraph 2 of the Guidelines, project activities of up to 5 megawatts that employ renewable energy as their primary technology (i.e., technologies described in Type I small scale methodologies including those used by this project) are automatically deemed "additional" if "any one of the conditions below is satisfied" (emphasis appears in the original document):

> (a) The geographic location of the project activity is in one of the least developed countries or the small island developing states (LDCs/SIDs) or in a special underdeveloped zone (SUZ) of the host country.
>
> [the Guidelines then list multiple other conditions that do not apply to the project activity]

There are therefore three questions to address:
1) Is the project a Type I project?
2) Is the project's output under 5 megawatts?
3) Is it in an LDC?
If answers to all questions are "yes", then the project is necessarily additional.

1) Is the project a Type I project?

[13] **EB68, Annex 26, available from** http://cdm.unfccc.int/EB/index.html**.**

As explained in both methodologies, AMS-I.F and AMS-I.D, hydroelectric power plants are Type I power plants. The power plant at issue here is a hydroelectric power plant. Therefore, the project is a Type I project, and it is possible to proceed to the next question.

2) Is the project's output under 5 megawatts?

The output at the generator terminals is 3.486 MWe. Because 3.486 is less than 5, the project is under 5 megawatts. Therefore, it is possible to proceed to the next question.

3) Is the project located in an LDC?

All of the project activity occurs within the United Republic of Tanzania. According to United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States, the United Republic of Tanzania is considered to be a least-developed country (LDC)[14]. Furthermore, the UNFCCC has recognized the United Republic of Tanzania as an LDC with an active National Adaptation Programme of Action (NAPA), confirming that the UNFCCC also recognizes the United Republic of Tanzania as an LDC[15].

Conclusion

Under the requirements of Section II., Paragraph 2 of the Guidelines for Demonstrating Additionality of Microscale Project Activities (version 4), specifically, Paragraph 2, subparagraph (a): The project activity falls under a Type I small-scale methodology, its output is under 5 megawatts and the geographic location of the project activity is in one of the least developed countries…." Thus, the project activity satisfies one of the conditions listed in EB 68, Annex 26, Section II, Paragraph 2.

Because the project activity satisfies one of the conditions listed in EB 68, Annex 26, Section II., Paragraph 2, and this provision requires satisfaction of only one of the criteria listed, the project activity is therefore necessarily "additional", and no further analysis is required.

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

The methodological approach adopted is presented for each of the two components considered:

Component # 1 The production and transport of electricity to meet the requirements of the Processing Factories

Baseline Emissions

According to AMS-I.F Version 03, the baseline emissions for grid systems are the product of the amount of electricity displaced by the electricity generated from the renewable energy generating unit and an emissions factor. To be conservative, emissions from processing factories diesel backup generators are not included in the calculation of the emissions factor for this component.

$BE_{y,1} = EG_{BL,y,1} * EF_{CO2grid,y,1}$

Where:
$BE_{y,1}$ = Baseline Emissions in year y (tCO_2) associated with component # 1
$EG_{BL,y,1}$ = Quantity of net electricity displaced as a result of the implementation of the CDM project

[14] http://www.unohrlls.org/en/ldc/25/ (last visited 2011-11-03)

[15] http://unfccc.int/cooperation_support/least_developed_countries_portal_/ldcf_napa_projects/items/5632.php (last visited 2011-11-03)

activity in year y (MWh) associated with component # 1
EF $_{CO2grid,y,1}$ = Emissions factor (tCO_2/MWh) associated with component # 1

According to AMS-I.F Version 03, the emission factor for a grid shall be calculated as per the procedure provided in AMS-I.D.

According to AMS-I.D version 18.0, the emissions factor of the grid is chosen to be calculated as a combined margin (CM), consisting of the combination of an operating margin (OM) and a build margin (BM), both of which are calculated according to the procedures prescribed in the "*Tool to calculate the emissions factor for an electricity system*", EB 100, Annex 04, version 7.0.

The Tool provides the following stepwise procedure:

Step 1: Identify the relevant electricity systems

The project electricity system is defined by the spatial extent of the power plants that are physically connected to the project activity through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints. These power plants are those that feed into the Tanzanian National Grid.

Tanzania imports power from Kenya and Uganda, but such electricity is fed to isolated grids and not to the National Grid i.e. not to the Project Electricity System. Hence these imports are not considered for the purpose of determining the OM emissions factor. TANESCO does not export electricity.

Thus, the relevant electricity system comprises the Project Electricity system, i.e the Tanzanian National Grid.

Step 2: (optional) *Choose whether to include off-grid power plants in the project system*

Option 1: "Only grid power plants are included in the calculation" is the option chosen

Step 3: Select a method to determine the operating margin

The calculation of the operating margin emission factor is based on one of the following methods:

(a) Simple OM
(b) Simple adjusted OM
(c) Dispatch data analysis (OM)
(d) Average (OM).

The simple OM method (option a) can only be used if low-cost/ must-run-resources constitute less than 50% of total grid generation in 1) average of the five most recent years or 2) based on long term averages for hydroelectricity production.

As shown below, in the case of the Tanzanian grid, low-cost/ must-run resources are hydro resources and these constitute less than 50% of total grid generation in an average of the five most recent years. Therefore, option a) the Simple OM cannot be used.

Table B1: Power generated in the last 5 years

Year	**2015**	**2016**	**2017**	**2018**	**2019**
Hydro	2104	2340	2324	2209	2,432
Thermal	3924	4380	4411	4,809	5,005
Total	6028	6720	6735	7018	7,436
% hydro	35%	35%	35%	31%	33%

Recent 5 Years Average for hydro	34%

Source: TANESCO

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units. Hourly data on generation and fuel consumption for all power plants are not available, hence Dispatch data analysis (OM) is not applicable for project activity. Dispatch data analysis (OM) approach is not applicable to historical data and thus requires annual monitoring. Project activity follows ex-ante approach for OM factor and does not required annual monitoring, hence Dispatch data analysis (OM) approach is not applicable.

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

(a) 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 emissions factor during the crediting period is required.

OR

(b) 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.

PP has chosen ex-ante option for calculation of Simple OM emission factor using 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.

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

The simple OM emission factor is calculated as the generation-weighted average CO2 emissions per unit net electricity generation (t CO2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

As per para 47 of Tool 7, Option A has been followed which is based on the net electricity generation and a CO2 emission factor of each power unit
Option A: Calculation based on average efficiency and electricity generation of each plant

Under this option, the simple OM emission factor is calculated based on the net electricity generation of each power unit and an emission factor for each power unit, as follows:

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

Where:
$EF_{grid,OMsimple,y}$ = Simple operating margin CO2 emission factor in year y (t CO2/MWh)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$ = CO2 emission factor of power unit m in year y (t CO2/MWh)
m = All power units serving the grid in year y except low-cost/must-run power units
y = The relevant year as per the data vintage chosen in Step 3

Determination of $EF_{EL,m,y}$

Since for a power unit m only data on electricity generation and the fuel types used is available, the emission factor is determined based on the CO2 emission factor of the fuel type used and the efficiency of the power unit in line with para 49 of TOOL 7, as follows:

$$EF_{EL,m,y} = \frac{EF_{co2,m,i,y} \times 3.6}{\eta_{m,y}}$$

Where:
$EF_{EL,m,y}$ = CO2 emission factor of power unit m in year y (t CO2/MWh)
$EF_{CO2,m,i,y}$ = Average CO2 emission factor of fuel type i used in power unit m in year y (t CO2/GJ)
ηm,y = Average net energy conversion efficiency of power unit m in year y (ratio)
m = All power units serving the grid in year y except low-cost/must-run power units
y = The relevant year as per the data vintage chosen in Step 3
3.6 = Conversion factor (GJ/MWh)

The operating margin emission factor has been calculated using a 3-year data vintage:

Net Generation in Operating Margin (MWh)			
	2017	**2018**	**2019**
Tanzanian Grid	4,411,010	4,808,929	5,004,734

Simple Operating Margin (tCO_2/MWh)			
	2017	**2018**	**2019**
Tanzanian Grid	0.5182	0.5059	0.5015

