Project design document form

(Version 10.1)

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

BASIC INFORMATION	
Title of the project activity	Itezhi Tezhi Hydro Power
Scale of the project activity	☒ Large-scale ☐ Small-scale
Version number of the PDD	9.0
Completion date of the PDD	13/04/2018
Project participants	Itezhi Tezhi Power Corporation (ITPC)
Host Party	Zambia
Applied methodologies and standardized baselines	ACM0002, version 16.0 Standardized baseline: Grid emission factor for the Southern African power pool (version 01.0)
Sectoral scopes linked to the applied methodologies	Energy industries (renewable-/non renewable sources)
Estimated amount of annual average GHG emission reductions	589,248 tCO_2

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The project activity consists of constructing and operating a 120 MW hydropower plant at the existing Itezhi Tezhi dam on Kafue river in Zambia, with associated ancillary equipment and structures and a transmission line to evacuate the generated electricity. The dam regulates the flow of the Kafue river for hydroelectric power generation and other water uses downstream. The reservoir is located approximately 295 km upstream of the confluence of the Kafue River and the Zambezi river and approximately 230 km upstream from the existing upper Kafue gorge hydro power plant (990 MW). The dam is a conventional rockfill dam with a central impervious core and shell zone meant for the control of seepage and prevention of any degradation of the embankment material properties. The reservoir has a total storage capacity of about 6,000 million cubic metres at elevation of 1,030.5 metres above mean sea level. It is impounded by an earth fill dam with a maximum height of about 51 metres and a crest length of about 1,400 metres. Power will be generated using the head available at the existing dam and flow released[1], and therefore there will be no construction of any new dam, or any change in the surface area of the existing reservoir or volume of water impounded. The average generation output is estimated at 611 GWh per year.

Surface power house and ancillary structures will be incorporated into the existing rock filled dam on Kafue river. The project activity will entail modifications of the existing intake, construction of a surface Power House to house two Kaplan turbines connected to synchronous generators with capacity of 120 MW. It will also involve the placement of a switchyard about 100m from the Power House. The current height of the dam will be maintained.

The project activity will also include construction of a transmission line of about 300 km in length to evacuate power from the plant, via Mumbwa, to Lusaka West. The transmission line will be constructed and maintained by the state company, ZESCO Ltd, that generates, acquires, transmits and supplies electricity as a public undertaking. The Itezhi Tezhi – Mumbwa 220 kV single circuit transmission line will originate from a 220 kV substation on the South bank of the Kafue River at the Itezhi Tezhi dam, located about 100m from the power house, to Mumbwa substation, a distance of approximately 146 km. From Mumbwa substation, a single circuit line of 330 kV (stepped up from 220 KV) to Lusaka West will be constructed with a length of 145 km. The electricity will be connected to the Southern African Power Pool (SAPP) grid that is dominated by thermal power plants, resulting in a high grid emission factor (combined margin grid emission factor 0.9644 tCO_2/MWh)[2]. In addition electricity will also be exported to the neighbouring Kataba town via a dedicated 33kV transmission line. All metering and payment arrangements for this 33kV line are totally separate from arrangements for the 220 kV single circuit transmission line. In order to be conservative these exports to Kataba town will not be included in the calculation of emission reductions and exports of electricity via the dedicated 33kV line are not included in the monitoring plan. The metering arrangements are shown in Figure 1 which shows which electricity supplies are accounted for in the emission reduction calculations.

[1] ITPC Ltd, Feasibility report for Itezhi Tezhi Hydro Electric Project (2 x 60 MW) by TEC Consulting Engineers Ltd.

[2] Standardized baseline for "Grid emission factor for the Southern African power pool", Version 01.0, EB 73. Annex 3

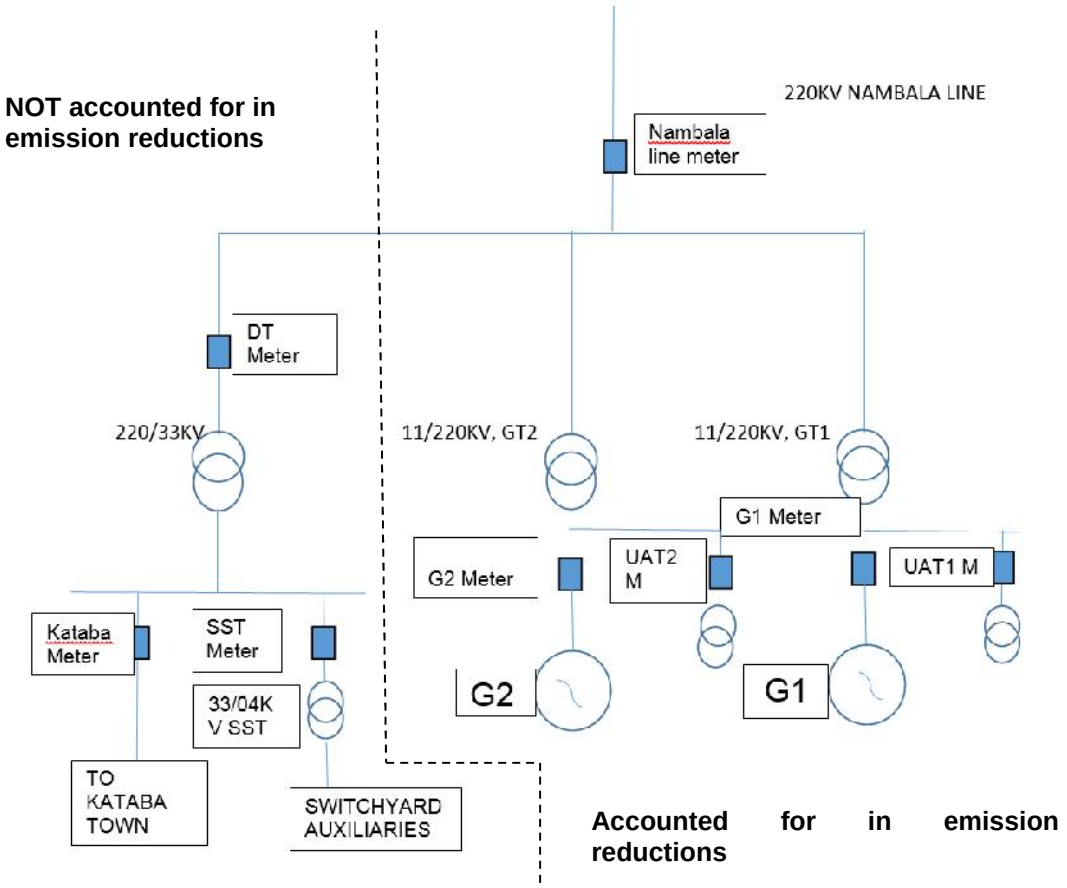


Figure 1: Schematic diagram of ITT power station metering points showing emissions accounted for and not accounted for

Zambia and the Southern African region in general continue to experience strong demand for power due to high economic growth. Zambia's tremendous hydro generation capacity is economically significant for both the national and regional markets. This project can therefore play an important role in increasing the supply of reliable power in the region, thereby helping to close the demand-supply gap. The project aligns with the Zambian strategy to develop its natural endowments of hydropower generation potential for national consumption and international sale. The market for the additional electricity to be generated exists within the South African Development Community SADC region where it is estimated that by 2025, 78 GW will be required to meet the predicted 6% economic growth, and 167 GW by 2040. The current total installed capacity is about 53 GW.

Zambia's hydropower potential and geographic position within the SADC region and the interconnected SAPP network is key to meeting some of the region's base-load requirements. ZESCO Ltd's network links the generating centers in the Democratic Republic of Congo (DRC) and Zambia and the load centers in Zimbabwe, Namibia, South Africa. The project will result in greenhouse gases emission reduction of 589,248 tCO_2/year on average

The proposed project activity will displace an equivalent amount of electricity that would have been generated using fossil fuels by making use of renewable and clean energy. The project has positive social and environment benefits. Specifically, the project has the following positive benefits:

- Contribute to the achievement of national development objectives contained in Zambia's Vision 2030 and its Sixth National Development Plan (2011-2015), in particular to the achievement of Zambia's strategic focus of diversifying the economy from dependence on copper mining

(export diversification) and promoting regional integration by enhancing national/regional interconnectivity

- Contribute to reducing poverty by ensuring reliable energy supply for domestic, commercial and industrial use
- Improve business infrastructure enabling environment and boost economic development and diversity
- Increase electricity supply and access to electricity in the country and in the region.
- Improve district health facility and reduce the usage of diesel generators
- Reduce GHGs emission by supplying green electricity in Zambia and neighboring countries
- Promote private public partnership. This is the first large scale renewable PPP power project in the country.
- Promote small scale entrepreneur activities, such as retail businesses and installation of milling machines
- Create skilled and unskilled job opportunities during construction and operation phases which will improve the local economy. It is expected that 450 jobs and 100 jobs will be created during construction and operation phases respectively.
- Open market opportunities at the project site for local products in particular agricultural products.
- Generate hard currency revenues for the government.

Project status and implementation plan

As of the date of publication of the PDD, approximately 59% of the total project has been completed, as summarised in the table below:

Activity	% completed	Comment
Infrastructure works	100%	Includes permanent camp for workers, office block, water and sewerage treatment plants (new and rehabilitation of old plants), rehabilitation of Kataba 33/11kVSubstation and rehabilitation of Kafue Flats, ZESCO Guest Houses and Mess.
Design	84%	Includes detailed design work, including civil, hydro-mechanical and electrical-mechanical design
Construction	48%	Includes civil works, ground power house, headrace tunnel, surge shaft, tailrace and switchyard, hydro-mechanical works, electrical-mechanical works, instrumentation and control systems
Procurement	42%	Includes procurement of hydro-mechanical and electro-mechanical equipment

As seen from the table above, all infrastructure work has been completed. With respect to the main work, the majority of the detailed design work, including civil, hydro-mechanical and electrical-mechanical design has been completed. With respect to the construction work, the majority of the surge shaft and power house have been completed, whereas the majority of the hydro-mechanical and electrical-mechanical works and installation of instrumentation and control systems is still on-going. Finally, much of the hydro-mechanical equipment is still to be procured, whereas procurement of the electrical-mechanical equipment is at a more advanced stage.

Commissioning of the plant and start of operation is expected to take place on 15 May 2015.

A.2. Location of project activity

Host Party:
Zambia

Region/State/Province etc.:
Central Province

City/Town/Community etc.:
Namwala, Itezhi Tezhi District

Physical/Geographical location:
The coordinates of the new hydropower plant is given below :

15°46'09''S, 26°01'21''E

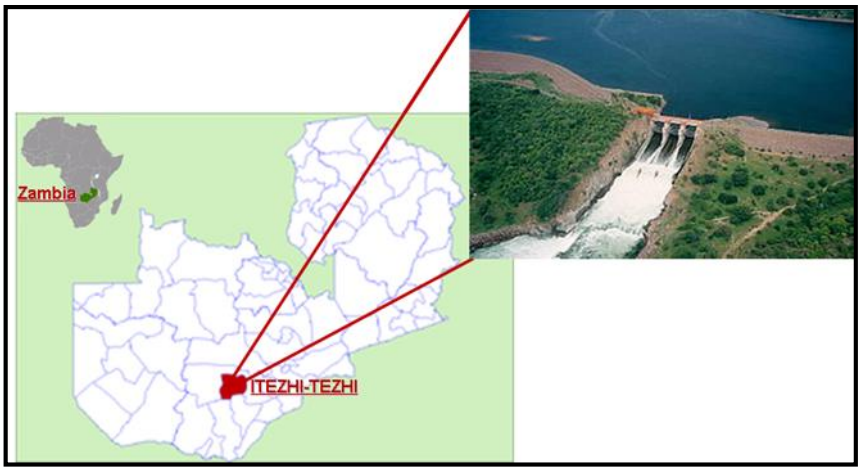


Figure 2: Location of Central Province in Zambia and existing Itezhi Tezhi dam

The transmission line will pass through four districts namely Itezhi Tezhi, Mumbwa, Chibombo and Kafue. It will originate from the south bank of Itezhi – Tezhi dam then traverse low lying portions of the Kafue Flats, then cross the river into Chief Shimbizi's area, then into chiefdoms of Chilyabufu, Muwezwa, Chibuluma, Moono, Senior Chief Shakumbila and part of Nkomensha in Lusaka West.

A.3. Technologies/measures

The technology involves hydro generation of power and construction of transmission line to evacuate power. The technology to be deployed will have the following components:

Electrical equipment

This will involve two generators designed for an output of 66.236 MVA at a power factor of 0.85 with a maximum of 90^{o}C winding temperature rise. It will operate at a speed of 157.9 rpm with a rated voltage of 11 kV. Each generator will have its own excitation and accessories such as static exciter and voltage regulator. Generated voltage (11 kV) will be stepped up using three phase transformer to 220 kV for transmission. Each unit will be connected to an individual unit transformer with a continuous rating of 70 MVA and a rated voltage of 220/11 kV. A step down transformer (220/33 kV) will also be installed on a transmission line supplying electricity to Kataba town and via a further step down transformer (33/04 kV) to the switchyard auxiliaries. As mentioned in section A.1. these exports to Kataba town will not be included in the calculation of emission reductions and exports of electricity via the dedicated 33kV line are not included in the monitoring plan.

