Regional Electricity Regulators Association of Southern Africa

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Supportive framework conditions for mini-grids employing renewable and hybrid generation in the SADC Region

Guidelines on

Ownership, Funding and Economic Regulation

December 2013

RECP
Africa-EU Renewable Energy Cooperation Programme

This study has been elaborated on behalf of the Regional Electricity Regulators' Association of Southern Africa (RERA) to establish a framework for attracting increased investment in mini-grids employing renewable and hybrid generation in the countries of the Southern African Development Community (SADC). This project has been financed under the Africa-EU Renewable Energy Cooperation Programme (RECP, www.africa-eu-renewables.org), an integral part of the Africa-EU Energy Partnership (AEEP).

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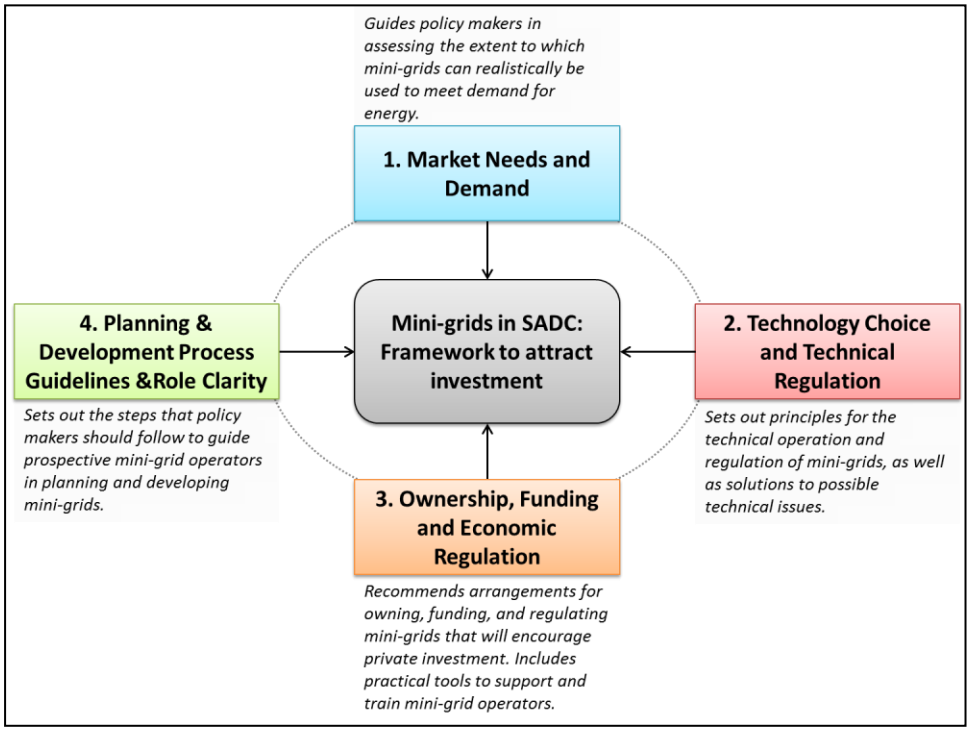
Acronyms and abbreviations

CA	Concession Agreement
DOE	Department of Energy
DSCR	Debt Service Coverage Ratio
ECA	Economic Consulting Associates
ERB	Energy Regulation Board of Zambia
EU	European Union
EUEI PDF	European Union Energy Initiative Partnership Dialogue Facility
EWURA	Energy & Water Utilities Regulatory Authority of Tanzania
FiT	Feed-in-Tariff
kVA	kilo volt-amperes
kWh	kilo watt-hour
LCOE	Levelised cost of energy
MW	Megawatt
NWEC	North West Energy Company, Zambia
O&M	operations and maintenance
OBA	Output-Based Aid
PA	Practical Action
PPA	Power Purchase Agreement
PPP	Public Private Partnership
REA	Rural Energy Agency, Tanzania
RECP	Africa-EU Renewable Energy Cooperation Programme
RERA	Regional Electricity Regulators Association of Southern Africa
REF	Rural Electrification or Energy Funds
SADC	Southern Africa Development Community
SHP	small hydro power
SOMA	Standardised operations and maintenance agreement
SPP	small power project
SPPA	Standardised PPA
SPPA	Standardised power purchase agreement
STM	Standardised Tariff Methodology
SWH	Solar Water Heater
TEDAP	Tanzania Energy Development Access Project
UAF	Universal Access Fund
UNEP	United Nations Environment Programme
US$, USD	United States dollar
USc	United States cents

Executive summary

The supportive framework conditions for mini-grids employing renewable and hybrid generation in the SADC region address four focus areas as summarised in the figure below:



The instruments which are provided in this document and in supporting additional legal templates are addressing the third focus area – Ownership, Funding and Economic Regulation. The templates are:

- ❑ Standardised licencing procedures and licence templates
- ❑ Guidelines for use of energy funds for mini-grid investment support ('Subsidy guidelines')
- ❑ Procurement guidelines for competitive bidding
- ❑ Standardised concession agreement (SCA)
- ❑ Standardised operation and maintenance agreement (SOMA)
- ❑ Standardised tariff methodology (STM) comprising Retail Tariff Tool, Feed in Tariff (FiT) Tool and Power Purchase Tool
- ❑ Standardised power purchase agreement (SPPA) templates

The instruments are oriented to facilitating efficient mini-grids being established on a viable, sustainable basis. One of the main themes is that mini-grid customers need

electricity much more than they need low tariffs. Regulation should therefore be as light-handed as possible; in particular tariffs for small mini-grids should not be directly regulated. It may be seen as unfair for mini-grid customers to pay more per kWh for power than main-grid customers, but the real unfairness is for people in remote centres not to have electricity at all.

Subsidies should be limited to one-off capital subsidies, as this will enable many more mini-grid users to benefit than concentrating providing recurrent subsidies to those few mini-grid beneficiaries lucky enough to already have access to electricity. Costs are high in mini-grids, and to ensure viability tariffs may need to be allowed to be above uniform national tariff levels. This should be acceptable to mini-grid consumers if the monthly cost of mini-grid electricity is less than the cost of their previous forms of energy (that they paid for before the mini-grid was constructed) or if they can increase income because of the energy access.

The economic and social benefits of mini-grids are substantial, but public and donor resources are insufficient relative to the need. For this reason full advantage needs to be taken of any opportunity to leverage community and private resources for mini-grid development. This can be done through deliberately minimal economic regulation, backed by standardised tariff guidelines and project agreements.

1 Ownership, funding and economic regulation

1.1 Introduction

The objective of this volume is to provide a set of practical instruments which SADC countries can use to ensure that economic regulation for mini-grids leads to sustainable ownership and funding arrangements for investment capital as well as operation and maintenance.

The instruments are intended to cover a wide spectrum of circumstances as illustrated in the table which highlights a mini-grid classification that combines the size of project with ownership and main grid vs. off-grid configurations.

Table 1 Mini-grid classification and applicable tariff tools

		Energy Source for the mini-grid			
		Vertically integrated		Non-vertically integrated	
		Main-grid	Off-grid	Main-grid	Off-grid
Size of energy source	**Very small-scale project (up to 1 MW)**	(Part of main grid)	1. Retail tariff tool to ensure cost-reflectivity	4. Simple wholesale price = an agreed percentage of main grid retail price	7. Retail tariff tool; Simple wholesale price = an agreed percentage of retail price
	Small-scale project (> 1 - 10 MW)	(Part of main grid)	2. Retail tariff tool to ensure cost-reflectivity	5. Wholesale price based on STM (FiT or PPA tool, etc) and non-negotiable SPPA	8.STM and non-negotiable SPPA; retail tariff tool
	Large project (> 10 MW)	(Part of main grid)	3. Retail tariff tool to ensure cost-reflectivity	6. Negotiable SPPA with tariff from STM (FiT or PPA tool, etc)	9. Negotiable SPPA with tariff from STM

Notes: STM = standardised tariff methodology; SPPA = standardised power purchase agreement; FiT = Feed in Tariff

The threshold for project size for the different categories given in the table is based on typical international practice but the policy makers and regulators in different countries have to specify the applicable thresholds based on their own experience. The very small projects are not subject to any of the instruments discussed in this report, except for guidance on tariffs from the retail tariff tool. For the small and especially large mini-grid projects, this document provides the following:

- ❑ standardised licencing procedures and licence templates;
- ❑ procurement guidelines for competitive bidding of large mini-grid generation and/or distribution and supply (whether or not the mini-

grid is connected to the main grid), small projects can be considered on a first come first served basis, subject to enforcement of time for specific deliverables;

- the corresponding standardised concession agreement or operations and maintenance agreement;
- standardised tariff methodology (described here, with accompanying spreadsheets);
- standardised power purchase agreement.