Weighted Generation Operating Margin = 0.5081 tCO_2/MWh

Thus:

$EF_{grid,OM,\ 2017\text{-}2019}$ = 0.5081 tCO_2/MWh

Step 5: Calculate the build margin emission factor

As per para 72 of TOOL 7, Option 1 i.e ex-ante option is selected for second crediting period and is calculated as below
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 renewal of the crediting period to the DOE.
As per para 73 of TOOL 7, Option 1 has been followed by PP.
As per para 74 of TOOL 7, Capacity additions from retrofits of power plants should not be included in the calculation of the build margin emission factor
As per para 75, The sample group of power units m used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:
(a) Identify the set of five power units, excluding power units registered as CDM project activities if applicable (no any CDM registered project considered to identify set of five power plants), that started to supply electricity to the grid most recently (SET5 units) and determine their annual electricity generation (AEGSET-5-units, in MWh);
(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEGtotal, in MWh). 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 per cent of AEG_{total} (if 20 per cent falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\ per\ cent}$) and determine their annual electricity generation (AEGSET-≥20 per cent, in MWh);

(c) From SET5-units and $SET_{\geq 20\ per\ cent}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});
Identify the date when the power units in SET_{sample} started to supply electricity to the grid.

Since none of power unit in SETsample started to supply electricity to the grid more than 10 years ago, hence same SET_{sample} is used to calculate the build margin and in this case steps d, e, f of para 75 of TOOL 7 are not required.

As per para 77, The build margin emissions factor is the generation-weighted average emission factor (t CO2/MWh) of all power units m during the most recent year y for which electricity generation data is available, calculated as follows:

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

Where:
EFgrid,BM,y = Build margin CO2 emission factor in year y (t CO_2/MWh)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$ = CO2 emission factor of power unit m in year y (t CO_2/MWh)
m = Power units included in the build margin
y = Most recent historical year for which electricity generation data is available

As per para 78, The CO_2 emission factor of each power unit m ($EF_{EL,m,y}$)should be determined as per the guidance in Step 4 for the simple OM, using Options A2, 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

The Build Margin set of plants is provided in Table B.1, and was obtained from TANESCO.

Table B.1: Determination of Build Margin Set of power units

Power plant	Resource	Commission Date	2019 Power Gen [MWh]	2019 Cumulative power gen [MWh]	2019 Cumulative %
HALE	Hydro power	1964	49,074.65	7,436,239.61	100.00%
NYM	Hydro power	1969	33,469.68	7,387,164.96	99.34%
KIDATU	Hydro power	1980	819,801.85	7,353,695.28	98.89%
MTERA	Hydro power	1988	243,900.00	6,533,893.43	87.87%
ZUZU	Fossil fuel	1978-1994	31.24	6,289,993.43	84.59%
NPF	Hydro power	1995	328,024.71	6,289,962.19	84.59%
KIHANSI	Hydro power	2000	957,234.72	5,961,937.48	80.17%
IPTL	Fossil fuel	2002		5,004,702.76	67.30%
SONGAS UGT1&2	Fossil fuel	2004	325,731.70	5,004,702.76	67.30%
SONGAS UGT3,4,5&6	Fossil fuel	2004/2005	1,188,904.05	4,678,971.06	62.92%
UGP1	Fossil fuel	Sep-2007	573,298.60	3,490,067.01	46.93%
TGP	Fossil fuel	2009	213,536.65	2,916,768.41	39.22%
UGP2	Fossil fuel	2012	859,926.00	2,703,231.76	36.35%
NYAKATO	Fossil fuel	2013	670.74	1,843,305.76	24.79%
KINYEREZ 1	Fossil fuel	2015	718,515.81	1,842,635.02	24.78%

KINYEREZ 2	Fossil fuel	2017	1,120,716.99	1,124,119.21	15.12%
MTWARA	Fossil fuel	2019	2,999.32	3,402.22	0.05%
SOMANGA	Fossil fuel	2019	402.90	402.90	0.01%

Power plant	**Generated electricity [2019]**	**Average net energy conversion efficiency**	**Fuel type**	**Average CO_2 emission factor of fuel type $EFCO_2$**	**$EF_{EL,m,y}$ CO_2 emission factor of power unit Option A2-formula (5) of the UNFCCC tool**	**CO_2 emission [2019]**	**$EF_{grid,BM,y}$ Build margin CO_2 emission factor [2019]**
	[MWh]			[tCO_2/GJ]	[tCO_2/MWh]	[tCO_2]	[tCO2/MWh]
	A	B	C	D	E=Dx3.6/B	F=AxE	G=SumF/SumA
NYAKATO	670.74	0.284	Gas/ diesel oil	0.0726	0.92	617.27	
KINYEREZ 1	718,515.81	0.395	Natural gas	0.0543	0.49	355,583.47	
KINYEREZ 2	1,120,716.99	0.395	Natural gas	0.0543	0.49	554,627.24	
MTWARA	2,999.32	0.395	Natural gas	0.0543	0.49	1,484.32	
SOMANGA	402.90	0.395	Natural gas	0.0543	0.49	199.39	
Sum	**1,843,305.76**					**912,511.69**	**0.4950**

Build Margin (tCO_2/MWh)	
	2019
Tanzanian Grid	**0.4950**

The resulting Build Margin emissions factor for 2019 is determined as:

$$\mathbf{EF_{grid,BM,2019} = 0.\ 4950\ tCO_2/MWh}$$

Step 6: Calculate the combined margin emissions factor

As per para 85 of TOOL7, The combined margin emissions factor is calculated as follows:

$$\mathbf{EF_{CO2,y}} = EF_{grid,OM,y} \times \omega OM + EF_{grid,BM,y} \times \omega BM$$

Where:
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)
ωOM = Weighting of operating margin emissions factor (%)
ωBM = Weighting of build margin emissions factor (%)

As per para 86 b) of TOOL 7, the weightings used are as follows: $\omega OM = 0.5$ and $\omega BM = 0.5$ for the first crediting period, and $\omega OM = 0.25$ and $\omega BM = 0.75$ for the second and third crediting periods.

Being second crediting period, weightage of $\omega OM = 0.25$ and $\omega BM = 0.75$
Given the above values for the Simple Operating Margin and Build Margin Emissions factor, the Combined Margin emissions factor is determined to be:

$\mathbf{EF_{CO2,y}}$ = 0.5081 tCO_2/MWh * 0.25 + 0.4950 tCO_2/MWh *0.75

= **0.4983 tCO_2/MWh**

The combined margin emission factor is an ex-ante parameter and is fixed for second crediting period.

The combined emission factor is as per Methodological Tool "Tool to calculate the emission factor for an electricity system" Version 7 which is latest tool for emission factor for an electricity system. https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf .

Project Emissions

Given that the project activity is a small-scale hydro project and does not result in a new reservoir, no project emissions occur on account of the decomposition of vegetative biomass.

As per para 24 of AMS I.F,
For most renewable energy project activities, PE_y = 0. However, for the following categories of project activities, project emissions have to be considered following the procedure described in the most recent version of "ACM0002: Grid-connected electricity generation from renewable sources":
(a) Emissions related to the operation of geothermal power plants (e.g. non condensable gases, electricity/fossil fuel consumption);
(b) Emissions from water reservoirs of hydro power plants

The project activity is hydro based renewable energy project and does not follow any category mentioned in para 24 of methodology. Hence Project emissions are considered as zero.
As per para 25 of AMS I.F., CO_2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
For AMS I.F component, there is no any fossil fuel consumption due to project activity. Hence para 25 is not applicable. As per para 25, Project emissions for component 1 is considered as zero.
The project activity is hydro based renewable energy project and does not include Biomass, hence para 26 is not applicable for project activity.
$PE_{,y,1}$ = 0 tCO_2/MWh

Leakage

No leakage takes place because the generating equipment is not transferred from another activity.

As per para 27 of AMS I.F, for Leakage emissions "General guidance on leakage in biomass project activities shall be followed to quantify leakages pertaining to the use of biomass residues",
Since project activity is run of river hydro power plant and not biomass project activity, hence Leakage emissions are zero as per AMS I.F methodology.