The 220 kV switchyard will be located about 500 m away from the existing outlet channel. The 220 kV equipment including circuit breakers, isolators and instrument transformers will be located in the

switchyard. The high voltage windings of the main transformer will be connected to SF_6 switchgear in the switchyard by 220 kV overhead line. The switchyard will also contain the following:

- A fire detection system
- A DC system with rectifiers and battery to provide a secure supply of power
- AC auxiliary system
- Communication systems
- Grounding
- Emergency diesel generator set (750 kVA)
- Transformers (generator set up, unit auxiliary and station transformers)
- Earthing and lightning protection

Mechanical equipment

This involves turbines with two units of conventional vertical shaft Kaplan each rated at 57.3 MW with a maximum capacity of 61.1 MW. The rated speed will be 157.9 rpm with discharge rated at 156 m^3/s at a net head of 40 m. The centre of turbine distributor will be at El. 977 m about ten metres below tail water. Each turbine will have a digital microprocessor-controlled electric-hydraulic governing system with speed and acceleration sensing, speed regulation, stabilizing and diagnostic functions. Each turbine will be protected by a butterfly shutoff valve located in the machine hall. The component will also contain the following:

- Water level monitoring and sensing systems
- Turbine flow meters and taps
- A cooling and service water system that will be supplied from the draft tubes
- A treated water system that will include a self-contained water treatment plant.
- A governor and turbine inlet valve compressed air system to provide pressure for the oil pressure tanks
- A station service compressed air supply system.
- A unit unwatering and filling system to unwater the area between the draft tube gate and the inlet valve.
- An oil purification and recovery system
- A forced, reticulating air conditioning and ventilation system; and
- Emergency generating equipment to supply emergency power to essential station services in the event of station power loss.

Transmission lines

This involves construction of 220 kV 146 km of single circuit of the line from Itezhi tezhi power plant to Mumbwa substation and further extension of 145 km 330 kV line with twin bison single circuit to Lusaka West substation. A 33kV line will also be built to Kataba town.

Substation

Substation will involve construction of two 125 MVA, 330/220/33 kV at Mumbwa. Also the existing Lusaka West 330 kV substation will be extended to accommodate a new 330 kV line bay and two transformers (1 No. 330 / 132kV and 1 No. 132 / 33kV). All insulators will have a minimum creepage distance of 20 mm/kV.

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Party A (host) Zambia	Private entity A: Itezhi Tezhi Power Corporation (ITPC)	No

A.5. Public funding of project activity

There is no public funding for the proposed project activity

A.6. History of project activity

It is confirmed that:

(a) The proposed CDM project activity is not registered as a CDM project activity nor included as a component project activity (CPA) in a registered CDM programme of activities (PoA);
(b) The proposed CDM project activity is not a project activity that has been deregistered.

A.7. Debundling

Not applicable'

SECTION B. Application of selected methodologies and standardized baselines

B.1. Reference to methodologies and standardized baselines

The proposed project activity uses the approved consolidated baseline and monitoring methodology "ACM0002: Grid-connected electricity generation from renewable sources", version 16.0, sectoral scope 01.

Related tools applied:

- Tool for the demonstration and assessment of additionality (version 07.0.0.)
- Combined tool to identify the baseline scenario and demonstrate additionality (version 05.0.0)
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (version 02)

The methodology chosen also references the following tools, but these have not been used for this proposed CDM project for the following reasons:

- Tool to calculate the emission factor for an electricity system: not relevant as emission factor used is referenced from the Standardized baseline entitled "Grid emission factor for the Southern African power pool" (version 01.0)
- "Tool to determine the remaining lifetime of equipment": this tool is used for project activities which involve the replacement of existing equipment with new equipment or which retrofit existing equipment as part of energy efficiency improvement activities, which is not the case for this proposed CDM project.
- "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period": this tool is relevant at the renewal of a crediting period, which is not the case for this proposed CDM project.

B.2. Applicability of methodologies and standardized baselines

ACM0002 (version 16.0) is applicable to grid-connected renewable power generation project activities that:

(a) Install a Greenfield power plant;

(b) Involve a capacity addition to (an) existing plant(s);

(c) Involve a retrofit of (an) existing operating plants/units;

(d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or

(e) Involve a replacement of (an) existing plant(s)/unit(s).

The proposed project activity is considered to fall under point (a) above, namely installation of a Greenfield power plant. The dam was originally built in the 1970s and is currently used for seasonal stream flow regulation. The closest existing power plant is the Kafue gorge upper hydro project which is situated 230 km down stream of the existing dam.

Table 1 provides a justification of the applicability of the chosen methodology.

Table 1: Justification of the applicability of the methodology ACM0002, version 16

Applicability condition	**Characteristics of the project activity.**	**Fulfilment of the condition**
The methodology is applicable to grid-connected renewable power generation project activities that: (a) Install a Greenfield power plant; (b) Involve a capacity addition to (an) existing plant(s); (c) Involve a retrofit of (an) existing operating plants/units; (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s)/unit(s).	The project activity involves installation of a Greenfield power plant (new grid connected renewable power plant (hydropower) at a site where no renewable power plant was operated prior to the implementation of the project activity).	Yes
The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit	The project activity involves installation of a hydro power plant using an existing reservoir/dam.	Yes
In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity	The project activity involves installation of a Greenfield power plant. Although using an existing reservoir/dam, no capacity additions, retrofits or replacements are involved, thus this condition is not applicable.	Not applicable
In case of hydro power plants, at least one of the following conditions must apply: • The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of the	• The project activity is implemented in the existing reservoir (Itezhi Tezhi dam) and no change in reservoir	Yes

reservoirs; or • The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density calculated using equation (3), is greater than 4 W/m^2; or • The project activity results in new single or multiple reservoirs and the power density, calculated using equation (3), is greater than 4 W/m^2; or • The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m^2.	volume is planned. • Since the project activity does not imply the construction of a new dam or increase in existing dam volume, but rather utilization of the existing dam, power density is not considered. • The project activity does not involve an integrated hydro power project.	
In the case of integrated hydro power projects, project proponent shall: • Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or; • Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.	The project activity will use the existing single reservoir, not multiple reservoirs.	Not applicable
The methodology is not applicable to the following: • Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; • Biomass fired power plants/units.	• The project activity involves the installation of new hydropower plant and does not involve switching from fossil fuels to renewable energy sources at the site of the project. • The project activity is the development, installation and operation of a hydropower plant and no biomass fired power plants are involved.	Not applicable

In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	The project involves the installation of new hydro power plant, and does not involve retrofits, replacements, or capacity additions.	Not applicable

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

According to ACM0002, version 16.0, the project boundary includes the project power plant/unit and all power plants/units connected physically to the electricity system that the CDM project power plant is connected to. The proposed hydropower plant will be connected to the South African Power Pool (SAPP) grid thus the project's electricity system is the SAPP electricity grid. The project boundary therefore includes the project power plant and the transmission line to evacuate power to SAPP grid system, and all power plants connected physically to the SAPP electricity system. The project boundary also includes the dedicated electricity supply to the neighbouring Kataba town, although these exports to Kataba town will not be included in the calculation of emission reductions.

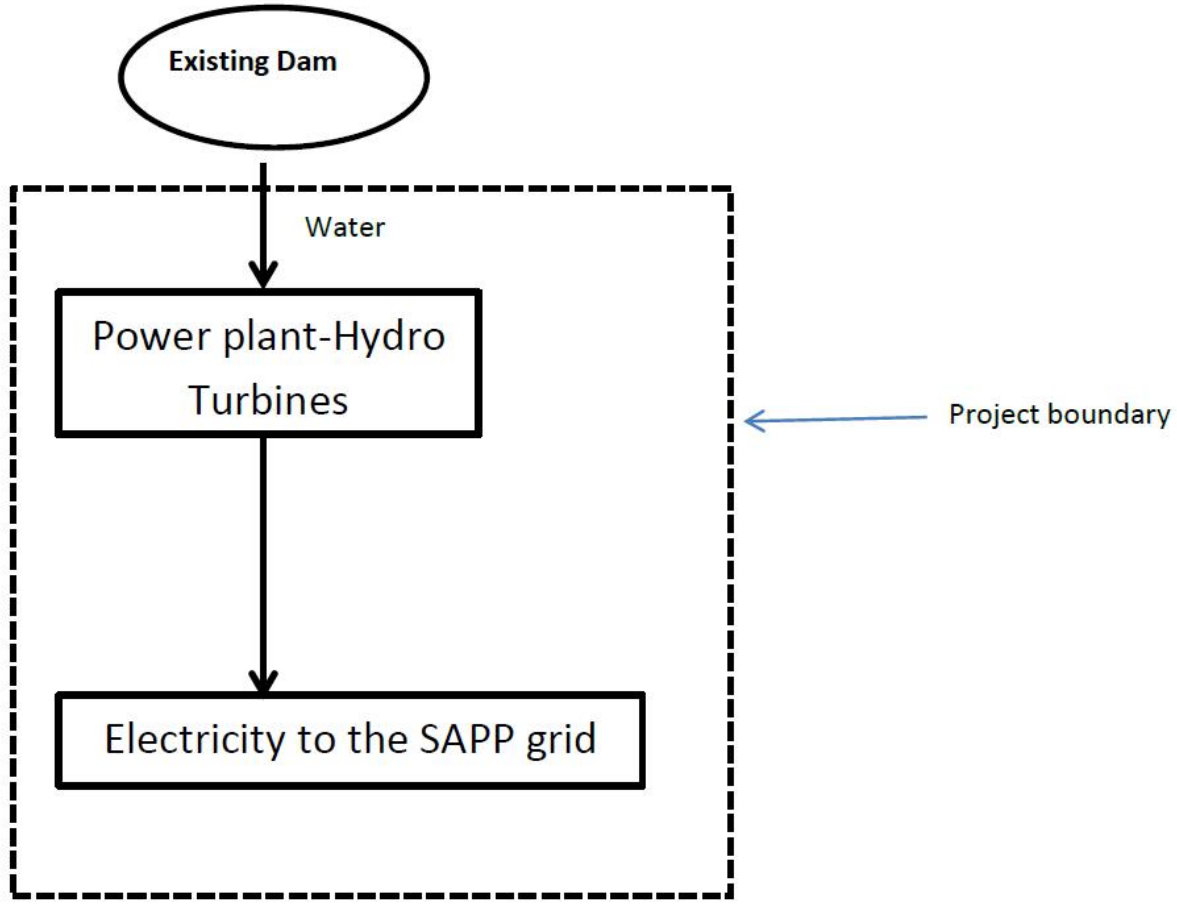


Figure 3: Project boundary

The greenhouse gases and emission sources included or excluded from the project boundary are shown in Table 2 below.

Table 2: Emissions sources included in or excluded from the project boundary

	Source	GHG	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project activity	CO_2 emissions from combustion of fossil fuels for electricity generation using back-up generator	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
	For hydro power plants, emissions of CH_4 from the reservoir[3]	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source

B.4. Establishment and description of baseline scenario

The project activity involves hydropower electricity generation and evacuation to the Southern African Power Pool (SAPP) grid system. Based on the approved consolidated baseline and monitoring methodology ACM0002, Version 16.0, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

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

Therefore, the baseline scenario of the proposed project activity is the production of the equivalent amount of electricity from new generation sources within the SAPP grid system as reflected in the combined margin calculations. Table 3 gives information and data used to calculate baseline emissions.

Table 3: Key information and data used to determine the baseline scenario

Variable	Value	Source
Operating margin emission factor (tCO_2/MWh)	0.9958	Standardized baseline: Grid emission factor for the Southern African power pool (version 01.0)
Build margin emission factor (tCO_2/MWh)	0.9331	Standardized baseline: Grid emission factor for the Southern African power pool (version 01.0)
Combined margin emission factor (tCO_2/MWh)	0.9644	Standardized baseline: Grid emission factor for the Southern African power pool (version 01.0)
Amount of electricity to be dispatched to the SAPP grid (MWh)	611,000	Itezhi Tezhi Power Corporation

[3] The project activity will use existing dam.

B.5. Demonstration of additionality

The additionality of the proposed project activity is demonstrated using the "Tool for the demonstration and assessment of the additionality", Version 07.0.0, approved by the CDM EB 70 and required by the methodology ACM0002, Version 16.0. The tool stipulates a step-wise approach for demonstrating and assessing the additionality of the project activity as follows:

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

This step is optional and not used for this project.

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

The aim of this step is to define realistic and credible alternatives to the proposed project activity through the following sub-steps:

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

In the absence of the proposed project activity the realistic and credible alternatives to provide outputs comparable to the project activity are:

i: The project activity undertaken without being registered as a CDM activity.

ii: Construction of a new power plant using other renewable power sources with equivalent electricity output to be connected to SAPP grid system.

iii: Construction of new thermal fossil fuel power plants with equivalent electricity output to be connected to SAPP grid system.

iv: Operation of SAPP 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" (baseline scenario).

Sub-step 1b: Consistency with mandatory laws and regulations:

The alternatives identified in sub-step 1a above are in compliance with the rules and regulations in the SAPP member countries. These options are already implemented in the member countries. The proposed project activity is in competition with several other sources of energy to meet the growing demand in SAPP grid member countries.

Step 2: Investment analysis

This step is optional and not used for this project.

Step 3: Barrier analysis

Barriers likely to affect the implementation of the proposed project activity have been identified using "Guidelines for objective demonstration and assessment of barriers", version 01, EB 50, Annex 13.