1.2 Regulatory forbearance

The purpose of economic regulation is to protect consumers while providing confidence for investors, the main focus therefore being on tariffs. At first gloss, it may seem that the regulatory approaches traditionally used for regulating a large national utility can simply be transferred across to a mini-grid. However, this would be a counterproductive approach for a number of key reasons:

- ***Mini-grid consumers need electricity much more than they need low tariffs.***
  - People in communities without electricity have to resort to extremely expensive forms of electricity, such as dry cell batteries at US$1-2 per kWh, which limits their consumption of electricity to very small quantities. To have access to electricity which can be used for a wide range of end uses is a huge improvement in people's lives, opening up all sorts of income earning and social enhancement possibilities.
  - One of the biggest threats to mini-grid viability and hence to people having access to electricity in communities remote from the grid, is the idea that mini-grid tariffs should be no higher than the tariffs enjoyed by grid-connected households in the urban areas. Mini-grid costs per kWh are often higher than the costs of grid supply (despite mini-grid capital subsidies) and in urban areas domestic consumption is cross-subsidised by other consumer categories. Opportunities for such cross-subsidisation are very rare in mini-grids. Policy makers and the communities themselves need to be made aware of this important 'fact of life' that mini-grid tariffs may often have to be higher for households than urban tariffs.
  - There is need for the benefits of electricity to be carefully explained, together with the principles of the equity-oriented subsidy policy (as explained in more detail later).
- ***Mini-grid tariffs are unlikely to exceed the ability and willingness to pay*** of the beneficiary community

- In community-owned schemes, it is clearly up to the beneficiaries themselves to decide on the tariffs which they are going to charge themselves, and the levels will not exceed ability and willingness to pay of the different kinds of consumer. The danger is that the tariffs will be set too low to ensure sustainability, and some guidance would be useful in this regard from the retail tariff tool. If the tariffs are set too high, a surplus would be generated, but this can always be paid back to consumers or devoted to some other community project.

- In privately owned schemes, the electricity supplier will be in a monopoly position and this is precisely the situation for which the instruments of economic regulation have been designed. However, in a typical mini-grid setting, it would be impossible for the private supplier to charge more than the community is able and willing to pay. The guiding framework is that the costs of electricity (a superior form of energy) should be less than the costs of the energy sources which are displaced by electricity (such as kerosene for lighting and batteries for phone charging, radios, TVs and other low power applications).

These views are supported by the detailed, multi-country analysis in the about-to-be published seminal volume by Bernard Tenenbaum, Chris Greacen and Tilak Siyambalapitiya *From the Bottom Up: How Small Power Producers Can Deliver Electrification and Renewable Energy in Africa.* The key elements of the arguments made in Chapter 9 of this book are:

- In order for SPPs that operate isolated mini-grids to exist as commercially viable entities, they must be allowed to charge tariffs that are higher than the uniform national tariff (pg 275)

- Rural household customers can afford cost reflective tariffs if they are allowed to pay for the initial connection cost in small monthly payments over time. Once they get over the connection cost hurdle, they can afford to pay electricity tariffs that will produce monthly expenditures equal to or less than their prior expenditures on non-electricity energy sources (kerosene, candles, batteries). Electricity has the added benefit of producing better energy services: higher quality lighting, better access to information, and health benefits. (pg 278)

In light of the above, ***it is recommended that regulatory authorities should not directly regulate mini-grid tariffs, particularly for small-scale projects***. The time and attention needed to do this on a thorough basis would not be warranted when the aim is to encourage electricity provision in a remote location. There can instead be a ***provision for mini-grid communities to appeal to the regulator*** if they feel that they are being over-charged and an investigation can then be carried out. The framework, however, should be that mini-grid tariffs need to be high enough for the system to be sustainable, and this will invariably mean that tariffs need to be higher than those enjoyed by urban grid-connected electricity consumers.

The main regulatory objective for mini-grids should be to facilitate community and private investment in mini-grids. Public resources to subsidise mini-grids are woefully inadequate in relation to need, and the most needs to be made of any opportunity to secure non-public financing. Regulatory forbearance is what is needed – something that was lacking when the Energy Regulatory Board of Zambia took the Northwest Energy Company to the High Court. Fortunately for the mini-grid cause, the ERB case was thrown out by the judge – see Box.

Box 1 ERB vs Northwest Energy Company

The most successful example of a distribution-only mini-grid in SADC is the Northwest Energy Company (NWEC) located near the Lumwana mine in Zambia. NWEC purchases bulk supplies from ZESCO and distributes retail electricity to consumers living close to mines. The company's first area of operations was to houses in Lumwana Mine township – starting from a low level in 2007, the customer base has grown to around 1,000 houses.

A dispute arose between NWEC and the Energy Regulatory Board over the tariff charged (9.5 c/kWh when ERB asserted that the tariff should be the uniform national level 6 c/kWh). In 2011, the ERB took this dispute to the High Court. The assertion by ERB that 9.5 c/kWh had not been approved and that the tariff should be reduced to 6 c/kWh and damages paid was dismissed by the judge. In Zambia, 9.5 c/kWh may seem high, but it would not be considered high in other parts of Southern Africa, particularly in remote centres which would not otherwise have electricity supplies.