$LE_{y,,1}$ = 0 tCO_2/MWh

Emissions Reductions

The emissions reductions that occur on account of project # 1 are calculated as follows:

$ER_{y,1} = BE_{y,1} – PE_{y,1} – LE_{y,1}$

Where:

$ER_{y,1}$ Emissions reductions in year y (tCO_2) associated with component #1
$BE_{y,1}$ Baseline Emissions in year y (tCO_2) associated with component # 1
$PE_{y,1}$ Project Emissions in year y (tCO_2/y) associated with component # 1
$LE_{y,1}$ Leakage Emissions in year y (tCO_2/y) associated with component # 1

Component # 2: Grid connected electricity generation

Baseline Emissions

The baseline emissions are the product of the electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the hydropower plant multiplied by the grid emissions factor.

$BE_{y,2} = EG_{BL\,y,2} * EF_{CO2grid,y,2}$

Where:

$BE_{y,2}$ = Baseline Emissions in year y (tCO2) associated with component # 2
$EG_{BL\,y,2}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity and associated with component # 2
$EF_{CO2grid,\,y,2}$ = CO_2 emissions factor of the grid in year y (tCO_2/MWh) associated with component # 2

The $EF_{CO2grid,\,y,2}$ is calculated as described above for Component # 1; and for the second crediting period given by:

$EF_{CO2grid,y,2} = EF_{CO2grid,y,1} = EF_{CO2,y}$ = **0.4983 tCO_2/MWh**

Project Emissions

Given that the project activity is a small-scale hydro project and does not result in a new reservoir, no project emissions occur on account of the decomposition of vegetative biomass.

As per para 39 of AMS I.D,
39. For most renewable energy project activities, PE_y = 0. However, for the following categories of project activities, project emissions have to be considered following the procedure described in the most recent version of "ACM0002: Grid-connected electricity generation from renewable sources":
(a) Emissions related to the operation of geothermal power plants (e.g. non-condensable gases, electricity/fossil fuel consumption);
(b) Emissions from water reservoirs of hydro power plants

As per para 40 of AMS I.D., CO2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion"

The project activity is hydro based renewable energy project and does not follow any category mentioned in para 39 of methodology. Hence Project emissions are considered as zero.

Project activity involves diesel generator that is used to restart the turbines, in the instances when the grid is down. Since emissions from the diesel generator are negligible, it will not be accounted for emissions reduction calculation.

Hence, Project emissions are considered as zero.

$PE_{,y,2}$= 0 tCO_2/MWh

Leakage

No leakage takes place because the generating equipment is not transferred from another activity.

As per para 47 of AMS I.D, for Leakage emissions "General guidance on leakage in biomass project activities shall be followed to quantify leakages pertaining to the use of biomass residues",

Since project activity is run of river hydro power plant and not biomass project activity, hence Leakage emissions are zero as per AMS I.D methodology.

Emissions Reductions

The emissions reductions which occur on account of component # 2 are calculated as follows:

$ER_{y,2} = BE_{y,2} – PE_{y,2} – LE_{,y,2}$

Where:

$ER_{y,2}$	Emissions reductions in year y (tCO_2) associated with component #2
$BE_{y,2}$	Baseline Emissions in year y (tCO_2) associated with component #2
$PE_{y,2}$	Project Emissions in year y (tCO_2/y) associated with component #2
$LE_{y,2}$	Leakage emissions in year y (tCO_2/y) associated with component #2

Total emissions reductions

The total emissions reductions are the sum of the emissions reductions attributable to the above two components of the small-scale project activity:

$ER_y = ER_{,y,1} + ER_{y,2}$

B.6.2. Data and parameters fixed ex ante

Data/Parameter	**$EF_{grid,OM,y}$**
Data unit	tCO_2/MWh
Desripticon	Operating Margin CO_2 emission factor in year y
Source of data	Calculated from TANESCO database
Value(s) applied	0.5081
Choice of data or measurement methods and procedures	Calculated as the last 3-year (2017, 2018, 2019) generation-weighted average, sourced from TANESCO database.
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire crediting period

Data/Parameter	**$EF_{grid,BM,y}$**
Data unit	tCO_2/MWh
Description	Build Margin CO_2 emission factor in year y
Source of data	Calculated from TANESCO database
Value(s) applied	0.4950
Choice of data or measurement methods and procedures	Calculated as per “Tool to calculate the emission factor for an electricity system, version 07” as per the latest data available for the most recent year 2019. The data is obtained from TANESCO database.
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire crediting period

Data/Parameter	**$EF_{grid,CM,y}$**
Data unit	tCO_2/MWh
Description	Combined Margin CO_2 emission factor in year y

Source of data	Calculated from TANESCO database
Value(s) applied	0.4983
Choice of data or measurement methods and procedures	The combined margin emissions factor is calculated as follows: $\mathbf{EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}}$ Where: $EF_{grid,BM,y}$= Build margin CO_2 emission factor in year *y* (tCO_2/MWh) EFgrid,OM,y= Operating margin CO2 emission factor in year y (tCO2/MWh) WOM = Weighting of operating margin emissions factor (%) = 25% W_{BM}= Weighting of build margin emissions factor (%) = 75%
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire crediting period

B.6.3. Ex ante calculation of emission reductions>>

Component 1

Based on the Processing Factories' historical power requirements[16], it is estimated that initially 2,910 MWh/yr of electricity that would be generated by the Hydropower project plant will be used to meet the requirements of the processing factories, i.e. $EG_{BL,y,1,}$ instead of from the TANESCO grid, is estimated 2,910 MWh/year initially.

Hence,

Baseline emissions

$BE_{y,1}$ = $EG_{BL,y,1}$ * $EF_{CO2\ grid\ y,1}$
= 2,910 MWh/yr * 0.4983 tCO_2/MWh
= 1,450.05 tCO_2/yr

Project Emissions

$PE_{y,1}$ = 0 t CO_2

Leakage

$LE_{,y1}$ = 0

Emissions reductions

$ER_{y,1}$ = $BE_{y,1}$ – $PE_{y,1}$ – $LE_{y,1}$
=1,450.05 tCO_2/yr – 0 – 0
=1,450.05 tCO_2/yr

Component 2

The amount of electricity that would be sold to TANESCO, $EG_{BL,y,2}$ is estimated from the balance between the project plant's estimated total net electrical output, as given in the FSR and that which it is anticipated would be used to meet the requirements of the Processing Factories and consumed in the Villages connected to it. MHL has estimated the figure for the latter at 2,537MWh per year, as shown in Table B.2.

[16] Based on 2010 monthly electricity bills from TANESCO for one processing factory i.e MTC.

Table B.2. Estimated annual village end user electricity demand[17]

	user count	Estimated user connection	Approved Tariff 2011, TSH/kWh	Estimated usage/month	Total Monthly Usage, kWh
Households (1)	6295	2600	60	30	79500
Offices	30	26	157	50	1300
Shops	165	100	157	100	10000
Butcheries	15	14	157	200	2800
Workshops	7	6	157	250	1500
Woodworks	46	42	157	800	33600
Milling	71	63	157	650	40950
Schools	20	20	157	300	6000
Restaurants	33	25	157	200	5000
Bars/clubs	168	80	157	200	16000
Dispensaries/Clinics	13	13	157	150	1950
Hospital	1	1	157	1500	1500
Warehouse	7	6	157	150	900
Water pump	3	2	157	400	800
Church/Mosque	53	40	157	100	4000
Cell towers	2	2	157	2160	4320
Guest Houses	3	3	157	200	600
Hair cutting salon	9	7	157	100	700
		3,100		Annual GWh	2,537

Hence, the amount of electricity generated which would be exported to the TANESCO grid $EG_{BL,y,2}$ is estimated:

$EG_{BL,y,2}$ = 24,000 MWh/yr – (2,910 MWh/yr +2,537MWh/yr)
= 18,553 MWh/yr

Hence,

Baseline emissions

$BE_{y,2} = EG_{BL,y,2} * EF_{CO2grid,y,2}$
= 18,553MWh/yr * 0.4983 tCO_2/MWh
= 9,244.96 tCO_2e/yr

Project Emissions

$PE_{y,2} = 0$

Leakage

$LE_{y,2} = 0$

Emissions reductions

$ER_{y,2} = BE_{y,2} – PE_{y,2} – LE_{y,2}$

Total Emissions Reductions

[17] End user count based on the "Baseline Study for Mwenga Hydro Project". Final Report by the Tea Research Institute of Tanzania. Estimate for end users to be supplied by the hydroplant includes a target of 2,600 rural households and all schools and dispensaries. End user estimated monthly electricity consumption figures based on "EDF Energy Facility 2nd Call for Proposals – Annex E – performance indicator benchmarks"; TANESCO Energy Usage Pamphlet, and Business Plan for Andoya Hydro – "Mbangamao Small Hydro" to World Bank Sponsored TEDAP Facility.