It should be highlighted that Zambia is considered to be a "Least Developed Country" (LDC)[4], so specific reference is made to "Guideline 7" of the aforementioned guidelines. Specifically, this guideline states that "in a Least Developed Country it may be sufficient to demonstrate a history of non-implementation...over a long period of time". The last hydropower plant to be commissioned in Zambia dates from 1976 (Kariba North)[5], over 35 years prior to implementation of the project activity. Given the high hydropower potential of the country and its low electrification rate, this long

[4] http://unctad.org/en/Pages/ALDC/Least%20Developed%20Countries/UN-list-of-Least-Developed-Countries.aspx

[5] Burian, M., Zhou, P.; Masawi, F., Yamba,F. and Baumgard, F. (2012). Analysis of grid emission factors for electricity sector in sub Saharan Africa: The case of the Southern African Power Pool, UNEP Risoe

period of non-implementation is neither due to supply or demand, but rather to the prevalence of national barriers to the implementation of hydropower projects.

It should also be noted that Zambia is classified by the UN as being a "landlocked developing country" (LLDC)[6]. As described by the UN, lack of territorial access to the sea, remoteness and isolation from world markets and high transit costs continue to impose serious constraints on the overall socio-economic development of landlocked developing countries. Their sea borne trade unavoidably depends on transit through other countries. Additional border crossings and long distance from the market substantially increase the total expenses for the transport services.

The economic performance of landlocked developing countries reflects the direct and indirect impact of geographical situation on key-economic variables. Landlocked developing countries are generally among the poorest of the developing countries, with the weakest growth rates, and are typically heavily dependent on a very limited number of commodities for their export earnings (copper and maize in the case of Zambia).

As stated by the UN, the distances involved in most cases of landlocked developing countries are excessive. Kazakhstan has the longest distance from the sea (3,750 km), followed by Afghanistan, Chad, Niger and then **Zambia**, with distances from the nearest seacoast in excess of 2,000 km[7]. Zambia is therefore placed fifth in the list of LLDCs with respect to distance to the sea, and is first with respect to its neighbours in Southern Africa.

The following is an analysis of barriers to project implementation, with specific reference to "Guideline 7" of the aforementioned guidelines.

Sub-step 3a: Identify barriers that would prevent the implementation of the proposed CDM project activity

The project activity faces the following barriers:

1. Investment barriers

    a. Investment barrier – financing of similar activities

Similar activities have only been implemented with grants or other non-commercial finance terms: The project is being undertaken by a special purpose vehicle Itezhi Tezhi Power Corporation (ITPC) which is owned by TATA Africa (a private company) and ZESCO Ltd (public electricity utility company). ITPC will develop the project on a build, own, operate and transfer (BOOT) basis. Although ZESCO Ltd is still owned by the government, reforms in Zambia has changed its way of doing business. The Zambian Energy Reform programme launched in 1991 did corporatize ZESCO Ltd and later commercialised it in 2003 where the state would retain its full ownership while allowing it to operate in a purely commercial basis[8]. This implies that the government may not provide 100% grants to ZESCO Ltd to implement a power project like in the past, and instead ZESCO Ltd will be required to mobilize finance to cover a large portion of investment costs. This is supported by the fact that ZESCO Ltd has approached lenders to access loan to cover part of the power plant investments and construction of the transmission line[9]. This should be compared to previous similar activities in Zambia i.e. medium to large scale hydropower plants, the most recent of which was implemented in 1976, and which have all been implemented solely by national governments using government equity, grants or other non-commercial finance terms (see Table 4). The first two hydropower plants (Mini-hydro, Mulungushi) were constructed before Zambia got her independence in 1964. Despite the fact that the commissioning of Kariba North was in 1976,

[6] http://unctad.org/en/Pages/ALDC/Landlocked%20Developing%20Countries/LLDCs-Map.aspx

[7] http://unctad.org/en/Pages/ALDC/Landlocked%20Developing%20Countries/LLDCs-Map.aspx

[8] Kbaki, J., Case study in corporate governance:Industry focus-electricity, SOE network for Southern Africa, June 2009, Maputo.

[9] http://www.afdb.org/en/news-and-events/article/zambia-signs-energy-sector-agreement-for-itezhi-tezhi-power-generation-project-13002/

the construction of the dam started in 1955[10] and was officially opened in 1960[11] [12] when generation (small capacity) of electricity started.

Table 4: Existing hydro power plants in Zambia[13]

Name of power plant	Country	Date of commissioning	Installed capacity (MW)	Implemented by
Kariba North	Zambia	1976	720	Federation of Rhodesia and Nyasaland
Kafue Gorge	Zambia	1968	990	Zambian Government
Victoria Falls	Zambia	1950	108	Zambian Government
Mulungushi	Zambia	1955	47	--
Mini-hydro	Zambia	1963	17.75	--

It can be concluded therefore, that similar activities have only been implemented with grants or other non-commercial finance terms.

b. Investment barrier – access to capital

Private capital is unavailable from domestic or international capital markets due to real or perceived risks associated with investment in the country, as demonstrated by the credit rating of the country or other country investments reports of reputed origin: Attempts to establish the potential of the Itezhi tezhi dam to generate additional electricity dates back to 1977 when a pre-feasibility study was done by SWECO[14]. A complete feasibility study was undertaken in 1999 by Harza[15], but since then no resources were committed to harness the potential. Mobilization of the financing was not possible until Itezhi Tezhi Power Corporation (ITPC), a special purpose vehicle, was formed in 2007. ITPC is owned by TATA Africa (a private company) and ZESCO Ltd (public electricity utility company). ITPC will develop the project on a build, own, operate and transfer (BOOT) basis. Equity of the company will be provided by ZESCO Ltd and TATA Africa on a 50:50 basis. The investment required for the power plant and transmission line is too high[16] [17] [18] (USD 165 million for the power plant[19]) to be raised from company own sources thus necessitates approaching international lender institutions to access a loan.

[10] http://en.wikipedia.org/wiki/Kariba_Dam

[11] http://en.wikipedia.org/wiki/Kariba_Dam

[12] http://www.industcards.com/hydro-africa-southern.htm

[13] Burian, M., Zhou, P.; Masawi, F., Yamba,F. and Baumgard, F. (2012). Analysis of grid emission factors for electricity sector in sub Saharan Africa: The case of the Southern African Power Pool, UNEP Risoe

[14] Project Concept Note, 2011, AfDB

[15] ITPC Ltd, Feasibility report for Itezhi Tezhi Hydro Electric Project (2 x 60 MW) by TEC Consulting Engineers Ltd.

[16] http://www.eu-africa-infrastructure-tf.net/activities/grants/itezhi-tezhi-hydro-power-and-transmission-line-project.htm

[17] http://www.hydroworld.com/articles/2012/02/alstom-wins-bid-for.html

[18] http://ppi-re.worldbank.org/data/project/tata-itezhi-tezhi-hpp-5927

[19] http://www.eib.org/attachments/pipeline/20080263_eia2_en.pdf

In 2011 (year of project start) Zambia was rated by Fitch and Standard & Poor rating companies with B+ on credit rating[20, 21, 22, 23]. A B+ rating is over two rungs below investment grade, and indicates a "speculative grade" investment which lies between BB (Less vulnerable in the near-term but faces major ongoing uncertainties to adverse business, financial and economic conditions) and B (more vulnerable to adverse business, financial and economic conditions but currently has the capacity to meet financial commitments). Given the recent and current global financial crisis, the projects significant vulnerability to financial and economic conditions translates to a reticence on behalf of investors to invest in projects in Zambia. Given the countries poor rating private capital from the international capital markets would not be available for such an investment, which is why the debt financing is being provided by multilateral financing institutions.

Accessing loans from local Banks to finance the proposed project activity is a challenge in particular to private sector as the cost of borrowing money in Zambia is too high and inconsistent with the low level of inflation in the country[24] that may be interpreted to high interest rate that becomes a burden to borrowers to service the loan. As shown in the tables below, Zambia has a high lending interest rate compared to other countries in the region. For this reason and due to the size of debt financing required, private capital from domestic capital markets would not be available for such an investment,

Table 5: Lending interest rates for some SAPP countries in 2010

Country	Interest rate (%)
Angola	22.54
Botswana	11.46
Lesotho	11.22
Mozambique	16.26
Namibia	9.72
South Africa	9.83
Zambia	20.92

Source: www.theglobaleconomy.com/compare-countries/

[20] For standard and Poor, Ranking interpretations are: AAA (the best-quality borrowers, reliable and stable), AA (quality borrowers, a bit higher risk than AAA), A(economic situation can affect finance), BBB (medium-class borrowers, which are satisfactory at the moment), BB (more prone to changes in the economy), B (financial situation varies noticeably), CCC (vulnerable and dependent on favourable business, financial and economic conditions to meet financial commitments), CC (highly vulnerable), C (even more highly vulnerable) and D (defaulting on commitments). Ratings from AA to CCC may be modified by the addition of a plus or minus sign to show relative standing within the major rating categories.

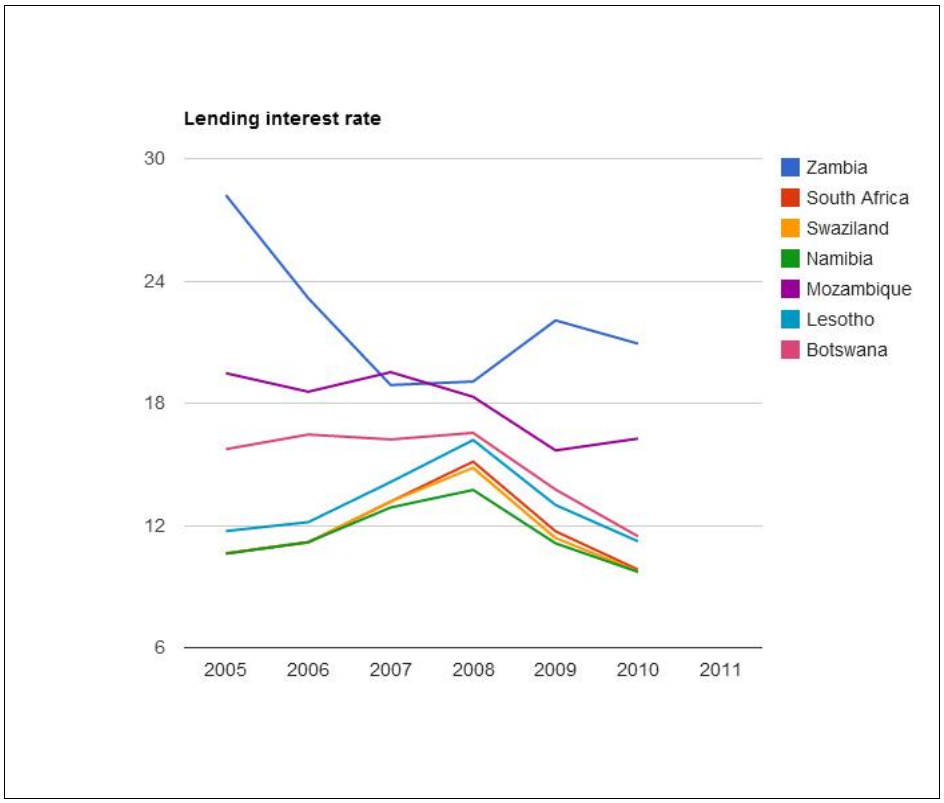
[21] https://www.creditwritedowns.com/2011/07/sovereign-credit-ratings.html

[22] http://www.boz.zm/%5CPublishing%5CSpeeches%5CZambiaSovereignCreditRating.pdf

[23] http://www.bloomberg.com/news/2011-03-02/fitch-assigns-zambia-b-sovereign-rating-and-says-it-has-stable-outlook.html

[24] http://www.ukzambians.co.uk/home/2011/10/03/coast-of-borrowing-in-zambia-too-high-%E2%80%93-chikwanda/

Table 6: Lending interest rate for SAPP country from 2005-2010[25]



Despite the fact the inflation rate (percent change in the Consumer Price Index) has been going down over recent years, reaching a single digit figure by 2010, Zambia still has a high inflation rate compared to other countries sharing the SAPP grid network. In 2010 the inflation for some counties was: Zambia (8%), Mozambique (12.7%), Malawi (7.41%), Botswana (6.95%), Swaziland (4.51%), Namibia (4.47%), South Africa (4.27%) and Lesotho (3.58%)[26]. High inflation rate will negatively affect the cash flow of the project and the ability of the project owner to service the debt. It is worth noting that the loan will be in foreign currency[27] (i.e. in US dollars and not Zambian Kwasha) and servicing it will be in the same currency. On the other hand the electricity to be consumed in Zambia will be sold to end users in local currency. With the unpredicted/fluctuating inflation rate the review/adjustment of the tariffs to reflect respective inflation may be a challenge given the fact that the process is long and cumbersome as it requires the acceptance of the regulation authority and wide stakeholders. Figure 4 shows inflation trend for SAPP countries. High and unpredictable inflation has impact to project developers who will sell the electricity in local currency while servicing the loan in foreign currency.