The tariff of 9.5 c/kWh was evidently not seen as a problem either by NWEC customers, as evidenced by continued growth in the customer base. Furthermore, other mining companies have approached NWEC to set up similar distribution mini-grids for First Quantum Minerals in order to electrify about 5, 000 houses to be built by Kansanshi Copper and Gold Mines in Solwezi, and there is another larger scale project on offer in Kalumbila. Had the ERB won its case in the high court, NWEC might well have gone out of business, depriving the electricity consumers not just in Lumwana but in these new project areas of access to power.

Source:http://www.zambialii.org/zm/judgment/high-court/2011/76

It may be seen as unfair for mini-grid customers to pay more per kWh for power than their cousins in the capital city, but the real unfairness is for people in remote centres not to have electricity at all.

Another way of expressing the approach needed to maximise investment in mini-grids is to make regulation as ***light-handed*** as possible. This should not be taken to imply cutting corners in critical areas such as safety and other technical concerns. What is implied by light-handed economic regulation is:

- Procedures that are as streamlined as possible in order to reduce transactions costs and time when mini-grids are established
    - Minimisation of number of regulatory processes and decisions

- Standardised documents

- Only essential reporting requirements so as to minimise administrative costs during project operation
  - Careful specification of information required by the regulator
- Reliance on related decisions made by other government or community bodies

There are dangers in being too light-handed: it could lead to a flood of applications and low quality projects that would be difficult to process (as occurred in Nepal and Sri Lanka)[1]. However, this would be a desirable outcome compared with the current situation where the number of mini-grids in many if not most SADC countries can be counted on the fingers of one hand.

[1]See Tenenbaum et al pg 80.

2 Mini-grid licensing procedures and standardised licence templates

Licensing is part of the core business of SADC electricity regulators. The procedures for the issuance of a mini-grid licence and the content of the licence should be similar to established norms in each country, with one important caveat.

This is that, given the difficulty of attracting investors willing to take on the difficult task of establishing and managing a mini-grid in a remote area, as far as possible the licence procedures should be streamlined and the licences simplified in order to reduce transactions costs and encourage a greater level of investment in mini-grids than has occurred in the past.

While all mini-grids have to show compliance with safety and technical standards, formal licences are only to be required for larger mini-grids. In order to promote mini-grid investment, the cut-off for the very small mini-grids which do not require formal licencing should in the first instance be set at a high level. Such very small mini-grids could instead be issued with a permit, as is the case in Kenya, where a permit is granted for carrying out any activity in the energy business where a licence is considered onerous. The threshold can and should be subject to review as mini-grid experience is gained by the regulator.

2.1 Licence procedures[2]

2.1.1 Licence applications

Applicants need to complete a prescribed form, indicating whether the application is for a provisional licence (so as to be granted exclusivity for the site while developing the project) or a full licence for (a) generation (b) distribution and supply or for both. In some countries, such as Zambia, supply is separately licenced. Given the small-scale nature of mini-grids it is recommended to minimise the number of separate licence documents. A vertically-integrated mini-grid could have one license that authorises the whole value chain required to serve customer needs.

2.1.2 Accompanying documents

A typical list of accompanying documents would comprise:

- ❑ certified copies of its registration documents;
- ❑ description of site details for generation and/or distribution and supply system, including future expansion plans;
- ❑ proof of land title or rights of use for land;

[2] Text is based on Tanzanian precedent. The licence application form is available from http://www.ewura.go.tz/newsite/index.php/2012-03-07-08-18-59/application-form

- a certified copy of the environmental clearance if this is required under national environmental legislation;
- a business plan;
- proof of financial capability;
- latest annual report and accounts for the applicant or sponsor

For a generation licence, in addition:

- proof of water rights for applicants intending to generate power from a hydro source;
- proof of authorization of development of the generation site, including building permit, if any;
- power purchase agreement, if any;
- description of the generation plant.

2.1.3 Publication of licence application

Once regulator has confirmed completeness and consistency of the application, a notice should be placed in two national newspapers of wide circulation and a local newspaper circulating in the target area, requiring comments to be received from the public within a stipulated period.

2.1.4 Granting of the licence

Thereafter the regulator must evaluate the application and decide grant or deny the application or refer it back to the applicant. The factors to be considered would include:

- economic efficiency and benefit to the mini-grid users, the public in general and the applicant;
- the applicant's record and financial capability;
- the protection of the environment;
- comments and representations received from the public, if any;
- the compliance of the generation facility and distribution network on matters including:
  - safety;
  - health;
  - security;

- hazardous substances;
- environment;
- planning requirements

- any other matter relevant to the orderly provision of electricity generation and distribution services.