$ER_y = ER_{y,1} + ER_{y,2}$
= 1,450.05 tCO_2e/yr + 9,244.96 tCO_2e/yr
= 10,695 tCO_2e/yr

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
2021	10,695	0	0	10,695
2022	10,695	0	0	10,695
2023	10,695	0	0	10,695
2024	10,695	0	0	10,695
2025	10,695	0	0	10,695
2026	10,695	0	0	10,695
2027	10,695	0	0	10,695
Total	74,865	0	0	74,865
Total number of crediting years	07			
Annual average over the crediting period	10,695	0	0	10,695

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data/Parameter	$EG_{BL,y,1}$
Data unit	MWh/Year
Description	Quantity of net electricity displaced in year y This is net electricity generated by the hydropower plant which is delivered to meet the requirements of the Processing Factories, but not including offset emissions from diesel backup generators
Source of data	Class 2 or better billing meter installed at the processing factories and, tested, and calibrated in accordance with manufacturer specifications and IEC and/or national standards when available and applicable
Value(s) applied	2,910
Measurement methods and procedures	Data will be collected in kWh on a monthly basis and annual overall consumption will be rounded to the nearest MWh for verification. MHL main meters and village transformer meters will be used as secondary checks against these figures and to monitor overall system efficiency and does not require calibration in accordance with manufacturers' specifications (ISKRA make meters) and instructions by an independent testing facility. These meters, in conjunction with the $EG_{BL,y,2}$ meter, can be used as backups to infer consumption at the off-take point in case of the failure of the off-take meter for $EG_{BL,y,1}$.
Monitoring frequency	Continuous measurement of electricity and monthly recording.

QA/QC procedures	• Data from MHL's main meter (again, Class 2 or better) compared with sales receipts and consumption figures obtained from meter readings taken at the Processing Factories. Data will be physically collected monthly by MHL for billing purposes to processing factories via a joint meter reading process. This data will be used to prepare the electricity bills to processing factories, which will be available for inspection from both processing factories head office and the MHL office as required. • Data to be archived electronically for at least 2 years after the later of the end of the crediting period or the last issuance of CERs for the project activity. • Meters tested and, if necessary, re-calibrated whenever a Party has reason to believe that the equipment is no longer performing to applicable IEC or national standards. MHL is responsible for testing and calibration. All testing and calibration will be performed in accordance with manufacturer's specifications. For ISKRA make meters, no calibration required as per manufacturers recommendation.
Purpose of data	To calculate baseline emissions
Additional comment	None

Data/Parameter	**$EG_{BL,y,2}$**
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y This is net electricity generated by the Hydropower plant which is delivered to the TANESCO national grid
Source of data	Billing meter installed at the TANESCO meter interconnection point (EDMI Mk10E Class 0.5), installed, tested, and calibrated in accordance with manufacturer specifications and IEC and/or national standards when available and applicable
Value(s) applied	18,553
Measurement methods and procedures	Data will be collected in kWh on a monthly basis and annual overall consumption will be rounded to the nearest MWh for verification. A secondary check meter is installed at this site so that the billing meter reading can be regularly checked for accuracy. It is also possible to use the processing factories meters, the MHL plant meter, and village transformer meters as a further check against these figures and to monitor overall system efficiency. These meter readings, in conjunction with the $EG_{BL,y,1}$ meter, can be used as backups to infer consumption at the interconnection point in case of the failure of both the main billing meter for $EG_{BL,y,2}$ and the check meter.
Monitoring frequency	Continuous measurement of electricity and monthly recording
QA/QC procedures	• Data from MHL's main meter compared with sales receipts and consumption figures obtained from meter readings by TANESCO, and cross-checked against a check meter on the MHL side of the grid interconnection • Data to be archived electronically for at least 2 years after the later of the end of the crediting period or the last issuance of CERs for the project activity • Meters tested and, if necessary, re-calibrated whenever a Party has reason to believe that the equipment is no longer performing to applicable IEC or national standards. TANESCO is responsible for testing and calibration of these meters as per Article 4 h) of the SPPA agreement. All testing and calibration will be performed in accordance with the manufacturers' specifications and instructions. For EDMI-mK10E make TANESCO meters, meter does not require any specific calibration frequency and no calibration required as per manufacturers' recommendations.
Purpose of data	To calculate baseline emissions

Additional comment	None

B.7.2. Sampling plan

Not Applicable

B.7.3. Other elements of monitoring plan

The Monitoring plan is designed to be in accordance with the modalities and procedures for small scale project activities. The monitoring plan describes the parameters to be monitored, monitoring practices, QA and QC procedures, data storage and archiving.

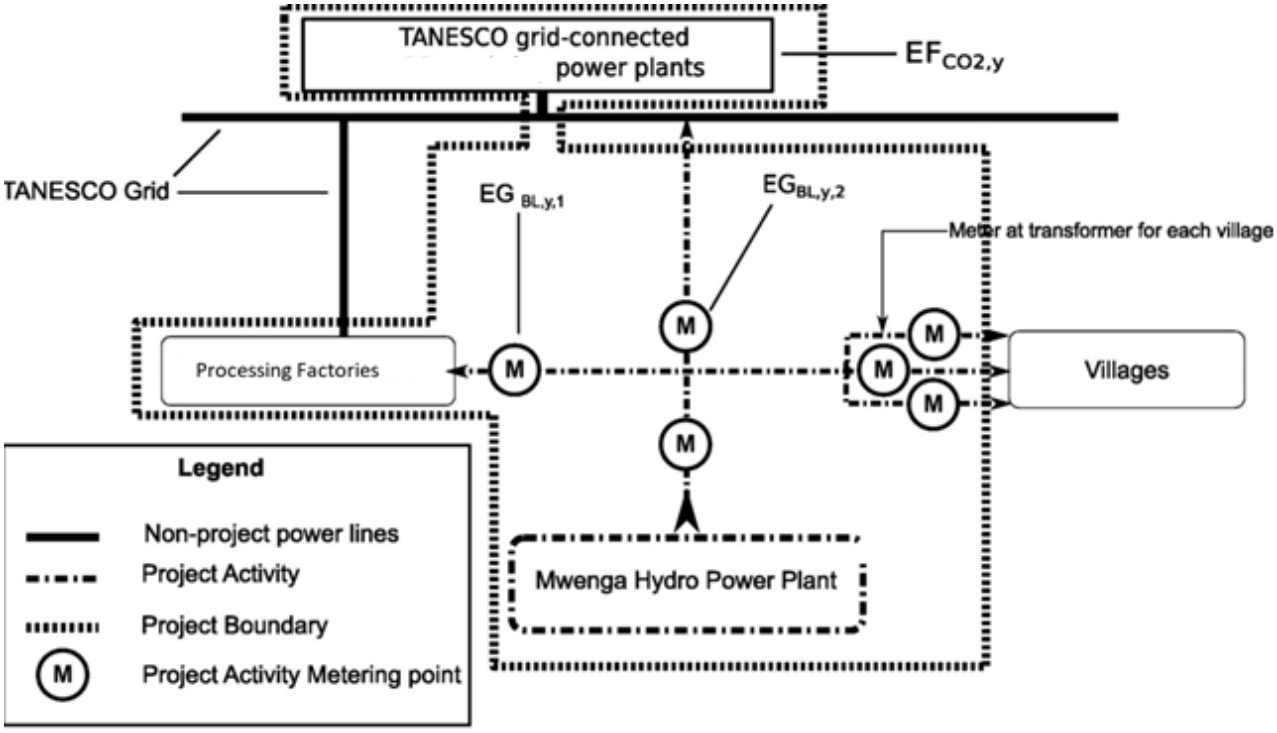
Parameters requiring monitoring:

The monitoring plan requires that the parameters indicated in section B.7.1 be monitored for the purposes of CER calculations. However, for operations as a whole, and to provide a backup in case of meter failure at either relevant off-take point, MHL will meter, with appropriate meters:

1) Total electricity produced from the power plant
2) Electricity delivered to processing factories ($EG_{BL,y,1}$)
3) Electricity delivered to TANESCO ($EG_{BL,y,2}$)
4) Electricity delivered to the villages at the transformer for each village. These village supply transformer meters, in conjunction with the total output meter, will be used for internal auditing purposes to monitor residential meter accuracy and transmission or other losses, and additionally allow reconciliation of power produced and distributed, particularly in the case of meter failure at a given off-take point.