[25] Ibid

[26] http://www.theglobaleconomy.com

[27] http://www.afdb.org/en/news-and-events/article/zambia-signs-energy-sector-agreement-for-itezhi-tezhi-power-generation-project-13002/

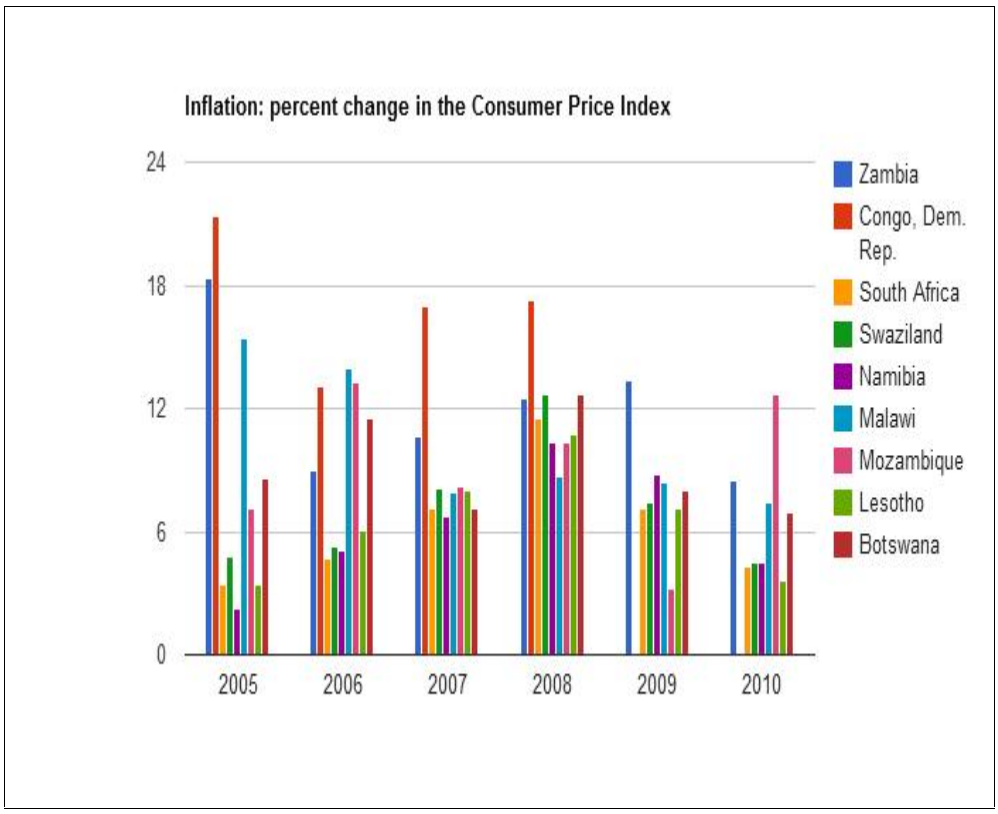


Figure 4: Inflation trend in SAPP country members[28].

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

1. Investment barriers

   a. Investment barrier – financing of similar activities

Similar activities in other countries whose electricity grid is part of the SAPP grid have historically had access to sources of funding other than grants or other non-commercial finance terms. For example, in South Africa Public Private Partnership (PPP) dates back to 1997 when the cabinet approved the appointment of an inter-departmental task team to develop a package of policy, legislative and institutional reforms to create an enabling environment for PPPs[29]. PPP projects registered in the energy sector are under development in waste to energy and bio-renewable energy[30]. In Namibia the involvement of the private sector in the energy sector started in 1996 when a private company, Northern Electricity (NE), was contracted to operate the existing distribution infrastructure in the north of the country although it didn't own any infrastructure apart from being responsible for all costs and revenues associated with the business[31]. One example of a PPP power project in Namibia is the Tsumkwe solar/diesel hybrid system[32], which has been implemented in partnership between the Desert Research Foundation of Namibia (DRFN), the

[28] http://www.theglobaleconomy.com/Zambia/Inflation/

[29] http://www.ppp.gov.za/Pages/About.aspx

[30] http://www.ppp.gov.za/Lists/PPP%20Project%20List%20Master/Energy1.aspx

[31] Clark,A.,Davis, M.,Eberhard,A.,Gratwick, K., and Wamukoya, N. (2005), Power sector reform in Africa:assessing the impact on poor people, A study managed by the graduate school, University of Cape Town for ESMAP/World Bank. Accessed from http://www.academia.edu/846486/Power_sector_reform_in_Africa_assessing_the_impact_on_poor_people_-_Namibia_case_study

[32] http://www.drfn.info/docs/drfn/2010-2011_DRFN_Annual_Report.pdf (page 21)

Government of the Republic of Namibia through the Otjozondjupa Regional Council, NamPower and the European Union.

In Mozambique, Cahora Bassa power plant (2,075 MW)[33] is owned by the Portuguese private company HCB (82 %) and the Government of Mozambique (18%). Cahora Bassa is the largest single power plant in the Southern Africa region.

b. Investment barrier - access to capital

Middle income countries in the SAPP grid system have high access to private capital owing to relatively strong economies that attract private sector investments. For instance, the World Bank's "Doing Business (2012)[34]" publication showed that South Africa has a good investment climate that is attractive for business. Out of 183 countries ranked, South Africa's position was: ease of doing business-35, starting a business-44, protection investors-10 and getting credit-1. Compared to Zambia's B+ credit rating, some of its counter party countries sharing the SAPP grid system are rated better[35]. This creates a better investment climate in particular for the private sector that may attract more foreign direct investment and private capital to finance power projects. For instance in June 2012 Botswana was rated by Standard and poor as A-, South Africa by both companies as BBB+, Namibia by Fitch as BBB-, and Angola by both companies as BB- thus creating competitive advantages compared to Zambia[36] [37]. Doing business economy ranking[38] as benchmarked to June 2011, depicted Zambia as having investment attractions similar to some middle income countries but its status as a least developed country and rate of inflation may not favour investors. South Africa and Botswana have been investing heavily in their energy sectors, in particular using fossil fuel plants, thus making the private sector comfortable to invest in the same due to technology track record and experience already accumulated. In addition to private capital, middle income countries have better opportunities to access loans from multilateral financial institutions and other existing funds/instruments to invest in energy. For instance the Clean Technology Fund (CTF)[39] has supported wind and concentrated solar power projects in South Africa by providing grants/concessional loan.

The conclusion is that access to capital is not a barrier to implement at least some of the identified alternatives in one of the SAPP countries.

Table 7 present a summary of the impact of the investment barriers on the four alternative scenarios which have been identified.

Table 7: Matrix showing whether the barriers prevent the implementation of identified alternative scenarios to the project activity

Barrier evaluated	i	ii	iii	iv
Investment barrier - financing similar activities	Yes	No	No	No
Investment barrier - access to capital	Yes	No	No	No

[33] http://en.wikipedia.org/wiki/Cahora_Bassa_Dam

[34] Doing business (2012), Doing business in a more transparent world, World Bank and IFC accessed from http://www.doingbusiness.org/~/media/FPDKM/Doing%20Business/Documents/Annual-Reports/English/DB12-FullReport.pdf

[35] http://www.guardian.co.uk/news/datablog/2010/apr/30/credit-ratings-country-fitch-moodys-standard#data

[36] http://www.guardian.co.uk/news/datablog/2010/apr/30/credit-ratings-country-fitch-moodys-standard#data

[37] http://www.washingtonpost.com/blogs/blogpost/post/standard-and-poors-credit-rating-for-each-country-of-the-world-map/2011/08/09/gIQAg4Qj4I_blog.html

[38] http://www.doingbusiness.org/rankings (accessed: 08/05/2012)

[39] https://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/Eskom_PID.pdf

The table above shows that scenario i (the project activity undertaken without being registered as a CDM activity) faces significant investment barriers, whereas scenarios (ii), (iii) and (iv), which includes the baseline scenario, do not face similar barriers.

Step 4: Common practice analysis

Sub-step 4a: The proposed CDM project activity(ies) applies measure(s) that are listed in the definitions section above

The latest version of the "Guidelines on common practice" (Version 3.1) available on the UNFCCC website has been applied:

Applicable geographical area: As specified in the above mentioned guidelines, the applicable geographical area is be the entire host country.

Different technologies: Criteria to select projects considered to be different technology:

a. Energy source/fuel: energy generation by different energy source (example: energy generation by different renewable energy sources (e.g. wind, solar, geothermal) or thermal generation based on fossil fuels;
b. Size of installation: hydropower generation capacity below 15MW;
c. Investment climate on the date of the investment decision:
    i. 100% investment made by state company (i.e. no private or public private partnership);
    ii. Investment made during colonial times (i.e. under British rule in Zambia);
    iii. Investment made over 30 years ago under completely differen legal, technical and economic conditions.

The proposed CDM project activity applies a measure that is listed in the definitions section of the above tool, namely measure (b) "Switch of technology with or without change of energy source including energy efficiency improvement as well as use of renewable energies (example: energy efficiency improvements, power generation based on renewable energy)". The following stepwise approach is therefore adopted to determine common practice.

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

The applicable capacity is defined as +/-50% of the total design capacity of the proposed project activity. As the design capacity of the proposed project is 120 MW, and 50% of this capacity is 60 MW, the applicable capacity will be 60 to 180 MW.

Step 2: Identify similar projects (both CDM and non-CDM) which fulfil all conditions specified in the aforementioned guidelines.

Table 8 gives a list of all hydropower projects in Zambia of similar, lower and higher capacities, and which meet the conditions (a) to (d) specified in the aforementioned guidelines. Zambia has four large hydropower plants and mini hydros commissioned latest by 1976 (i.e. over 36 years ago), albeit with some periodic maintenance and upgrading.

Table 8: Hydro power plants in Zambia[40]

Name of power plant	Date of commissioning	Installed capacity (MW)
Kariba North	1976	720
Kafue Gorge	1968	990
Victoria Falls	1950	108
Mulungushi	1955	47
Mini-hydro	1963	17.75

[40] Burian, M., Zhou, P.; Masawi, F., Yamba,F. and Baumgard, F. (2012). Analysis of grid emission factors for electricity sector in sub Saharan Africa: The case of the Southern African Power Pool, UNEP Risoe

From the above table, only one project meets guideline (e) - the capacity or output of the projects is within the applicable capacity or output range calculated in Step 1. Only Victoria Falls, with a capacity of 108 MW is within the applicable capacity range of 60 to 180 MW. With respect to condition (f), Victoria Falls started commercial operation before the project design document (CDM-PDD) for Itezhi Tezhi Hydro Power was published for global stakeholder consultation.

Step 3: Within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation.

The one project identified in Step 2, Victoria Falls, is neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Therefore $N_{all} = 1$.

Step 4: Within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity.

The one project identified following Steps 2 and 3, Victoria Falls, applies similar technology to that of the proposed project activity. Therefore $N_{dif} = 0$.

Step 5: calculate factor F=1-Ndiff/Nall representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

$F = 1 - N_{dif}/N_{all} = 1 – 0/1 = 1$

And:

$N_{all} - N_{dif} = 1$

The proposed project activity is a “common practice” within a sector in the applicable geographical area if the factor F is greater than 0.2 and $N_{all} - N_{dif}$ is greater than 3. Although in the case of the project activity F is greater than 0.2, $N_{all} - N_{dif}$ is **not** greater than 3. The proposed project activity is therefore **not** “common practice”.

Outcome of Step 4: The outcome of Step 4 is that the proposed project activity is not regarded as “common practice”. According to the “Tool for the demonstration and assessment of the additionality”, Version 07.0.0, the proposed project activity is therefore additional.

It is worth emphasising that although similar to the project activity, the existing hydro power plants were installed in different international and national environment. The proposed project is the first to be implemented in Zambia under public private partnership (PPP) arrangement. Although ZESCO Ltd is still owned by the government, reforms in Zambia have changed its way of doing business. The Zambian Energy Reform programme launched in 1991 did corporatize ZESCO Ltd and later commercialised it in 2003 where the state would retain its full ownership while allowing it to operate in a purely commercial basis[41]. This implies that the government may not provide 100% grants to ZESCO Ltd to implement a power project like in the past, and instead ZESCO Ltd will be required to mobilize finance to cover a large portion of investment costs. This is supported by the fact that ZESCO Ltd has approached lenders to access loan to cover part of the power plant investments and construction of transmission line[42].

The Kariba Dam was constructed between 1956 and 1960 and officially opened on May 16th 1960 with the switching on of the first electricity generators. The first phase of construction was estimated to cost approximately £ 78 million (approximately USD 126)[43]. The funding to meet the cost was from different sources including copper mining companies, World Bank, commercial

[41] Kbaki, J., Case study in corporate governance:Industry focus-electricity, SOE network for Southern Africa, June 2009, Maputo.

[42] http://www.afdb.org/en/news-and-events/article/zambia-signs-energy-sector-agreement-for-itezhi-tezhi-power-generation-project-13002/

[43] http://www.zambia-travel-guide.com/bradt_guide.asp?bradt=492

banks and other government institutions[44]. The second phase construction started in 1971 and completed in 1976 at a cost of USD 420.

Mulungushi power station has been developed in stages, with the first 2 MW unit installed in 1925 and replaced by a 10.5 MW unit in 2009. Two 6 MW units were added in 1927 and a third unit was installed in 1941[45].

Victoria falls power station has been implemented at several times in several phases. The power plant was first commissioned in 1938, with just two 1MW turbines, and was subsequently expanded in 1956, when a further two 3MW turbines were added. In 1969, an additional power station was built close to the old site, with six 10MW turbines. In addition in 1972, a third and final power station C was built adjacent to Power Station A, with four 10 MW turbines, giving a total capacity of 108 MW[46].

The Kafue Gorge was first identified in the early 1950s by British consulting firm as a potential source of hydropower to cater for the power requirements of Zambia and Zimbabwe, then known as Northern and Southern Rhodesia, respectively. After independence the government of Zambia decided to proceed with plans to develop a hydropower plant on the Kafue Gorge. Consequently, the 900MW Kafue gorge upper plant was developed and commissioned in 1977, utilizing 400 meters of the available head of 600 meters at Kafue Gorge[47].