2.1.5 Modifications to the licence

Provision needs to be made in the procedures for subsequent modifications to the licence. These might include:

- Change of name or shareholding structure
- Renewal of licence
- Transfer of assignment of a licence
- Revocation of a licence

2.2 Standardised content of generation, distribution and supply licences for mini-grids[3]

2.2.1 Authority

Citing the relevant powers under the enabling legislation, the initial articles of the licence must specify the granting of a Generation Licence and/or a Distribution cum Supply or separate Supply Licence of specified duration. The following need to be specified

- Full contact details of the applicant.
- Size and scope of permitted services
- Prohibited services.

2.2.2 Licence conditions

1 Definitions of terms used in the licence

As in any legal document, the first section must define the terms used in subsequent sections.

2 General obligation of Licensee

The general obligations of the licensee would typically embrace the following:

[3] This section is based on Zambian precedent which is typical.

- ❑ Compliance with Laws and Regulations
- ❑ Compliance with technical, safety and environmental standards (as specified in other regulatory documents)
- ❑ Obligation to provide certain information on a regular basis to the regulator, including operational and financial statements
- ❑ Compliance with other regulatory orders or rules which may be imposed during the licence period
- ❑ Obligation to pay the licence fees (which may be one-off fees or regular payments).

3 General Service Conditions

The way these are specified will vary by established practice in each country, but should include:

- ❑ Communication – requirements for periodic communication with the regulator
- ❑ Pursuit of the public interest – obligation to pursue national development and not just private commercial interests
- ❑ Business conditions – legal context for the conduct of business, common to all firms (not just electricity generators)
- ❑ Provisions for isolated mini-grids to subsequently connect to the main grid
- ❑ Transfer of licence obligations – requirements if the legal entity holding the licence ceases to exist or is taken over during the tenure of the licence.

4 Conditions on Generation Service

Specific conditions pertaining to generation:

- ❑ Generation system operation
- ❑ Dispatch requirements
- ❑ Planned and unplanned outages
- ❑ Ancillary services
- ❑ Energy banking
- ❑ Obligation to enter into sales contracts and agreements
- ❑ Metering

- ❑ Tariffs

5 Conditions on Distribution Service

Specific conditions pertaining to distribution:

- ❑ Scope of distribution permitted under the licence
- ❑ Obligation to offer to connect
- ❑ Operation and maintenance of the distribution system
- ❑ Metering
- ❑ Ancillary services
- ❑ Outages and emergencies
- ❑ Expansion of the distribution network
- ❑ Distribution tariffs, fees and charges

6 Conditions pertaining to Electricity Supply

Specific conditions pertaining to supply:

- ❑ Licenced territory for supply
- ❑ Obligation to extend service
- ❑ Non-discrimination
- ❑ Customer service system and complaint mechanisms
- ❑ Retail tariffs
- ❑ Customer billing
- ❑ Promotion of efficient use of energy

7 Changes to licence

Different situations need to be covered:

- ❑ Amendment
- ❑ Renewal
- ❑ Breaches of licence conditions and revocation

Schedules

These would include definitions and maps of the authorized distribution and supply area and details of the generation and network equipment and facilities. For main grid connection mini-grids, one of the schedules should provide the details of the inter-connection.

2.3 Licence templates

Two licence templates have been prepared as part of this project and are provided as stand-alone documents:

- Generation Licence Template
- Distribution Licence Template

These are word files which can be drawn upon and edited for use by any SADC country that is drafting generation and distribution licences for mini-grids.

3 Guidelines for use of energy funds for mini-grid investment support

3.1 Funding of mini-grids

The funding of mini-grid projects is closely tied to the ownership structure. From the viewpoint of being able to use scarce public or concessionary resources for as many schemes as possible, the ideal is for these funds to leverage contributions from the beneficiaries and the scheme owners:

- ***Communities*** may make financial contributions, but can also contribute 'sweat equity' through providing labour for the construction of the project;
- ***Private owners*** of schemes can provide their own equity contributions and use their credit standing to obtain loans to finance the initial capital costs or future investment needs (expansion of schemes and/or replacement of components).

For the publicly owned schemes, the investment resources clearly have to come predominantly from the public sector, although it is always desirable for the beneficiary communities to make a significant contribution, thereby ensuring commitment and a sense of ownership, as well as allowing the public funds to be spread over a larger number of projects. The reality, however, is that even in community owned and privately owned schemes there will still be need for a ***subsidy*** from public sector or concessional resources. Few if any mini-grid schemes have been in the past and will be in the future financed solely by communities and private investors.