As noted above, for $EF_{CO2,y}$, is fixed ex-ante parameter and constant throughout the crediting period.

Figure B.2. Simplified Monitoring Diagram indicating location of metering points covered by the monitoring plan



Notes: Diagram is not to scale. There will be a meter at the transformer from the project to each village. To keep this figure legible, only three village transformer meters are shown here. As noted throughout this document, emissions reductions are not being claimed for villages because of the

impracticality of establishing a valid baseline. As noted in parameters $EG_{BL,y,1}$ and $EG_{BL,y,2}$, the main plant meter and village transformer meters are monitored as secondary checks against the processing factories and TANESCO meters, and are therefore included within the project boundary. Per AMS I.D and associated guidance, grid-connected power plants with CO_2 emissions are included within the project boundary because they are used as the basis for calculating $EF_{CO2,y}$. Note that the project boundary does not include non-project power lines, because MHL is not responsible for building or maintaining them.

Metering Equipment and Seals

Metering devices shall enable the continuous measurement of the electricity supplied to meet the requirements of the processing factories, the TANESCO grid, and the villages.

MHL is responsible for the installation, ownership and maintenance of the metering at the Delivery Point and Off-take Points for the villages and processing factories. TANESCO is responsible for the seals on the billing and check meter at the grid interconnection point.

Meter Testing / Calibration

Meter testing and calibration is conducted in accordance with manufacturer specifications using calibration equipment approved by the manufacturer for that purpose.

The metering systems shall be designed such that the overall error of the metering installation, (including instrument transformers, wiring, and metering instruments) shall be in accordance with manufacturer specifications and national or IEC standards when available and applicable.

The main meter and the processing factories and village transformer meters tested and, if necessary, re-calibrated whenever MHL or one of its customers has reason to believe that the equipment is no longer performing within the applicable standards of accuracy given in the preceding paragraph. The calibration shall be performed by an individual or entity that is authorized to certify or otherwise attest that the meters have been calibrated in accordance with manufacturer specifications and national or IEC standards when available and applicable.

For ISKRA make meters, no calibration required as per manufacturer’s recommendation. If meters are changed with different manufacturers during verification, the new manufacturer’s recommendation will be followed for calibration interval.

TANESCO shall have the main and check meters at the grid interconnection point tested and, whenever a party has reason to believe that the equipment is no longer performing to applicable IEC, manufacturer, or national standards.

For EDMI-mK10E make TANESCO meters, meter does not require any specific calibration frequency and no calibration required as per manufacturer’s recommendation. If meters are changed with different manufacturers during verification, the new manufacturer’s recommendation will be followed for calibration interval.

After completion of any such testing, MHL shall prepare a statement which shall constitute a record of the results of the testing carried out, and the extent to which the meters were performing outside the required limits of accuracy.

If, at any time, it is determined by the MHL or one of its customers as a consequence of a test or as is otherwise manifestly necessary that the meters should be replaced, then MHL shall arrange for a new meter to be furnished. Such action shall be recorded and the relevant documentation held.

Procedures for documentation and storage

The Operations Manager of MHL will be responsible for the reading and recording of the respective kWh meter readings on the respective electricity meter(s) on the last day of each calendar month, along with the time of the reading, and the date of reading.

This data will be entered into a hard copy book set aside for this purpose, and kept at the Operations Manager's office. Additionally, this data will be used to generate invoicing to the respective customers, and will also be entered into a computer spreadsheet by the Operations Manager that mirrors this information. This file will form part of the monthly operations report of MHL. These physical and electronic records will be stored for at least two years after the end of the crediting period or the last issuance of CERs for the project activity.
The Operations Manager shall be responsible for maintaining records of meter testing and any replacement, as well as any other information relating to the meters' operations.

Internal audits shall be conducted annually under the supervision of the Director, Internal Audit of MHL's parent company.

Training for monitoring personnel

Staff involved in monitoring and reporting shall be trained to ensure that the relevant monitoring and reporting procedures that need to be followed as part of the above monitoring plan.

Management will be responsible for ensuring that staff responsible for monitoring and reporting have received adequate training.

MHL will provide the necessary management structure and allocate responsibilities to staff to be identified at a later stage to ensure that the above procedures are adhered to.

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

19/10/2010, the date the contract was signed for the hydroelectric turbine.

C.2. Expected operational lifetime of project activity

25 years and 00 months. The manufacturer has rated the equipment for 50 years, but to be conservative, we have down-rated this to 25 years.

C.3. Crediting period of project activity

C.3.1. Type of crediting period

Renewable crediting period
Second crediting period

C.3.2. Start date of crediting period

30/01/2020

C.3.3. Duration of crediting period

7 years and 00 months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

An Environmental Impact Statement (EIS) was prepared to fulfil the requirement of The Environmental Management Act (No. 20) of 2004 and the Environmental Impact Assessment and Audit Regulations of 2005 of the government of Tanzania. It also seeks to recommend any mitigation measures to minimize any possible negative impacts and means to enhance the positive

impacts of the project in order to make it sustainable.

The Environmental Impact Assessment and Audit Regulation Act of 2005 emphasizes the importance of conducting an Environmental Impact Assessment (EIA) before the development of the project. It defines the EIA as a systematic examination, conducted to determine whether or not a programme, activity or project will have any adverse impacts on the environment. It further emphasizes the importance of environmental audit, which it defines as a systematic evaluation of activities and processes of a project to determine how far these activities and programmes conform to the approved environmental management plan of that specific project and sound environmental management practices and applicable environmental standards.

The Act also provides an outline of the nature of development projects that require an EIA study. According to this Act, all energy development projects require a mandatory EIA. It is on this basis that the National Environment Management Council (NEMC) directed MTC through the letter with reference number NEMC/179/1/vol 23/172 to carry out a full EIA study after screening their project brief.

The findings and recommendations of the EIA are presented in an Environmental Impact Statement (EIS). The EIS report was completed with the aim of meeting in full the requirements of the Tanzanian Environmental Impact Assessment and Audit Regulations of 2005, but also to satisfy international requirements such as those of The World Bank and the International Finance Corporation.

The National Environment Management Council (NEMC) is responsible for the review of the EIS report. The Sector Ministry approves implementation of the project after receiving recommendations from NEMC by issuing an Environmental Impact Assessment Certificate after ensuring that the environmental statement complies with environmental requirements.

The EIS[18] report provides the results of an assessment of the environmental aspects of the project and its impact on the natural environment. Mitigation measures, management and monitoring plans have been recommended as part of this assessment.

Impacts

The major ecological impacts associated with the project are related with clearing of vegetation during construction works and drying of the river bed due to water diversion.

So far, no significant number of unique aquatic or endangered species of fauna or flora of commercial, scientific or conservation value have been identified during the survey within the 450 m stretch nor around the project site. Most of the important species of flora and fauna have been noted to be widespread within the existing forest reserves around the project area.