From the discussion above it is concluded that although similar activities are observed, essential distinctions exist between the project activity and similar activities implemented early, which can be summarised as follows

- The proposed project is the first to be implemented in Zambia under public private partnership (PPP) arrangement;
- Most of the existing hydropower projects were completed, or commenced, prior to Zambian independence;
- All existing hydropower plants and mini hydros were commissioned latest by 1976 (i.e. over 36 years ago).

It should also be noted that the CDM has been an important component of the project development, and its consideration during the development of the project can be traced back to 2007 when the analysis of the CDM benefit was incorporated into the project feasibility study. Table 9 provides a timeline of important milestones with respect to the development of the CDM component of the project.

Table 9: Important milestones in the implementation of the project activity

Date	Activities
07/2007	Analysis of CDM benefit incorporated in the project feasibility study
10/2008	Environmental and social impact Assessment completed by ZESCO Ltd Environment and Social Affairs Unit.
08/04/2011	Power Purchase Agreement approved by Energy Regulatory Board.
18/04/2011	Contract for the infrastructure works became effective
03/05/2011	CDM prior consideration submitted to the UNFCCC and to DNA Zambia
16/11/2011	Civil and hydro mechanical and electromechanical works

[44] http://share.nanjing-school.com/dpgeography/files/2013/05/World_Commission_on_Dams_2000_Case_Study_Kariba_Dam_Final_Report_November_2000-2etc5lv.pdf

[45] http://www.aguaimara.com/projects/zambia-lunsemfwa-and-mulungishi

[46] http://clairemchapman.wordpress.com/2011/09/01/victoria-falls-run-of-river-hydro-scheme/

[47] http://www.electricityforum.com/news/nov09/Zambianhydrostudycomplete.html

	contract with Sinohydro becomes effective, and works commenced.
22/03/2012	Request for Letter of No objection from host country DNA
09/03/2012	Request for proposal sent out to carbon credit buyers.
14/05/2012	PDD development started
13/06/2012	Loan approval given by AfDB
21/11/2012	Request for LoA from Zambia DNA
17/01/2013	LoA for project activity issued by Zambia DNA

The project feasibility study dating from July 2007 incorporated the CDM revenue in the investment analysis where a price of CER was considered to be 10USD. Initial estimation done indicated that the project will reduce 424,975 tCO_2/year[48] that it equivalent to USD 4,249,750 per year. The feasibility study clearly indicated that the revenue from the CDM would reduce the tariff that will benefit the intended beneficiaries and achieve the required rate of return. The start date for the project activity is considered to be 8 April 2011, which is the date when the Power Purchase Agreement approved by Energy Regulatory Board. The CDM prior consideration was sent to the UNFCCC for notification as rules require and also to the Zambian DNA on 3 May 2011, as specified on the UNFCCC website. The Zambian DNA issued a letter of no objection (LoNO) on 18th June 2012, and the host country LoA from the Zambia DNA was issued on 17 January 2013.

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

The emission reductions are calculated in accordance with the approved consolidated baseline and monitoring methodology ACM0002, Version 16.0. The applicability has been demonstrated in section B.2.

Baseline emissions

As stated in the methodology, baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid connected power plants and the addition of new grid connected power plants. The baseline emission is calculated using steps below:

$$BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y} \quad \textbf{(1)}$$

Where:

BE_y	=	Baseline emissions in year y (tCO_2)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

Calculation of $EG_{PJ,y}$

The calculation of $EG_{PJ,y}$ is different for

(a) Greenfield plants

(b) Retrofits and replacements,

(c) Capacity additions.

[48] Emission reduction calculated by multiplying annual energy generation (611 865 MWh) by emission factor (0.706 tCO_2/MWh)

The project activity is categorised as “greenfield renewable energy power plants” as the project activity involves the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity; therefore

$$EG_{PJ,y} = EG_{facility,y} \quad \textbf{(2)}$$

Where:

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

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

Project emissions

For most renewable power generation project activities, PEy = 0. However, some project activities may involve project emissions that can be significant. These emissions shall be accounted for using the equation below:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad \textbf{(3)}$$

Where:

PE_y = Project emissions in year y (tCO_2e)

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (tCO_2)

$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO_2e)

$PE_{HP,y}$ = Project emissions from reservoirs of hydro power plants in year y (tCO_2e)

As the proposed project activity does not involve operation of geothermal power plants $PE_{GP,y.}$ is 0. As the project activity will utilise the existing dam without any modification, the emissions from the reservoir, $PE_{HP,y}$, is 0. Project emissions from fossil fuel consumption are possible due to the use of diesel generators on site in the event of plant shut down and grid based electricity not being available.

Therefore equation 3 becomes: $PE_y = PE_{FF,y}$

Emissions from back up diesel generator

Emissions from back up diesel generator was calculated using "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", using the following calculation:

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y} \quad \textbf{(4)}$$

Where:

$PE_{FC,j,y}$ = Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr);

$FC_{i,j,y}$ = Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr);

$COEF_{i,y}$ = Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)

i = Are the fuel types combusted in process j during the year y

With respect to equation 4, $PE_{FC,j,y} = PE_{FF,y}$.

Due to data availability, the CO_2 emission coefficient $COEF_{i,y}$ is calculated using Option B as presented in the "Tool to calculate project of leakage CO_2 emissions from fossil fuel combustion" and is calculated as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \quad \textbf{(5)}$$

Where

$COEF_{i,y}$ = Is the CO_2 emission coefficient of fuel type i in year y (tCO2/mass or volume unit)

$NCV_{i,y}$ = Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)

$EFCO_{2,i,y}$ = Is the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)

i = Are the fuel types combusted in process j during the year y

Leakage

According to the methodology applied no leakage emissions are to be considered. The main emission potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g extraction, processing, transportation). These emissions sources are ignored as they are not significant.

Emission reductions

Emission reductions have been calculated using the equation below:

$$ER_y = BE_y - PE_y \quad \textbf{(6)}$$

Where:

ER_y = Emission reductions in year *y* (t CO_2e)
BE_y = Baseline emissions in year *y* (t CO_2)
PE_y = Project emissions in year *y* (t CO_2e)

Grid emission factor calculation

The value of the grid emission factor used in estimating the volume of emission reductions to be achieved by the project is that of Southern Africa Power Pool (SAPP[49]) as specified in the standardized baseline entitled "Grid emission factor for the Southern African power pool" version 01.0 which was adopted by the CDM Executive Board (EB73, Annex 3). The applicability of this standardized baseline is confirmed as follows:

- The CDM project is implemented in the Republic of Zambia, which is a SAPP member country;
- The project activity is connected to the project electricity system;
- The CDM approved methodology that is applied to the project activity, namely ACM0002, version 16.0, requires to determine CO_2 emission factor for the project electricity system through the application of the "Tool to calculate the emission factor for an electricity system" for the determination of baseline emissions, project emissions and leakage emissions.

In addition, as specified in the standardized baseline entitled "Grid emission factor for the Southern African power pool" version 01.0, as the project activity uses the ex ante option of data vintage, as

[49] Grid systems of 9 countries including Botswana, Democratic Republic of Congo, Lesotho, Mozambique, Namibia, south Africa, Swaziland, Zambia and Zimbabwe.

per the tool, the latest approved values of this standardized baseline shall be used for calculation of emission reduction for the entire first, or entire second or entire third crediting period;

In determining the grid emission factor the following steps are stipulated in the tool:

Step 1. Identify the relevant electricity systems;

Step 2. Choose whether to include off-grid power plants in the project electricity system (optional);

Step 3. Select a method to determine the operating margin;

Step 4. Calculate the operating margin (OM) emission factor according to the selected method;

Step 5. Calculate the build margin (BM) emission factor;

Step 6. Calculate the combined margin (CM) emissions factor.

As the standardized baseline entitled "Grid emission factor for the Southern African power pool" version 01.0, is to be used for this project activity, steps 1 and 2 have been followed to determine applicability of the baseline, whereas steps 3 to 6 have been combined and reference is made to the value for parameter $EF_{grid,CM,y}$ for "Combined margin CO_2 emission factor for the project electricity system applicable to all project activities other than wind and solar for the first crediting period" specified in the standardized baseline.

Step 1. Identify the relevant electricity systems

For determining the electricity emission factors, a project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints.

The electricity from the proposed Itezhi Tezhi hydro power project will be connected to the SAPP grid system. SAPP grid system is considered to have no significant transmission constraints therefore it is defined as project electricity system. SAPP grid system constitutes a total of 62 power station with installed capacity of 53,227.9 MW made up of coal fired power stations (39,162 MW installed capacity), 34 hydropower stations (19,606.9 MW installed capacity), 7 diesel stations (1,783 MW), one natural gas plant (746 MW) and one nuclear power plant (1,939 MW).

In calculating the grid emission factor the following were considered:

- SAPP grid emission factor has been built on the data of the national grid emission factor calculations.
- For combined margin (CM) the standard weighting has been applied.
- Angola, Malawi and Tanzania have been excluded as they are not yet connected to SAPP although they are regarded as members.

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

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.

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

Only grid connected power plants have been considered in calculating SAPP grid emission factor.

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

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

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

Step 6. Calculate the combined margin (CM) emissions factor

The above four steps have been combined, and the value for parameter $EF_{grid,CM,y}$ for "Combined margin CO_2 emission factor for the project electricity system applicable to all project activities other than wind and solar for the first crediting period" specified in the standardized baseline entitled "Grid emission factor for the Southern African power pool" version 01.0 is used.

$EF_{grid,CM,y}$ = 0.9644 tCO_2/MWh

B.6.2. Data and parameters fixed ex ante

(Copy this table for each piece of data or parameter.)

Data/Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	"Combined margin CO_2 emission factor for the project electricity system applicable to all project activities other than wind and solar for the first crediting period" specified in the standardized baseline entitled "Grid emission factor for the Southern African power pool" version 01.0.
Source of data	"Grid emission factor for the Southern African power pool" version 01.0.
Value(s) applied	0.9644
Choice of data or measurement methods and procedures	The Combined Margin (CM) grid emission factor is calculated ***ex-ante*** for the duration of the crediting period
Purpose of data	Calculation of baseline emissions
Additional comment	None

B.6.3. Ex ante calculation of emission reductions

Greenhouse gases emission reductions were calculated according to ACM0002, version 16.0. The grid emission factor used was defined in the standardized baseline entitled "Grid emission factor for the Southern African power pool" version 01.0.

Baseline emissions

Baseline emissions were calculated using the equation below:

$$BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y} \quad \textbf{(10)}$$

Where:

BE_y = Baseline emissions in year *y* (tCO_2)
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh)
$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

Since the project is a greenfield renewable energy power plant that involves the installation of a new power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then,

$$EG_{PJ,y} = EG_{facility,y} \quad \textbf{(12)}$$

Where:

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

in year *y* (MWh)

This implies that $EG_{PJ,y}$ is the same as the electricity to be generated by the proposed project activity i.e Itezhi tezhi hydro power project that will replace an equivalent amount of electricity that would have generated from fossil fuel fired power plants in SAPP electricity grid system.

Therefore, $EG_{PJ,y}$ = **611,000 MWh**

The grid emission factor used is the "Combined margin CO_2 emission factor for the project electricity system applicable to all project activities other than wind and solar for the first crediting period" specified in the standardized baseline entitled "Grid emission factor for the Southern African power pool" version 01.0.

$EF_{grid,CM,y}$ = **0.9644 tCO_2/MWh**

BE_y = 611,000 MWh * 0. **9644** tCO_2/MWh = **589,248 tCO_2/year**

Baseline emission is **589,248 tCO_2/year**

Project emissions

Emission from back up diesel generator

As the tool proposes the quantity of fuel type used in a year y to be used, emissions from back up diesel generator will be calculated ex-post. However initial estimates using different scenarios of the quantity that might be used in the future shows that emissions expected are very low (< 1% of baseline emissions) and thus can be ignored.

Leakage

According to the methodology leakage was not considered.

Emission reductions

Emission reductions were calculated using the equation below:

$$ER_y = BE_y - PE_y \quad \textbf{(13)}$$

Where:

ER_y = Emission reductions in year *y* (t CO_2e)
BE_y = Baseline emissions in year *y* (t CO_2)
PE_y = Project emissions in year *y* (t CO_2e)

Baseline emissions, BE_y = 589,248 tCO_2

Project emissions, PE_y = 0 tCO_2

Therefore emission reductions is **589,248 tCO_2e/year**

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)
Year 1	589,248	0	0	589,248
Year 2	589,248	0	0	589,248
Year 3	589,248	0	0	589,248
Year 4	589,248	0	0	589,248
Year 5	589,248	0	0	589,248
Year 6	589,248	0	0	589,248

Year 7	589,248	0	0	589,248
Year 8	589,248	0	0	589,248
Year 9	589,248	0	0	589,248
Year 10	589,248	0	0	589,248
Total	5,892,480	0	0	5,892,480
Total number of crediting years	10			
Annual average over the crediting period	589,248	0	0	589,248

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data/Parameter	$EG_{facility,y}$
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Source of data	Project activity site
Value(s) applied	611,000
Measurement methods and procedures	Bulk electricity meters supported by balance bills Electricity meters will measure both: (i) The quantity of electricity supplied by the project plant/unit to the grid; and (ii) The quantity of electricity delivered to the project plant/unit from the grid
Monitoring frequency	Continuous measurement and at least monthly recording
QA/QC procedures	Cross check measurement results with records for sold electricity. Meters will be periodically checked according to the relevant national electric standards and regulations; power supplied to the grid will be double checked according to electricity sales invoices.
Purpose of data	Baseline emissions calculation
Additional comment	

Data/Parameter	$FC_{i,j,y}$
Data unit	ton/yr or m^3/yr
Description	Quantity of fuel type *i* combusted in process j during the year *y*
Source of data	On site measurement or purchase invoice
Value(s) applied	0
Measurement methods and procedures	Mass or volume of the fuel consumed by the back-up generator on monthly and annual basis.
Monitoring frequency	Continuous recording at least on monthly.
QA/QC procedures	Cross check measurements with buying receipts/invoices.
Purpose of data	Calculation of project emission
Additional comment	

Data/Parameter	$NCV_{i,y}$
Data unit	TJ/Gg
Description	Net calorific value of diesel
Source of data	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories

Value(s) applied	43.3 TJ/Gg (IPCC default value)
Measurement methods and procedures	Not applicable
Monitoring frequency	Not applicable
QA/QC procedures	Any future revision of the IPCC Guidelines should be taken into account
Purpose of data	Calculation of project emission
Additional comment	Option b) used: IPCC default value

Data/Parameter	$EF_{CO2,i,y}$
Data unit	tCO_2/TJ
Description	Emission factor for diesel in year *y*
Source of data	a) Values provided by the fuel supplier in invoices: this is the preferred source if the carbon fraction of the fuel is not provided (Option A) If a) is not available, IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value(s) applied	0.0748 tCO_2/GJ (IPCC default value)
Measurement methods and procedures	--
Monitoring frequency	--
QA/QC procedures	Any future revision of the IPCC Guidelines should be taken into account
Purpose of data	Calculation of project emission
Additional comment	Applicable where Option B is used (see "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", version 02).