It should be noted that main grid customers are also subsidised either through the cross-subsidisation of uniform national tariffs or through direct subsidies from grants and concessionary funds extended to main-grid utilities.

Funding sources for subsidies for mini-grids would include:

- Universal Access Funds (UAF);
- Rural Electrification or Energy Funds (REF);
- government grants;
- donor grants or concessional loans;
- non-government organisation developmental grants or soft loans.

In several SADC countries, the basic element of financing is a ***levy on existing electricity customers*** designated as being for universal access or rural electrification. In a situation where the majority of the population do not have access, those who

have electricity are a privileged minority and it is a good principle that there should be a small addition to their electricity bill to assist in funding access for others.

3.2 Subsidy policy guidelines

To ensure the most efficient and equitable use of resources available for subsidies, it is important for ***subsidy policies for mini-grids*** to be developed and clearly enunciated. The following sub-sections constitute guidelines for a mini-grid subsidy policy in the SADC region.

3.2.1 Capital not recurrent subsidies

Subsidies are to be provided as once-off capital contributions for viable projects. Recurrent costs are not be subsidised on an on-going basis.

'Viable projects' are those which can generate sufficient revenue to cover operation, maintenance and replacement costs so that the projects are sustainable without further subsidies. Providing capital and on-going subsidies for non-viable projects would disproportionately benefit the community involved, at the expense of other mini-grid projects requiring an initial capital subsidy to get started.

Viability requires that mini-grid tariffs be allowed to rise to levels which cover the costs but which are still attractive for the customers in relation to the energy costs they used to incur in the absence of electricity. Insisting that mini-grid tariffs must be the same as tariffs in major urban centres could only be achieved by providing recurrent subsidies on an on-going basis. The difficulties and risks of this will kill off investor willingness to invest in mini-grids, but even if they could be made to work such subsidies would be deeply inequitable. It would mean focussing all resources on the few communities which have electricity, to the detriment of the many other remote centres which might otherwise (if subsidies are limited to once-off capital injections) be the beneficiaries of mini-grid investments.

In Tenenbaum et al, it is assumed that mini-grids will receive capital subsidies, but thereafter it is recommended (pg 275) not just that SPPs operating isolated mini-grids should be allowed to charge tariffs that are higher than the uniform national tariff, but that they be allowed to charge higher tariffs to business customers in order to cross-subsidise household customer tariffs. For main grid connected mini-grids, there may also be opportunities to cross-subsidise mini-grid customers using revenues from sales to the grid (this implicitly assumes favourable feed-in tariffs for sale to the main grid).

3.2.2 Subsidies to catalyse complementary financing

Subsidies from public and concessional resources should as far as possible leverage capital contributions from beneficiaries and project promoters, thereby allowing as many mini-grid projects as possible to be supported.

It would be bad practice for subsidies to cover the total capital costs of a mini-grid project. This would encourage 'gold plated' design of the schemes rather than least cost, appropriate designs which minimise the initial capital outlay while not

compromising sustainable operation of the mini-grid once it is up and running. At a minimum, there should be a community contribution in kind.

Leveraging private financing may not necessarily involve a direct financial outlay. Where a private project promoter is seeking a commercial bank loan as part of the project financing, it may be necessary or expedient for the public subsidy-granting entity to provide a ***partial risk guarantee*** for the project. The provision of such a guarantee would constitute a contingent liability which if called could impair future subsidy provision. Projects need to be subject to a due diligence review before a guarantee is provided.

3.2.3 Require recipients to compete for the subsidy

Require potential subsidy recipients to compete to obtain a share of the resources available for mini-grid subsidies. Essentially there are two main approaches:

- Offer a ***fixed subsidy*** for a mini-grid and ask bidders to compete on the number of connections and the level of service which they will provide.
- Set a ***fixed number of connections*** and specified minimum service levels and ask bidders to compete on the basis of the smallest subsidy they would need to achieve the targets.

There is not a lot of experience of competitive bidding for subsidies in SADC. Elsewhere in Africa, the experience of ***Senegal*** stands out. At the bidding stage, the business model that had been developed indicated that O&M costs plus some capital contribution would be covered by tariff revenues, and therefore the projects were suitable for once-off capital subsidies. The bidding was on the basis of the operator which offered the maximum number of connections within the first 3 years for a pre-set subsidy amount. The winning bidder brought equity and loan financing and, against a minimum tender requirement of 8,500 connections, offered far more than had been anticipated (21,800 connections)[4]. In the first phase of the Senegal programme, 18 hybrid mini-grids have been established.