The ecological survey has documented the main flora and fauna. The diversion of water may result in drying of the river banks and the river bed in the month of November, hence affecting the normal growth of the existing riparian vegetation, especially the water ferns and other micro-fauna which depend on continuous flashing by water flows. A prolonged drought could result in damage to the river bank vegetation, especially to the existing fern plants which grow on dead woods. The drying of the river bed could also affect the life of aquatic fauna, including frogs and other organisms which depend on the availability of water flows. However, none of these has any significance on the spatial scale.

The problem should be mitigated by allowing a minimum water flow through the river stretch during extreme drought. The determination of minimum flow could be done by assessing the critical amount of water required for electricity production during periods of drought.

[18] **"**Environmental impact statement (EIS) for the Mwenga hydropower project in Mufindi district, Iringa region." Nyinisaeli K Palangyo, submitted to the National Environment Management Council (NEMC) Dar es Salaam, Tanzania.

Recommendations

The following recommendations were put forward to ensure the sustainability of the project and to maintain the good intention of the project:

- In order to safeguard the ecological integrity of the Mwenga River, including the 450 m stretch, the EIS report recommends that the following measures be implemented by the project proponent:
  (a) The minimum environmental flow requirement must be determined to ensure that no long-term ecological impacts will occur due to alteration of water flow through the river bed stretch.

  (b) The project proponent must avoid discharge of raw sewage effluent into the river during construction and operation phase to avoid cumulative impacts downstream of the project site.

  (c) The project management should give special attention and execute programme for protecting the Prunus africana tree due to its status. That means workers and local people should not be allowed to harvest the plant because it is restricted by CITES.

  (d) Periodic monitoring of the river bed stretch must be implemented to detect any changes occurring within the area and take remedial measures immediately to reverse the effect. This includes supporting appropriate catchment management programs to ensure that soil is not washed away as a result of the project activity.

  (e) The Contractor must avoid unnecessary clearing of vegetation during construction and must confine construction works only on-site. This should also include paving all bare areas and/or planting of grass to minimize soil erosion. During operations, the project will support appropriate afforestation activities to preserve the catchment area, i.e. to plant trees and grass within the 200-meter boundary of the river within the immediate project area from the intake weir to the power house outlets.

- Since there is no specific In-stream or Environmental Flow Requirement (EFR) defined for Tanzania, it is estimated that a 10% of the annual minimum flow should be considered as a minimum. This is around equal to 0.45 m3/sec in the Mwenga River. Subsequently, this was revised upwards to 2.5 m3/sec and set as a condition upon which the Water Permit was to be awarded. This figure will be re-evaluated based on ecological evidence and reduced only based on such evidence. This amount should be allowed to flow between the diversion and the point of return flow during periods of drought.
- Because there is no gauging station on the river, MTC implements a programme of monitoring flows at the intake. Once the abstraction starts a second station needs to be installed downstream to monitor how much water is left in the river (the EF). The difference between the two will be the abstraction. The company should also monitor their abstraction directly. The monitoring programme should include a quick re-visit each year by an ecologist to check on the health of the river. If any impacts are noticed then these have to be discussed with the company and abstraction adjusted accordingly.
- It is important to check and understand the variability of the low flow from year to year and the ecologically important times of dry season in October to November. This data should be correlated with that from the Mpanga River Gauging Station 1KB8B in order to have more data for conclusive information on the conditions at the site in terms of environmental flow requirements
- Monitoring is a long-term process which is recommended should begin at the start of the project. Its purpose is to establish a baseline so that the nature and magnitude of anticipated environmental impacts are continually assessed. Monitoring therefore involves a periodic review of mitigation activities to determine their effectiveness. Consequently,

trends in environmental degradation or recovery can be established and previously unforeseen impacts can be identified and means to address can be brought forward.

- The EIS report also recommended that an Environmental and Social Management Plan (ESMP) and monitoring be implemented to ensure sustainability of the project. Both parties, project proponent (MTC) and Contractor should ensure that they fulfil their responsibilities.

The Environmental Impact Assessment Certificate referred to in Section D.1 above, for the project activity was issued for the project on November 20th, 2009, thus certifying that the host party environmental requirements have been met. The project proponent shall implement all relevant EIS recommendations that supported the issuance of the Environmental Impact Assessment Certificate.

D.2. Environmental impact assessment

The Environmental Impact Assessment Certificate referred to in Section D.1 above, for the project activity was issued for the project on November 20th, 2009, thus certifying that the host party environmental requirements have been met. The project proponent shall implement all relevant EIS recommendations that supported the issuance of the Environmental Impact Assessment Certificate.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

A stakeholder consultation was undertaken as part of the Environmental Impact Statement preparation. The Following stakeholders from national to village level were identified: the project proponent, National Environment Management Council (NEMC) environmental authority, Rufiji Basin Water Office manages the water issues in Rufiji basin; Mufindi District Authority, Local leaders, WWF have stake in Kilombero valley; TANESCO a power company responsible for distributing power to the area and the whole country; EWURA, energy and Water utility regulator, 14 villages falling in the project areas as beneficiaries and affected people.

These stakeholders were involved through consultation, interviews, public meetings for which their comments and concerns are addressed in the EIS report.

Consultations

An important element in the process of the project's impact assessment is consulting with stakeholders to gather the information needed to complete the assessment. In the public consultation process two types of consultation were considered:

- Consultations with District and Local authorities; and
- Consultations with communities along the transmission line way leave.

Fundamentally these consultations are intended to disseminate project information, to obtain views and perceptions regarding the project and also to gather information regarding sources of livelihood, living standards and other socio economic elements.

Consultative Meetings with District and Local Authorities

Consultative Meetings at district and local levels included discussions with district and regional officers, specialists and other knowledgeable people and key informants. These consultations were held in key selected locations along the transmission line way leave.

Consultations with District Authorities covered Mufindi District. These consultations were conducted as either:

- Direct, personal interviews with selected district leaders and informants, or

- Focus Group Meetings with authorities and technical personnel (e.g. District Planning Officer, District Engineer, agricultural extension services, Natural resource officers, etc).

Agenda

Typically, the Agenda for these consultations included:

- presenting the Project:
- presenting the advantages and disadvantages of the project and the associated transmission lines that will connect nearby villages;
- presentation way leave management features;
- defining the project requirements and Regional/District institutional framework;
- discussing recent experience in the District with respect to compensation eligibility criteria and entitlement packages;
- obtaining from the authorities their environmental and socio-economic concerns and perceptions regarding the project; and
- discussing the role of the authorities in public information dissemination, monitoring and management plan.

Community Consultations

Information flow:

Dissemination of Project information among communities located along the transmission line way leave is an important aspect of the public participation process. Such communities should be appropriately informed about what is planned. Women and youth were also involved in a two-way dialogue regarding the Project.

Objectives

The main objectives of community consultations are to:

- provide clear and accurate information about the Project to the communities along the transmission way leave and the beneficiaries of the project;
- inform communities along the way leave about the Project schedule;
- obtain the main concerns and perceptions of the population and their representatives regarding the hydropower project and the associated transmission lines;
- obtain opinions and suggestions directly from the affected communities on their preferred mitigation measures; and
- identify local leaders with whom further dialogue can be continued in subsequent stages of the Project.

Organization

For each meeting to be hosted by local authorities which lasted not more than 1 hrs, at least two Consultants were present for each meeting; one to acted as moderator, and other to take notes for the minutes of the meeting. The project proponent, was also involved in presenting some issues of the project and organization of the meetings.

Agenda

The Agenda for the Community consultations included:

- presenting the Project:
- presenting the advantages and disadvantages of the project and the associated transmission lines that will connect more than 14 villages;

- presentation way leave management features;
- defining the project requirements and Regional/District institutional framework;
- discussing recent experience in the District with respect to compensation eligibility criteria and entitlement packages;
- obtaining from the communities and authorities their environmental and socio-economic concerns and perceptions regarding the project; and
- discussing the role of the authorities in public information dissemination, monitoring and management plan.