Data/Parameter	$\rho_{i,y}$
Data unit	t/L
Description	Density of diesel in year *y*
Source of data	a) Values provided by the fuel supplier in invoices: this is the preferred source if the carbon fraction of the fuel is not provided (Option A) b) Measurements by the project participant (if option a is not available) c) Regional or National default values
Value(s) applied	0.000845 t/L
Measurement methods and procedures	--
Monitoring frequency	--
QA/QC procedures	Any future revision of the value should be taken into account
Purpose of data	Calculation of project emission
Additional comment	Applicable where $FC_{i.j.y}$ is measured in a volume unit (see "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", version 02). Diesel density for the ex-ante emission reduction calculation is sourced from public domain information available at: (https://www.dieselnet.com/standards/eu/fuel_reference.php)

B.7.2. Sampling plan

No data and parameters monitored in section B.7.1 were determined by a sampling approach therefore sampling plan is not relevant to the proposed project activity.

B.7.3. Other elements of monitoring plan

Monitoring will be developed to ensure the reliability and accuracy of data collected for the calculation of emission reductions of the proposed project activity. The plan will be designed in

such a way to ensure the collected data are complete, reliable and archived in a format that would allow easy retrieval. The equipment will be maintained and calibrated at regular intervals by qualified technicians for accuracy measurements. Emission reductions will be obtained by multiplying electricity supplied to the SAPP grid system with the ex-ante fixed combined margin grid emission factor thus making electricity generation a very important parameter in estimating emission reductions to be achieved by the project activity.

Itezhi Tezhi Power Corporation (ITPC) and ZESCO Ltd will play a significant role during the implementation of the monitoring plan. They will be responsible to maintain credible, transparent and adequate data estimation, measurement, collection and tracking systems to maintain the information required for and audit of an emission reduction project. Records and monitoring systems will be needed to allow DOE to verify the performance of the project activity and certification processes.

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

The monitoring plan will cover the following aspects:

- Monitoring organisation
- Monitoring equipment and calibration
- Quality assurance and quality control of data
- Data management, archiving and retrieval
- Training

Monitoring organisation

Itezhi Tezhi Power Corporation (ITPC) and ZESCO Ltd

The generation of electricity will be done by the ITPC while transmission will be done by ZESCO Ltd therefore the two companies will be involved during the monitoring. ITPC will record the electricity generated and sold to ZESCO Ltd on monthly and annual basis. ZESCO Ltd will record the electricity at the point of connection to SAPP grid system on monthly and annual basis. Technicians to take readings will receive appropriate training on how to be accurate and organise the data for easy retrieval. Data collected will be submitted to the CDM manager.

CDM manager

CDM manager with support from selected staff will be responsible for data processing and archiving. All data recorded will be stored in electronic file. The role of the manager will be to check accuracy, consistency and relevance of the manual readings with electronic data sets. Monthly/annual reading of meters will be done by the manager and his/her assistance. The monthly and annual data will have two kind of information: electricity generated in the site and electricity dispatched to the SAPP grid system. In case of meter problems the manager will take appropriate urgent action to replace it and inform the technician including explanation on how to take reading in case it is different from the previous one. To ensure consistency and as a way of back up the manager will crosscheck monthly readings against respective sales receipts and the readings at the point of connecting to the SAPP grid.

In addition the manager will be the contact focal point for all issues concerning the CDM and communication to CDM EB, DOE, DNA, etc.

CDM consultant

A consultant will be hired to organise the data and prepare monitoring reports as well as respond to any CDM related technical concerns raised during verification. The monitoring report will be forwarded to the manager for further processing. The consultant will address all issues raised by the manager or any other third party.

Monitoring equipment and calibration

The main equipment will be electricity meters measuring the amount of electricity generated and dispatched to the SAPP grid. Two trivector energy meters will be installed on the 220 kV outgoing line just before it leaves the switchyard. The same meters will measure both import & export (i.e.

the energy taken from the grid & supplied to the grid). One will be the “main meter” & the other “check meter”. The accuracy class of both meters is specified as 0.2 s.

Meters will be installed and maintained according to national standards or manufacturer specifications. The meters will be calibrated just before installation at the factory and thereafter will be calibrated as per the national standard of calibration by the authorized calibration agency.

Meter readings will be taken on a daily basis by ITPC staff, while readings will also be taken by ZESCO staff once a month. These meter readings will also be available online through the SCADA system. All records will be documented and maintained by the project owner for DOE verification purpose.

Quality assurance and quality control of data

Quality assurance and quality control for measurement reading, recording/documentation and archiving will be emphasised and improved from time to time to ensure high quality monitoring is achieved and the emission reductions achieved is credible. Meters will be checked on annual basis or any other time when discrepancy is observed by professional technicians and take any necessary calibration/adjustment. Broken meter will be replaced quickly and calibrated according to the national standards or supplier specifications.

Measurement reading will be done every month and any inconsistency noted will be reported to the CDM manager for urgent action.

Data management, archiving and retrieval

The collected data will be archived electronically and also documented in hard copy as a back-up. Data on electricity generated and that connected to the SAPP grid system will be measured on monthly basis at the project site. The readings will be transferred both in hard and soft copies to the storage system after passing through all quality control procedures.

Monthly measurements of electricity will be collected by the technicians who will document the readings and establish any error and transfer the data to the CDM manager who will check the accuracy and completeness of the collected data and any mistake/error identified will be corrected immediately before storage.

Monthly measurements and reports including sales receipts will be compiled at the end of each calendar year for annual project monitoring report to be prepared by the consultant in collaboration with the CDM manager ready for verification by the DOE.

All data and reports will be achieved for at least two years after the end of the crediting period.

Training

Meter reader technicians and CDM manager and other staff to be involved in the project will be trained by the CDM consultant on how to take accurate measures, identification of errors, recording measurements, storage and reporting. They will also receive training on the CDM concept and their roles notably monitoring to making the CDM component of the project activity successful. Emphasis will be on validation, registration and verification processes to make them aware what is required and their roles in each step.
Monitoring plan and responsible entities is attached as appendix 5.

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

The start date of the project activity is 08/04/2011

C.2. Expected operational lifetime of project activity

25 years

C.3. Crediting period of project activity

C.3.1. Type of crediting period

Fixed

C.3.2. Start date of crediting period

24/05/2016 or date of registration whichever is later

C.3.3. Duration of crediting period

10 years

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

The environmental impact assessment for the proposed project activity was undertaken as a legal requirement in Zambia and in accordance with the requirements of the Environmental protection and pollution control act of 1990 and notably Statutory instrument no. 28, the Environmental impact assessment regulations of 1997, section 3 (1) of statutory instrument no. 28 of 1997 of the above mentioned act that clearly states that "a developer shall not implement a project for which a project brief or environmental impact statement is required under these regulations, unless the project brief or an environment impact statement has been concluded in accordance with these regulations and the Environmental Council of Zambia has issued a decision letter." New electricity generation stations and electrical power transmission lines of more than 1 km do require environmental impact assessment to be undertaken.

The Environmental impact assessment was done by ZESCO Ltd Environment and social affairs unit and Harza Engineering Company International LP. The report was compiled by ZESCO Ltd in 2008.

Environmental impact assessment on the power generation and transmission line was considered separately. The following are the identified potential environmental and social impacts and the proposed corrective measures.

Power plant

Since the project activity will utilise the existing dam, the adverse impacts usually associated with hydropower developments have been reduced. No settlements will be affected since the existing dam water level will not be raised and there are no houses at the proposed power station site. The project activity will only affect the general physical and biological environment in the immediate project area. The potential impacts are analysed below:

Noise and dust

Noise and dust from drilling, blasting and excavation will be expected only during the construction of power plant. The same applies to dust emanating from sand aggregation, cement and construction steel that will be sourced from outside the area.

Mitigation: Blasting time can be arranged to be done in a specified period of time in a day in particular when majority of the people who would be affected are away.

Work force

The project will require new work force that would be accommodated in the nearby surrounding that would create some social disturbances. For instance the work force will consist of about 20-25 management and engineering personnel, 30-40 semi-skilled workers and 150 unskilled labourers. This large number of new work force to be part of a sparsely settled rural area may cause

disturbance to the lives of local people in aspects such as competing for water resources like drinking water, fuel wood and health facilities.

Mitigation: To reduce the number of new comers, the contractor will be advised to hire local labourers from the surrounding community.

Public health

A large number of new people in the project area may pose health threats to local people in particular the introduction of new diseases such as sexually transmitted diseases including HIV/AIDS and water borne diseases. Spread of HIV/AIDS is of greater concern because project workers are likely to have more money than locals and this may stimulate prostitution in the area.

Mitigation: Health campaign should be undertaken on regular basis to educate and raise awareness to workers and local community on the danger and the prevention of HIV/AIDS and other communicable diseases. Clean and safe drinking water will be provided on the site as well as providing water borne toilets in designated areas for the use by construction workers.

Loss of vegetation

Removal of vegetation during construction may induce soil erosion from runoff as the power house will be located at the foot of the hill. Vegetation removal on the Kafue river banks may lead to erosion and increase the sediment load of the river.

Mitigation: Vegetation removal shall be kept to a minimum by making sure that only trees on the direct site of construction are removed. Re-vegetation should be implemented after the construction phase to accelerate ecological restoration.

Wildlife effects

The new workforce may engage into poaching activities using weapons such as guns that will be brought to the area as a result of the proposed project activity. The power house may also partially block the corridor to the river for some animal species. Excavation and cutting of trees may lead to habitat destruction for some species.

Mitigation: Anti-poaching campaign will be done as well as environmental conservation. Any bird, animal or reptile found during the construction phase should be released to the natural environment.

Safety on site and on the road

Location of the power house at the foot of a hill on the road to Namwala, Ngoma ZAWA camp, Kalala and Musungwa Lodges will obstruct the smooth flow of traffic and may lead to an increase in road traffic accidents.

Mitigation: Appropriate road signs to be placed along the Itezhi Tezhi - Namwala road that will be re routed. A speed limit of 30km/h will be set to all motorists. Work area will be marked whereby all workers and visitors will be required to wear appropriate protective gears. First aid training will be provided to all workers including making sure that first aid kit is available all the time.

Down stream flow changes

The project activity will result in alteration of the flow regime. Since the project will produce peaking power, the flow in the Kafue river will fluctuate between the low flow release of about 20-25 m^3/s and 315 m^3/s.

Mitigation: To reduce the risk of wave surges in peaking projects or where the slipways might be opened suddenly, the following will be carried out:

- Control of the release
- Warning devices
- Educate the population at risk

Transmission line

The impact is expected during the construction of 300 km transmission line. The way leave will result in some permanent resettlement (dwellings) and temporary displacement of land use in particular subsistence agriculture. The occurrence of blasting at isolated spots along the routing will result in the most significant impact. Other impacts are anticipated to be localized and temporary. Environmental and social impacts likely to occur during the construction of transmission line are:

Loss of vegetation

Transmission line construction includes bush clearing to pave the way for way-leave of 50m width (25m from the centre of the line on either side) and will involve cutting down of trees resulting in the opening up of forested areas. Plant species heterogeneity may be affected and subsequently affect both grazing and browsing animals. Way-leave clearing will also hence increase vulnerability of soil to degradation in open forest areas.

Mitigation: To encourage re-growth trees will be stumped and clearing will be restricted to prescribed way leave in the riverine areas. To minimize soil erosion, access roads will be compacted where feasible and use of heavy equipment will be minimized in erosion prone areas.

Disturbance of wildlife

The way-leave for the proposed transmission line could open or cut some migratory routes for wild animals from the Game Management Area (GMA) and Kafue National Park (KNP) such as Elephants and antelopes. However, open areas under the way-leave could also provide new grazing grounds for animals, especially antelopes. Disturbance may lead to the death of some animals with low mobility. Poaching may occur due to open up of access roads.

Mitigation: Anti-poaching sensitization to workers and the community. Placement of bird diverters on the line in identified migratory sections of the line.

Waste

Significant wastes such as human waste, construction waste and general household wastes from consumption will be generated during the construction period.