Full guidelines for competitive bids are provided in Section 4 applicable where there are likely to be sufficient bidders.

3.2.4 Performance-based subsidies

Whenever possible, ***subsidy provision is to have in-built performance incentives.*** This is the 'output based aid' (OBA) approach whereby the recipient only receives the subsidy on proof of a tangible output being achieved.

OBA subsidies can be applied to the initial project development, but the classic use of OBA is to provide incentives for operators to increases the number of customers connected to the mini-grid. A fixed subsidy amount is provided for each new

[4] More details are available from http://www.ruralelec.org/fileadmin/DATA/Documents/06_Publications/Position_papers/ARE_Mini-grids_-_Full_version.pdf and http://www.gpoba.org/sites/gpoba.org/files/OBApproaches14_SenegalElectric_0.pdf

customer who is connected and purchases electricity, the subsidy only being paid when the connection and its use has been verified, this normally being done by a designated independent verification agent.

The main problem with OBA subsidies is that the investments have to be financed up-front by the developer, with the subsidy being paid only when there is evidence of the investment being out to use. Some common ways around this are:

- ***Combine OBA with commercial bank loans*** – banks have the assurance that the initial high level of debt of the developer will be sharply reduced when the OBA subsidy is paid on completion of the project, reducing the outstanding debt to a manageable amount for the developer and less risky quantum from the viewpoint of the bank.

- ***Make partial payments,*** leaving only the final amount to be disbursed against project completion.

In mini-grid projects, upfront capital expenditures as a percentage of total costs are very high and service providers are typically small. For the project to go ahead, a large fraction of the subsidy may need to be paid up-front, and this should be done in stages on the achievement of construction milestones. Subsequently, connection-related OBA subsidies can be offered and drawn down as the operator builds up the customer base.

In a 2010 review of global OBA experience, very few mini-grid projects were found to have benefitted from OBA subsidy mechanisms. The most successful seems to have been Nicaragua's off grid rural electrification project (PERZA): this disbursed 70%-80% of the subsidies against installation of turbines and grid, and the remaining 20%-30% against final outputs, such as new connections and service quality.

In SADC, the ***Tanzania Energy Development Access Project (TEDAP)*** stands out. For mini-grid projects, the Rural Energy Agency (REA) as administrator of TEDAP offers $500 for each new connection. For a greenfield project, the following payment schedule applies:

- 40% mobilization after signing;

- 40% after delivery of goods on site;

- 20% after approval of customer acceptance receipts by REA.

However, for a variety of problems not connected to the subsidy framework, very few mini-grid projects have actually taken off in Tanzania since the introduction of the framework to encourage small power producer investments. One of the most successful projects, however, is the ***Mwenga-Mufindi*** 4 MW hydropower project, which was commissioned in October 2012. It serves an initial base of 900 customers and sells surplus power to the grid. The intention is to expand the customer base to 4,000 customers in 16 villages, with sales to the grid being progressively reduced.

3.2.5 Monitoring and subsidy policy review

A system of ***monitoring the use of subsidy resources for mini-grids and the outcomes*** achieved needs to be in place. If a point is reached where all opportunities for providing capital subsidies to viable mini-grid projects have been exhausted, then consideration can be given to providing recurrent subsidies as well as capital subsidies.

4 Procurement guidelines for competitive bidding

4.1 Motivation for competitive bidding for large projects

Mini-grids not connected to the main grid which involve renewable generation are particularly well suited to being concessioned as a whole system. It is difficult to establish PPAs for the renewable generators: demand and generation may often be out of sync with each other, which is why batteries (or other storage devices) and complementary generation (typically diesel) are needed to ensure secure supplies. Minimising the costs of supplying mini-grid energy is best done by a single operator having control of the entire hybrid system, hence a comprehensive concession is suitable rather than a series of separate contracts with different generators and the distribution/supply entity.

The lowest cost overall should be obtained through requiring competitive bidding for the concession. This in turn requires having sufficient bidders to make bidding meaningful and having a well-structured process to ensure the best result from a national standpoint.

From the perspective of the public authorities, it is important that the concessionaire be required to serve as many people as possible. This can be achieved through providing subsidies for connections (see Section3.2), license requirements (Section 2.2.2) and bidding conditions. As discussed in the previous section, the bidding can be based on different parameters; for the purposes of presentation and discussion the guidelines presented here can be thought of as being based on the offer a fixed subsidy for a mini-grid, with bidders being required to compete on the number of connections and the level of service which they will provide.