All these community consultations took place between the month of October 2008 and February 2009 as the following table shows

Table E.1 Community meetings Schedule:

Meeting Date	Ward	Village	Ward/village population	Meeting status
29/10/08	Ihanu	1.Isipi	1230	Conducted
31/10/08	Ihanu	2.Ihanu	1206	Conducted
12/1/09	Iyegeya	3.Iyegeya	1321	Conducted
29/10/08	Ibwanzi	4.Lulanda	1119	Conducted
30/10/08	Ibwanzi	5.Ibwanzi	1754	Conducted
31/10/08	Ibwanzi	6.Nandala	1323	Conducted
1/11/08	Mdabulo	7.Ikanga	1375	Conducted
1/11/08	Mdabulo	8.Kidete	2602	Conducted
31/10/08	Ihanu	9.Kilosa	1851	Conducted
1/11/08	Mdabulo	10.Mlevelwa	970	Conducted
12/1/09	Luhunga	11.Igoda	2071	Conducted
12/1/09	Luhunga	12.Luhunga	2790	Conducted
1/11/08	Mdabulo	13.Mdabulo	1700	Conducted
13/1/09	Luhunga	14.Mkonge	2097	Conducted
14/1/09	Luhunga	15.ikaning'ombe	No data	Conducted

Public consultations took the form of a public village meeting in all the villages likely to be affected or benefited by the project, an example of which is provided in Figure E.1. below. Village leaders were used to facilitate the meeting by establishing a date, time and calling up for a meeting.

Figure E1. One of the public meetings in the project areas to identity local concerns[19]

[19] Mwenga Environmental Impact Statement, July 2009. Submitted to the National Environment Management Council (NEMC)

E.2. Summary of comments received

Main Stakeholder comments were:

- All stakeholders are positive about the project but want the project to be sustainable and ensure that other environmental subsystems are protected by releasing some amount of water to the river.
- The project should provide fair, transparent and prompt compensation for those who may be affected it.
- Employment and other benefits accrued from the project should also be directed to the people in the villages to be affected
- The project proponents and implementers were requested to respect burial sites though there is no problem if there will be a need to relocate the graves provided compensation for the cost to relocate them is provided.
- The main concern in every village was implementation of the project in a manner that they all benefit from it.
- There was a request for special a tariff and connection fees to be awarded to schools and village offices connections
- Villagers wanted the issue of safety be given priority and require more awareness on the safety measures associated with the use of electricity and in case of electrical accidents
- Villagers wanted that natural forests be avoided when identifying transmission line routes

Comments obtained from each of the Community consultations carried out are provided in Annex C of the Mwenga Environmental Impact Statement.

E.3. Consideration of comments received

Stakeholder comments were addressed in part by clarifying a number of issues during the actual stakeholder meetings and through the identification of a number of measures to be implemented. The following table lists the most common comments made by stakeholders and the responses provided to them.

As the table in Appendix 7 shows, a number of responses provided to address stakeholder concerns consist in the implementation of concrete measures. In order to ensure that the measures that have been put forward to address the stakeholder's concerns are implemented, the project owner has designed Environmental and Social Management and Monitoring Plans and submitted these to the National Environment Management Council (NEMC) as part of the Mwenga Environmental Impact Statement, which is incorporated here by reference.

SECTION F. Approval and authorization

A letter of approval for the project was obtained from the Tanzanian DNA on 29/11/2011 and from the Swedish DNA on 01/11/2011.

Appendix 1. Contact information of project participants

Organization name	Mwenga Hydro Ltd
Country	Tanzania
Address	P.O. Box 555, Mafinga, Iringa
Telephone	+255 68 599 3351, +43 69 91 920 9597
Fax	-
E-mail	franz@riftvalley.com
Website	www.riftvalleyenergy.com
Contact person	Franz Kottulinsky

Organization name	Mwenga Hydro Ltd
Country	Tanzania
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Fax	-
E-mail	mgratwicke@riftvalley.com
Website	www.riftvalleyenergy.com
Contact person	Michael Gratwicke

Organization name	Swedish Energy Agency
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Fax	+46 (0)16 544 2099
E-mail	backoffice@energimyndigheten.se
Website	http://www.energimyndigheten.se/
Contact person	Christer Gustafsson

Organization name	Swedish Energy Agency
Country	Sweden
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Fax	+46 (0)16 544 2099
E-mail	kenneth.mollersten@energimyndigheten.se
Website	http://www.energimyndigheten.se/
Contact person	Kenneth Möllersten

Appendix 2. Affirmation regarding public funding

There are no public funds used in the project that would result in a diversion of official development assistance, as confirmed by the EU delegation to Tanzania in the following letter:

EUROPEAN UNION

DELEGATION TO THE UNITED REPUBLIC OF TANZANIA

The Head of Delegation

D/2011/00414/FM/nr

5th October 2011

TO WHOM IT MAY CONCERN

The European Union Delegation to Tanzania hereby confirms that the grant funds allocated to the Mwenga Hydropower project through the 1st EU-ACP Energy Facility Programme are intended for use in such energy projects in ACP countries including Tanzania.

These funds, which are a form of Official Development Assistance (ODA), were not diverted from other development uses of the European Union to Tanzania in order to finance Mwenga Hydropower project as CDM project.

Enrico Strampelli
Head of Cooperation

P.O. BOX 9514, DAR ES SALAAM

Telephone :(255-22) 2117473 to 76 Fax: 2113277 - E-mail: Delegation-Tanzania@ec.europa.eu

Y:\Intra-Development Cooperation\Co-financing NGOs\Co-financing NGO Projects\2007_195963 Mwenga Hydropower\Correspondence\

Appendix 3. Applicability of methodologies and standardized baselines

No further information

Appendix 4. Further background information on ex ante calculation of emission reductions

Please refer section B.6

Appendix 5. Further background information on monitoring plan

No further information

Appendix 6. Summary report of comments received from local stakeholders

Stakeholder ID	Stakeholder	Common Issues	Response
1	Surrounding villages where distribution lines shall pass	1. Shall the distribution lines pass through our homesteads?	- The distribution lines shall by pass settlements to avoid displacement and relocation of people
1	Surrounding villages where distribution lines shall pass	2. Shall the distribution lines pass through farming land?	-Where unavoidable, the distribution lines may pass through farm land but villagers shall be allowed to grow short seasonal crops leaving access route if required
1	Surrounding villages where distribution lines shall pass	3. When shall the project start?	- The project implementation shall commence when the developer complies with all required regulations
1	Surrounding villages where distribution lines shall pass	4. What benefits shall we get from the project implementation?	-There are quite a number of benefits associated with the project implementation; employment opportunities, connection to the national electricity grid, improved livelihoods and general economic growth.
1	Surrounding villages where distribution lines shall pass	5. Shall compensation be done for crops destroyed?	-Crops destroyed if any shall be compensated fairly
1	Surrounding villages where distribution lines shall pass	6. What space shall be required for the way leave?	- About 10m wide right of way is required
1	Surrounding villages where distribution lines shall pass	7. Shall we get employment for unskilled labor?	- The contractor implementing the project shall require unskilled labor. The number of laborers required shall depend on his labor demand at any given time.
1	Surrounding villages where distribution lines shall pass	8. What shall be done in the event the distribution line passes through graves and spiritual places?	-The distribution lines shall avoid spiritual and burial places -Where avoidance of graves is not possible, relocation of graves shall be done in accordance to rites and rituals and the elders or priests shall be involved
1	Surrounding villages where distribution lines	9. What shall be the connection costs to individual	-The distribution company, MTC in liaison with TANESCO and EWURA shall agree on connection costs and

	shall pass	houses?	tariffs that shall be communicated to the people requesting for connection
1	Surrounding villages where distribution lines shall pass	10. Shall institutions like hospitals and schools be connected to the national electricity grid?	-The authorities running the institutions shall apply for electricity after which connection shall be done
2	District Authorities	1. How shall compensation be done for land acquired or crops for the villagers affected?	-The project does not aim at displacing or relocating people - Evaluation shall be done and compensation done if any for the affected people
2	District Authorities	2. Shall employment opportunities be prioritized to people in the project area?	-For unskilled labor, priority can be given to people in the project area while recruitment of skilled labor shall be based on the free market
2	District Authorities	3. How shall the effects associated with the project implementation be dealt with?	-The EIA study being done shall assess these impacts and develop appropriate mitigation measures that the contractor and the developer shall adhere to