Mitigation: Disposal of waste in specific designed areas only and avoiding disposing waste in ecological sensitive environments. To avoid hydrocarbons pollution, it is envisaged that the transformers will use Polychlorinated Biphenyls free oils as well as constructing oil interceptors and containments chambers around transformers in substations.

Water pollution

The Transmission line will cross the Kafue River once and over many streams into Mumbwa and then Lusaka west substation. Use of construction equipment for materials haulage, access road construction and during maintenance of the transmission line could cause stream bank erosion. Over the Kafue River crossing, use of water transport will be required which may result in water pollution due to use of fuels and lubricants. Greater impacts will occur if construction occurs during the wet season.

Mitigation: The contractor will be required to develop a construction activity schedule that will outline methods as well as appropriate seasons to carry out some actions.

Noise and air quality

Air quality may change due to pollution from construction. Blasting and drilling for foundations in rocky areas and use of heavy vehicles will produce localized air pollution. However during line operation and maintenance, no such noise and less air pollution will be experienced.

Mitigation: Use of heavy duty construction equipment on the transmission line will require application of dust suppressant materials line water, on access roads and work sites. To reduce dust in access roads, it is recommended to open up and use access roads when there is enough amount of moisture in the soil.

Seismicity

Blasting may induce minor localized earth movements though this will not be of similar magnitude as the frequent low intensity seismic activities (and occasional larger events) experienced occasionally at Itezhi Tezhi. Use of dynamite (and other explosives) around Lusaka West substation may induce localized earth shaking. To minimize impacts, blasting will be done where necessary.

Mitigation: Blasting will be controlled by qualified and registered blasters. Warning will be given in advance and blasting locations appropriately secured before blasting.

Settlements and land use

The project area stretches over four districts in which some settlements will be affected and relocation required. In total 101 households will have some form of asset displaced. The way-leave acquisition for the transmission line will not entail conversion of land into a different land tenure system. However, the land for the proposed substation in Mumbwa will be converted from customary to leasehold.

Mitigation: land use under the Transmission line will be restricted to activities such as animal, grazing, growing of low crops (but not under irrigation) and access (traversing).

Health impact

The influx of people in the project area seeking employment may create stress on public health services. For instance, a potentially serious adverse effect of a project work force on local people is the introduction of infectious diseases, especially sexually transmitted ones (such as HIV/AIDs).

Mitigation: Sex education to project labour and the community in general will be done by the project management team from the client in collaboration with Ministry of health in the respective Districts. This will be done at regular intervals throughout the construction period.

Visual impact

The types of towers to be used will cause visual protrusion on the line route. However, the double circuit towers and self supporting Guyeed Vee towers will be of a particular height in order to meet the minimum ground clearance as required by applicable national, regional and international standards. This will be above most tree lines especially in the Kafue Flats hence will stand out against the background environment.
Mitigation: The location of the transmission line will be away from the main road to reduce the inevitable visual intrusion.

D.2. Environmental impact assessment

In principle the environmental impact of a new hydropower plant is normally associated with the construction of water reservoir. Since the proposed project activity will utilize the existing Itezhi Tezhi dam, it can be fairly concluded that no significant environmental impact is expected. For the case of transmission line construction, the environmental impacts have been identified and they are not significant based on the proposed route. Mitigation measures to address identified environmental impacts as a result of power generation and transmission line construction have been proposed.

An environmental and social monitoring programme together with a resettlement action plan have also been developed.

The ESIA was undertaken according to national regulations of the Republic of Zambia. The legislations considered are:

- Water Act (CAP 312)
- National Water and Sanitation Act (No. 28 of 1997)
- The Electricity Act (No. 15 of 1995)
- Natural Resources Conservation Act (CAP 315)
- Forestry Act (CAP314)
- Local Government Act (CAP 22 of 1991)

  - National Water and Sanitation Act (No.28 of 1997)
  - Town and Country Planning Act of 1995 (CAP 283)
  - Public Health Act (CAP 295)
- Zambia Wildlife Authority Act ((No. 10 of 1991)
- Fisheries Act (CAP 314, 1974, 1998)
- Lands Act, 1995 (CAP 292, CAP 289, CAP 288)
- Mines and Minerals Development Act (CAP 320)
- National Heritage Conservation Commission Act(No. 23, 1989)

The following documents have been reviewed:

- Itezhi Tezhi Power Transmission Project, vol.II of II, Environmental Impact Assessment, ZESCO, October 2008
- Itezhi Tezhi hydroelectric, Environmental Impact Assessment- addendum, ZESCO Ltd, November 2008
- Itezhi Tezhi Hydro Power Project, summary of the environmental and social impact assessment, African Development Bank, 2011.

The Environmental Impact Assessment prepared by ZESCO has been approved by the relevant authorities in Zambia (see appendix 7).

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

Stakeholder consultation was undertaken as part of the development of the social and environmental impact assessment (ESIA) and the resettlement action plan (RAP). Meetings were held with stakeholders to the project activity who are likely to be affected by the project. Two main sets of consultative meetings were held, with (i) the local stakeholders in Musungwa and Kaingo Villages and with (ii) institutions operating in Itezhi-Tezhi.

Consultative Meetings with Stakeholders in Musungwa and Kaingo Villages

Meetings were announced beforehand in the local media (newspapers The Times of Zambia on 02/11/2012 and radio) and by direct mail invitations to the more senior invitees. Stakeholder meetings were announced on 15 October 2012 and were held on 8 November 2012. The stakeholder meetings were targeted at people likely to be affected by the project, the Chiefs under their jurisdiction and government institutions operating in the area.

Meetings were held with relevant stakeholders in the Musungwa and Kaingo Villages. The most senior people consulted included:

Musungwa Village:

- Chief Musungwa
- Headman Shamwene
- Headman Mwiila

Kaingo Village:

- Chief Kaingo and his Indunas

Consultative Meetings with institutions operating in Itezhi – Tezhi

A consultative meeting was also held with institutions operating in Itezhi Tezhi as well as Kafue National Park and Nangoma camp. These stakeholder meetings with institutions operating in Itezhi – Tezhi were announced on 15 October 2012 and were held on 9 November 2012 (Figure 5). During the meetings a brief background was presented by the Consultant after which the meeting went into deliberations. The meeting participants were informed about the surface and

underground power station options being considered, and that building the power station would result in increased flow releases from the reservoir, with the release being varied according to the demand of electricity during the day.

Figure 5: Consultation meeting at Itezhi-Tezhi

Furthermore consultation for construction of the transmission line was made towards the following stakeholders:

- Fishermen
- Councillors
- Village headmen
- Chiefs
- Civil servants
- Zambia Wildlife Authority.

These stakeholder meetings were announced on 15 October 2012 and were held on 11 November 2012.
During preparation of Resettlement Action Plan (RAP) communities were consulted to air their views and concerns. The consent was sought from the land owners/villages where the line will traverse (see the sample as appendix 8).

E.2. Summary of comments received

Chief Musungwa and Chief Kaingo pointed out concerns as well as offered some suggestions with respect to the implementation of the project. These were:

- All affected people should be compensated.
- Set up a labour council and involve local chiefs in the recruitment of labourers/workers during construction.
- Since the dam was constructed in 1978, there has been less flooding downstream and the ponds have no water. Downstream users would prefer more flooding as it would assist the generation of pasture for grazing.
- Chiefs downstream should be informed well in advance before opening the water gates.

The consultative meeting was held with the heads of department of various institutions operating in Itezhi Tezhi with the aim of introducing the project activity and to receive comments/concerns. Explanation to participants was made on the surface and underground power station options that

were under consideration at that time, where the building of the power station would result in increased flow releases from the reservoir with the release being varied according to the demand of electricity during the day. The following concerns were raised:

- The effect of raising the dam to the fishing industry.
- The effect of raising the dam to the immediate surroundings.
- The effect of continuous flooding on fishing downstream of the river. It was mentioned that fishermen catch more fish when the level of water in the river is low.
- Fluctuation of water releases would affect fish breeding
- People should be informed before releases are discharged
- Differences in ethnic composition of the people along the reservoir and upper land should be considered during relocation.
- The intake should be designed to avoid the use of deoxygenated water as it would kill the fish.

Communities consulted during the design and preparation stages of Resettlement Action Plan raised issues concerning land tenure, resettlement, land use, health, fishing, employment, etc,

E.3. Consideration of comments received

As can be seen above, the main comments and concerns presented above can be grouped under the following headings:

- Grievances and compensation
- Local employment
- Impact of flooding
- Relocation
- Impact on fishing

Concerns raised by the stakeholders were addressed either in environmental impacts mitigation measures, which have been reported in the ESIA, or the Resettlement Action Plan. It should be noted that many of the concerns to be addressed emanate from the construction of transmission line component and not of the hydropower plant itself, and these are therefore not addressed in detail in this document.

A summary of how comments received related to each of the headings above were taken into consideration is presented below, and more comprehensive information is provided in the ESIA and the Resettlement Action Plan.

Grievances and compensation

Grievances are inevitable in projects that involve disturbing people's livelihoods and wellbeing. These could vary from rates of valuation, compensation eligibility criteria and actual compensation payments. Timely redress or resolution of such grievances is vital to the smooth and satisfactory implementation of the relocation program. The project owners have put in place procedures that allow affected people to lodge complaints or claims with the Project Team. The full time Project Team ensures that all such grievances are resolved in a fair manner and within a reasonable time frame.

Grievances should be resolved within the Project context without taking a protracted course to the detriment of the project and the affected individual. Hence, grievances related to any aspect on projects are handled through negotiations with affected persons. The complaints received from can be in verbatim, or in writing. Any project team member that receives such complaint notes the same in writing for further consideration.

When reported, a formal file for each grievance is opened and contains the following documents for ease of follow-up and verification:

- Description of the grievance;
- Location of the complainant on the project;
- Date the grievance received;
- Description of the resolution; and
- Date the grievance was resolved.

If the matter still remains unresolved after all levels of grievance redress have been utilized, the complainant may then forward his/her case to a court of law. In addition to the above mechanisms, and at the option of the Affected People, grievances may be taken to other mediating bodies, such as the local leadership or any other dispute resolution mechanism as may be decided by the affected people.

The project owners have experience on compensation issues from various projects, and based on that experience, have developed a draft compensation policy drawn from Zambia's Land Acquisition Act. The general objectives of the compensation policy are therefore to (i) take into consideration project options and locations that avoid involuntary resettlement where feasible and to minimize population displacement; (ii) ensure that displaced people receive compensation and assistance so that they would be at least the same or better off as a result of the project; (iii) communities in project areas benefit from the project where feasible; (iv) project stakeholders are consulted and given the opportunity to participate at an early stage in the project cycle (during environmental studies, feasibility studies, design, implementation, and operation of the project); and (v) appropriate assistance and compensation is provided to any affected persons or to individuals with user rights of any parcel of land that falls within the project area.

The two most important elements that are considered and covered in compensation are (i) compensation for loss of any fixed assets and or other physical infrastructure and (ii) improvement of local incomes through the provision of jobs on the project.

Local employment

The magnitude of the project, including the transmission line, will entail creation of employment opportunities for both unskilled and skilled labor in the local communities. It is envisaged that during annual bush clearing, the contractors will create employment for locals in their respective sections on the transmission line. Planned new developments such as agricultural expansion, tourism and mining in Lusaka West will be supported by availability of reliable electricity supply from the proposed T-line.

Impact of flooding

The principal effect of the project on the river will be an alteration of the flow regime. The change in river flow during operation is expected to be accomplished at a ramping (increase) rate selected with regard to public safety. Hydroelectric turbines are capable of extremely rapid starts (less than one minute from stationary to full revolution), but such a start would cause a substantial wave of water to move down stream.

There are several ways of reducing the risk of wave surges in peaking projects, or other projects where the spillway might be opened suddenly: 1) control of the release; 2) warning devices; and 3) education of the at-risk population. All three of these will be used on this project.

During the design phase of the project, engineers determined the safe ramping rate for start-up. A ramping time of 20-30 minutes is likely.

A warning system will be installed at points, such as Namwala, where people usually are in close proximity to the river. The form of this warning system will be discussed with district authorities; the usual devices are a siren or a spoken warning. Public education will be aimed at ensuring that all sectors of the public are aware of the risk of a river surge at start-up and of the meaning of the warning devices. The time of peaking will be posted in prominent places in settlements along the river. Education signs will be placed in schools and clinics, informing the public about the danger of river surges. Teachers in primary and secondary schools will make sure that their pupils understand the significance of the warning devices.

Public awareness of and interest in the hydropower project could be enhanced by organized tours.

Relocation

Issues related to relocation have been addressed in the Resettlement Action Plan. The budget for relocation and environmental impacts mitigation is attached as appendix 9.

Activities that would give rise to resettlement would include, the transmission line (i) bush clearing, (ii) transmission line construction, (iii) construction and siting of associated construction camps, (iv) opening up access roads in the way-leave, and substation construction at Mumbwa. On the hydropower station, it suffices to say that the dam is already in existence and situated in an area whose land belongs to ZESCO. However, over the years and due to changes in district administrative jurisdiction, ZESCO will have to reclaim some pieces of land to ensure no obstruction to the power station activities including raw water intakes for the power station; emergency spillway discharge channel; switchyard construction at Itezhi-Tezhi; and land near sewerage ponds. With this, the potential impacts on settlements are within the context of the transmission line rather than the hydro-power station.