Appendix 7. Summary of post-registration changes

Minor changes to project design in the first crediting period which are listed below:

- **Section A.3, Project Design:** Changes to project design due to site geography mean that small water channel and low head closed conduit runs 70m rather than 50m as in registered PDD
- **Section A.3, Powerhouse Flow Requirements:** After some testing and environmental monitoring, the final Water Use Permit was issued with a requirement of 1m^3/s environmental flow for maintenance of the river during periods of low flow, rather than at 2.5m^3/s as estimated in registered PDD
- **Section A.3, Electromechanical Equipment:** The type of turbine and the name plate data of the turbine and alternator have not altered in any way. During routine operational tests conducted over the course of wet seasons of 2013 and 2014, the PO was able to determine the maximum instantaneous capacity available out of the turbine, and subsequently the generator terminals. This information has been added as a footnote in this revised PDD
- **Section A.3 Distribution Network:** Additional rural distribution infrastructure is larger than that described in the registered PDD. 35 km of minor spur lines have now been installed rather than 34 km as estimated in the registered PDD. An estimated 40 km of LV distribution lines have now been installed within the various target villages rather than 30 km as estimated in the registered PDD. These are however outside the boundary of the registered CDM project and no CERs are claimed for this element of the project.
- **Section B.6.1 and B.6.2:** Clarification that the Simple Adjusted OM is calculated based on the Ex ante data vintages Option for the estimates appearing in this PDD. However, as stated in the Monitoring Plan, Ex Post monitoring shall be used.
- **Section B.7.3:** clarification that the grid emission factor will be calculated in accordance with ex-post monitoring procedures.

Editorial changes due to adoption of new PDD template, listed below:

- **Cover page:** completion of additional fields, namely Project participant(s), Host Party, Sectoral scope and selected methodology(ies), and Estimated amount of annual average GHG emission reductions, in line with new PDD template
- **Section A.1 and section A.3:** additional text to clarify that the project is a greenfield project and to describe the scenario existing prior to implementation of the project and the baseline scenario
- **Section B.6.2:** completion of additional fields, namely purpose of data Section B.7.1: completion of additional fields, namely purpose of data and monitoring frequency
- **Section B.7.2:** clarification that this section is not applicable to this project
- **Section F:** additional text to confirm that Letters of Approval have been received from the Tanzanian DNA and the Swedish DNA for this project
- **Appendix 1:** addition of Camco contact details as responsible entity for application of selected methodologies
- **Appendix 3:** Transfer of text from Appendix 3 to Appendix 4
- Revised Appendix references in the entire PDD text

The above post registration changes were requested earlier and were approved on 21/10/2015.

During the third verification period, the changes as stated below have been requested:

1. The latest PDD template version 10.1 has been used and relevant editorial changes has been made as per PDD completion requirement,
2. The PDD has been revised to remove the specific name of processing factory. MTC is revised as processing factories to allow project activity to supply electricity to other eligible processing factories.
3. Further, the rural network has (since commissioning 2012) grown organically and expanded. Therefore, the PDD has been revised in order to state, that the number of (14) villages is not final (concluding).
4. Being ex-post monitoring of grid emission factor, transparent information of use of simple OM option if eligible and use of latest version of “Tool to calculate the Emissions Factor for an electricity system” is mentioned. For BM, option 2 of ex post monitoring is mentioned in PDD.
5. The calibration frequency information is revised and manufacturer’s recommendation is considered. For ISKRA make meters (processing factories meters) and for EDMI-mK10E make TANESCO meters, no calibration is required as per manufacturer’s recommendation. Also, it is mentioned that “If meters are changed with different manufacturers during verification, the new manufacturer’s recommendation will be followed for calibration interval.”
6. Contact information for Project Participants has been updated.

Appendix 8. Plant Load Factor

Mwenga Hydro Limited

A MEMBER OF THE RIFT VALLEY HOLDINGS

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1st November 2011

To whom it may concern

Re- Mwenga Hydro Ltd. Capacity Factor Used Within Its Financial Model Submitted to Banks

Below is an extract from the "base assumptions" worksheet of the financial model that was submitted to CRDB bank during the process of securing its loan facility.

Finance Charges				
	Interest on Loan		14.0%	
	Interest on OD		14.0%	
	Pay Back Period		7	
	Loan Repayment start		Year 3	
	Grant	%	49%	
	Debt	%	47%	
	Equity	%	4%	
Currencies	Tsh Devaluation - US$	%	1.49%	
	Tsh Devaluation - Euro	%	2.19%	
	Tsh Inflation	%	7.00%	*Source:http://www.imf.org/external/np/loi/2009/tt*
	Regional US$ Inflation			
	Sales Tanesco	(kWh)	18,788,563	
	Sales MTC	(kWh)	2,611,437	
	Sales Disco	(kWh)	2,600,000	
	Assumed Generating Capacity	(kWh)	29,000,000	

From the extract, it can be seen that a total generation of 24,000,000 kWhrs was forecast (18,788,563 + 2,611,437 + 2,600,000), against an assumed Generating Capacity of 29,000,000.

This yields a load factor of 82.8%, and is substantially lower than the 92.6% that was assumed in the independent feasibility study. This lower load factor figure was chosen so as to ensure that a conservative approach was adopted in our financial forecasts, and so minimize any risk of failure to meet our forecast generation levels.

Yours faithfully

Michael Gratwicke

Project Manager / Director

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Ref No. 3390/MHL/TL/2012/01

18th June 2012.

To Whom it May Concern

Re: Financing of Mwenga Hydro Power Project.

Please refer to the above subject matter.

Mwenga Hydro was awarded a loan facility o[redacted] by CRDB Bank PLC to finance construction of Mwenga Hydro Power Project. This loan facility was accepted by Mwenga Hydro Ltd. on the 26th July 2010.

We confirm that the forecast annual energy sales used in the financial assumptions of the financial model that formed part of the loan facility application was 24,000,000 kWhrs. The assumed maximum generation capacity of the plant within the same model was 29,000,000 kWhrs.

Yours faithfully,

Frederick W. Mwamyalla
Relationship Manager

Charles R. Bandoma
Ag. Director of Corporate Banking

Appendix 9. Net Conversion Efficiency Figures

Power plant	Generated electricity (2017)	Generated electricity (2018)	Generated electricity (2019)	η_{my} Average net energy conversion effiency[1]
	[MWh]			
	A			B
SONGAS UGT 1&2	341,152	298,396	2,431,506	0.355
SONGAS UGT 3,4,5&6	1,133,354	1,173,510	325,732	0.355
UGP1	575,347	486,056	573,299	0.465
TGP	236,997	147,541	213,537	0.432
UGP2	959,068	911,883	859,926	0.395
KINYEREZ 1	950,806	861,961	718,516	0.395
KINY II	12,150	897,994	1,120,717	0.395
MTWARA	-	-	2,999	0.395
SOMANGA	-	-	403	0.395
IPTL	52,707			0.383
ZUZU	689	676	31	0.247
NYAKATO	148,741	30,912	671	0.284
Total	**4,411,010**	**4,808,929**	**5,004,734**	

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Document information

Version	*Date*	*Description*
11.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
10.1	28 June 2017	Revision to make editorial improvement.

Version	*Date*	*Description*
10.0	7 June 2017	Revision to: • Improve consistency with the “CDM project standard for project activities” and with the PoA-DD and CPA-DD forms; • Make editorial improvement.
09.0	24 May 2017	Revision to: • Ensure consistency with the “CDM project standard for project activities” (CDM-EB93-A04-STAN) (version 01.0); • Incorporate the “Project design document form for small-scale CDM project activities” (CDM-SSC-PDD-FORM); • Make editorial improvement.
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the “Standard: Applicability of sectoral scopes” (CDM-EB88-A04-STAN) (version 01.0).
06.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Make editorial improvement.
05.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1; • Change the reference number from F-CDM-PDD to CDM-PDD-FORM; • Make editorial improvement.
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	13 March 2012	Revision required to ensure consistency with the “Guidelines for completing the project design document form for CDM project activities” (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

Version	*Date*	*Description*

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