With respect to the transmission line, there are a total of 101 locations or households. In line with the African Development Bank policies and other funding agencies on involuntary resettlement and displacement, it is ZESCO's practice to align any transmission line to avoid affecting households and other infrastructure. The ITT line project despite the distance the actual displacements are likely to be relatively low. Some structures will also be affected by construction of the access roads, substation and other associated infrastructure. These may cause rise to the resettlement and relocation of homestead structures in the project area.

Fishing

During construction, settling ponds should be constructed where waste water should collect before it is discharges in the River. This will allow the suspended load in the water (including soil particles) to settle in the ponds to minimize the volume of the sediments to be discharged in the River. Frequent cleaning of the settling ponds will be undertaken to maintain sufficient capacity to handle runoff water from large rainfall storms.

During the dry season, the daily generation flow will be an augmentation of the natural flow of the river and will serve to keep some of the side channels inundated. This may result in greater survival of juvenile fishes, with general benefits to fishery production. If these benefits are to be realized, however, some changes in fisheries regulations and their enforcement may be required.

To ensure impact mitigation measures will be conducted smoothly as proposed, actors has been identified and their roles defined clearly. The team will be composed of the following:

Environmental Coordinator:

Seated at ZESCO Limited, the Environmental Coordinator will be responsible for planning, implementation and on-going management of all compensation issues on the project. In consultation with the project/site manager the coordinator is responsible for consulting with the local community on compensation schedules. This includes:

- Ensuring compliance with agreed mitigation measures according to Environment Management Plan including contractor's movement on the line, construction schedule and land access schedules.
- Ensuring that compensation requirements are met before commencement of construction.
- Liaising with communities and the contractor for and any grievance that may delay project implementation.
- Implementing the re-location plan.

ZESCO Limited Capital Cost Controller

The Capital Cost Controller will assist the project team with the administration and control of the field activity and relocation budget, e.g. by recording expenditure and by reporting on trends and

variances so that management is warned in advance of potential problems; more importantly to provide funds in a timely manner for compensation.

Projects Consultants and Contractors

The Consultants and Contractors will assist the Environmental Coordinator in locating any affected persons that may have been missed during the first asset survey and provide description of skills that will be required for the locally sourced construction labour to evaluate which of the affected persons may qualify for employment.

The Project Team and Composition

The Relocation Project Team members will be required to ensure that the project is implemented successfully and provide progress reports to the company management and other stakeholders. The Team will comprise:

- The Project Manager
- The Site Manager
- Electrical Engineer
- Civil Engineer
- Environmental Coordinator

Valuation and compensation for assets and structures has been done by an independent property valuator engaged by ZESCO Ltd.
Grievance and redressal mechanism have also established to address grievances that might be raised by the affected persons such as compensation eligibility criteria, rates of evaluation and actual compensation payments.

SECTION F. Approval and authorization

Letter of Approval (LoA) from DNA in Zambia was issued on 17 January 2013.

Appendix 1. Contact information of project participants

Organization name	Itezhi Tezhi Power Corporation
Country	Zambia
Address	Plot 3039, Makishi Road, Fair view, Post Net 239,Private Bag E891
Telephone	+260 211 230461
Fax	+260 211 230458
E-mail	fmubiana@itpc.co.zm
Website	--
Contact person	Mr. Fidelis Mubiana

Appendix 2. Affirmation regarding public funding

The project participants confirm that there is no public funding for this project.

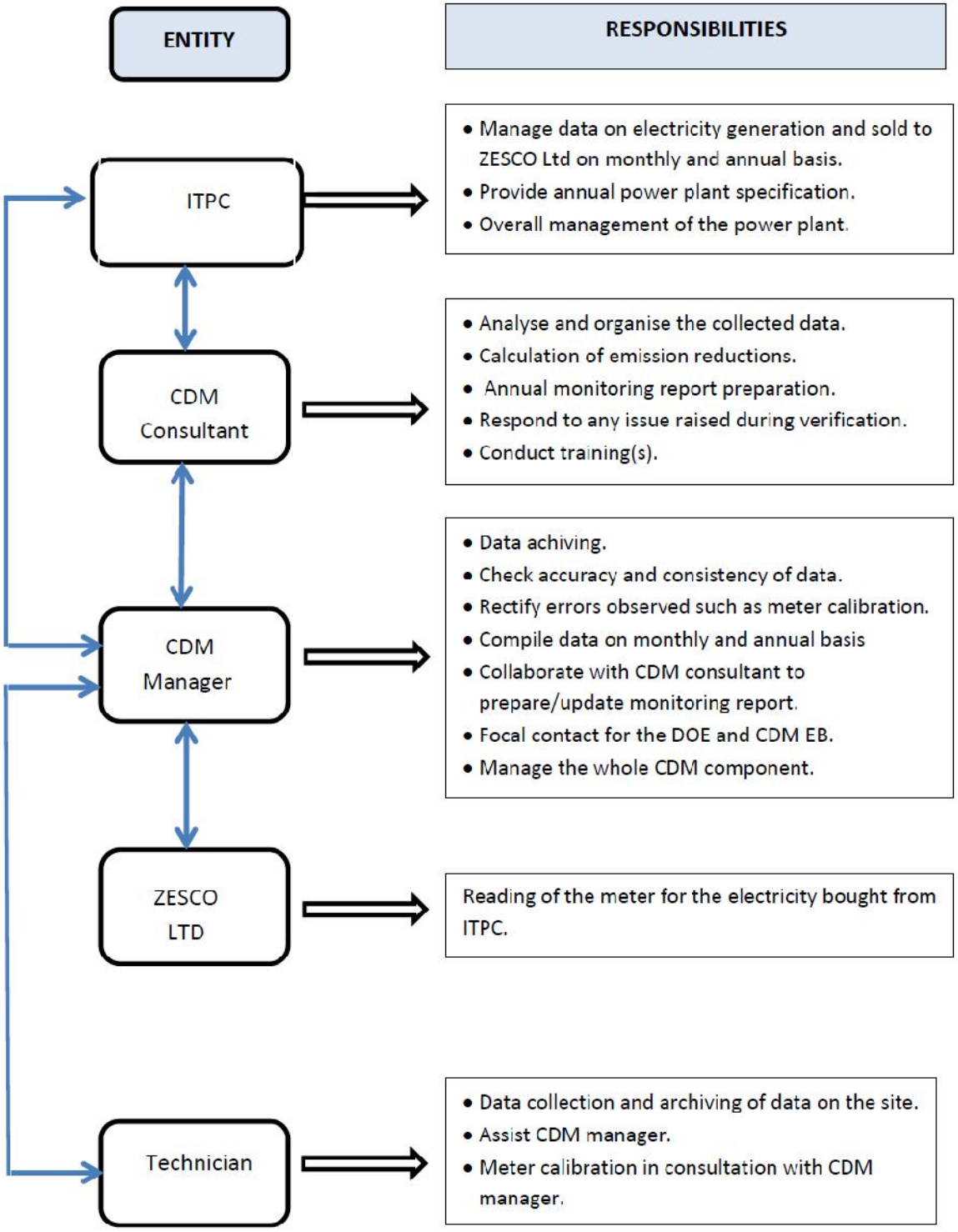
Appendix 3. Applicability of methodologies and standardized baselines

All information pertaining to the applicability of the selected methodology is provided in the main PDD document.

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

All information pertaining to the ex-ante calculation of emission reductions is to be found in the Standardized baseline - Grid emission factor for the Southern African power pool (version 01.0), and no further background information is therefore deemed necessary.

Appendix 5. Further background information on monitoring plan



Appendix 6. Summary report of comments received from local stakeholders

Appendix 7. Summary of post-registration changes

A request was sent on 19/03/2018 to the UNFCCC secretariat requesting a change to the date for the start of the crediting period from 8 September 2015 to 24 May 2016 as the latter is the date of commissioning of the plant, and should therefore also be the start date of the first monitoring period. This is in accordance with paragraph 128 of Project Cycle Procedure (PCP) for CDM project activities (version 01.0). Confirmation of implementation of this change by the CDM registration team was received on 21/03/2018.

Change was also made to project description to include description of 33kV transmission line to Kataba town (section A.1.).

Appendix 8. ESIA approval letter

ENVIRONMENTAL COUNCIL OF ZAMBIA

Head Office
Corner Suez & Church Roads
P. O. Box 35131
Lusaka, Zambia
Tel: 260 211 254130/254023/254059
Fax: 260 211 254164
necz@zamnet.zm

Copperbelt Regional Office
Jacaranda Road
P. O. Box 71302
Ndola, Zambia
Tel: 260 212 621048/610407
Fax: 260 212 610246
eczndola@necz.org.

Livingstone Office
Plot No. 555
Junction Obote / Nehru Roads
Livingstone, Zambia
Tel/Fax: 260 213 321297

Chirundu Border Office
Lusaka Road
P.O. Box CRU31
Chirundu, Zambia
Tel/Fax: 260 211 515261

In reply please quote ECZ/INS/101/4/1

No.

January 26, 2009

The Managing Director
Zesco Limited
Stand No.6949
P.O. Box 33304
LUSAKA

Attention: Mrs. E Mwelwa

Dear Sir,

Proposed Itezhi-tezhi Hydro Electric Project by Zesco Limited.

I make reference to the Environmental Impact Statement for the above project submitted to us in 2006 for consideration in accordance with the requirements of the Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations, Statutory Instrument No. 28 of 1997 and which project was subsequently approved on September 21, 2006. We further make reference to the Addendum to the above project submitted on December 8, 2008.

The Environmental Council of Zambia has reviewed the said addendum to the EIS and based on the information provided by yourselves, comments from stakeholders and from our site verification inspection findings, we have **approved** your project proposal. Find attached herewith, the amended Decision Letter with stated conditions.

Yours faithfully,

ENVIRONMENTAL COUNCIL OF ZAMBIA
26 JAN 2009
DIRECTOR'S OFFICE
P.O. BOX 35131, LUSAKA

Victoria S Mupwaya
Acting Director
ENVIRONMENTAL COUNCIL OF ZAMBIA

Cc: The Council Secretary– Itezhi-tezhi District Council, **ITEZHI TEZHI**
The Director General – Zambia Wildlife Authority, **CHILANGA**
The Director & Chief Executive Officer- Road Development Agency, **LUSAKA**
The Secretary Water Development Board, **LUSAKA**

Appendix 9. Sample of land use consent from the owner

TO PART II

Name & Address of:
Owner/ Leaser/ Occupier
JUSTINA MWANSA MWAPE
OF... L/62551M.....
LUSAKA.....

ZESCO Limited,
Environment & Social Affairs Unit
P. O. Box 33304
LUSAKA

Dear Sir,

SURVEY & ERECTION OF ELECTRICITY LINES SHOWN ON DRAWING No....1528A3.....
Property No...L/62551/M.....

I acknowledge receipt of your letter reference.AI4U/EA/JTT-mum-HWEST/08
Date.01.06.08.. and as Owner/ Leaser/ Occupier, I give the necessary permission to carry out the work as detailed in your letter.

Yours faithfully,

Signed.....
Owner/ Leaser/ Occupier

NRC/~~Passport No~~:....146660/51/1

Appendix 10. Relocation and Environmental impacts mitigation budget

ACTIVITY	IMPLEMENTING AGENCY	ESTIMATED COST US$
1. Land acquisition/Resettlement • At substation & on the transmission line.	**ZESCO Limited:** Based on professional advice (valuation report) from an independent & registered Property Valuator	**150,000**
2. Health Education • Conducting health awareness campaigns to construction workers & the local community	**Ministry of Health (ITT & Mumbwa)** Project ECO: 1XUS$ 100/dayX 20 days Health staff: 2XUS$ 70/dayX 20 days RDC Member: 2XUS$ 70/dayX 20 days Local Leader 1XUS$ 70/dayX 20 days Logistics (fuel etc) US$1,220/tripsX2 Note that the awareness would be conducted twice during the respective project component implementation.	**11,440**
3. Access and Road • Purchase or fabrication of appropriate road signage & warnings	**Contractor(s)** (Note that the contractor may opt to buy already made signage or could fabricate all signage on site).	**10,000**
4. Wild life Conservation • For antipoaching and fisheries campaigns	**ZAWA and Fisheries Department** Project ECO: 1XUS$ 100/dayX 20 days ZAWA staff: 2XUS$ 70/dayX 20 days Fisheries Officer 2XUS$ 70/dayX 20 days RDC Member: 2XUS$ 70/dayX 20 days Local Leader 1XUS$ 70/dayX 20 days Logistics (fuel etc) US$ 1,220 X 2 trips Note that the awareness will be conducted on the Mumbwa - ITT segment of the line (In Chief Chibuluma, Shimbizi & Chilyabufu areas)	**14,240**
5. Forest Management Plan • Develop a set of forestry management plans for Mumbwa Forest •	**Forestry Department** Project ECO: 1XUS$ 100/dayX 20 days Extension officer 2XUS$ 70/dayX 20 days Research Officer 2XUS$ 70/dayX 20 days Note that the FMP is intended to guide ZESCO during bush clearing and during annual bush clearing operations	**7,600**
6. Monitoring & Auditing • Regular monitoring of implementation of mitigation measures	**ZESCO Limited/ZAWA** Project ECO: 1XUS$ 100/dayX 7days/month (X10 months) ZAWA staff: 2XUS$ 70/dayX 20 days Logistics (fuel etc) US$3,000 for the Project duration	**12,800**
7. Total mitigation budget		**206,080**

Document information

Version	*Date*	*Description*
10.1	28 June 2017	Revision to make editorial improvement.
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

Version	*Date*	*Description*
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

Decision Class: Regulatory
Document Type: Form
Business Function: Registration
Keywords: project activities, project design document