4.2 Competitive bidding procedures

An effective competitive bidding process for a mini-grid starts with a clearly articulated series of steps which are made public, together with the associated timetable:

- ❑ Pre-bid announcement
- ❑ Bidders conference
- ❑ Expression of interest and bidder short list
- ❑ Issuance of Request for Proposals (RFP)
- ❑ Receipt and adjudication of proposals
- ❑ Negotiation with preferred bidder
- ❑ Finalisation of contracts
- ❑ Project implementation and performance monitoring.

4.3 Expression of interest

Before inviting formal bids, it is important to screen the potential applicants for suitability. Key indicators to be provided in an expression of interest are:

- Technical competence to operate a generation system and/or a mini-grid distribution system.
- Commercial capability (in respect of billing, collection and customer satisfaction).
- Financial capacity, particularly if the concession is to involve the operator making investments – ability then also to plan and execute investment projects.

4.4 RFP Bidding documents

Once a short list of competent bidders is available, the next stage is to move to the tender process itself.

If the project is relatively small, and the benefits of an electricity grid being established clearly significant, then consideration should be given to minimising the regulatory requirements and hence the extent and complexity of the bid package. A streamlined RFP may be sufficient, the main purpose of which would be to define fairly precisely the functions expected of the concessionaire and the basis for the bid process (eg in this case the number of connections and level of service consistent with the fixed subsidy on offer).

If the project is large and more complex and warrants a more detailed approach, then at the RFP stage, a package of documents will need to be made available to the bidders:

- Request for proposals
  - Invitation to bid – formal invitation
  - Instructions to bidders – how the bid is to be prepared (common to all submissions)
  - Bid data sheet – specific items related to the project in question
  - Technical specifications and drawings
  - Tariffs, financial and commercial specifications
  - Formats or templates for bid submission
- Pro-forma Licence or Licences
- Pro- forma Concession Agreement (CA)

- ❑ Standardised tariff methodology
- ❑ Pro-forma PPA (where this is needed over and above the CA)
- ❑ Evaluation criteria

4.5 Contract award and monitoring

Once the concession contract has been negotiated and awarded, it is important that the authorities have a system of monitoring in place. This is to ensure that the conditions of the concession are adhered to and penalties specified in the CA if the concessionaire is underperforming are applied, but equally important is for lessons to be learnt about the competitive bidding the concessioning process so that improvements can continually be made.

5 Standardised concession agreement (SCA)

A concession agreement is needed when a mini-grid is to be operated by a private entity which has investment as well as operating and maintenance responsibilities. What is presented here is a standardised 'term sheet' that will allow legal drafters in any SADC country which wants to apply this model to draw up a concession agreement (CA) that is suitable for a mini-grid. Concessions would generally be procured through a competitive bidding process (see Section4). The draft CA would be part of the bidding documents, with the final CA being signed at the conclusion of the process.

As far as we have been able to ascertain, there are no readily generalisable models for mini-grid concessions in SADC. What we present below is based on a CA from another country, where the mini-grid concession arrangement is deemed to have been very successful. It is an African country – Mali – in which the Malian Agency for the Development of Household Energy and Rural Electrification (AMADER) has signed concession contracts with the French utility EDF[5].The specific agreement identified in the table is for Yéelen Kura, which includes 8 hybrid solar PV / diesel power plants supplying electricity to around 22 villages.

The Mali concession agreement has two parts:

- The ***Concession Contract*** – this is the main contract that sets out the general terms and conditions of the contract (see Table 2)
- ***Specifications*** – this is an annex to the main contract, and provide detailed provisions governing the agreement (see Table 3).

This division between the CA framework and the detailed provisions is a useful one for SADC countries to adopt. The tables below summarise and describe the main provisions that are required in a mini-grid CA and specifications. In the last column, cross-references are given to the AMADER – Yéelen Kura CA in Mali. Where this is necessary, we have added in the last column comments or suggested additions to the provisions of the Mali CA, distinguishing these with square brackets and *[italics]*.

[5] The concession agreement is available in English from http://ppp.worldbank.org/public-private-partnership/sites/ppp.worldbank.org/files/documents/Mali11CONCESSION0CONTRACT0YK.pdf

Table 2 Concession Contract

Concession Contract Terms / Provisions	Description	Application in Concession Contract between AMADER and Yeelen Kura in Mali
General Terms		
Definitions	Define particular phrases or words used in the contract	Article 1
Objective of the contract	Clearly set out the objective of the contract	Article 2 – The objective of the contract is to set out the responsibility of the concession holder to install and supply electricity to the specified areas, which include connection of interior electrical installation and/or equipment, and supply of electricity to these consumers. The definition of supply includes supplying electricity to a grid serving the customer, or individual systems installed by the concession holder.
General service conditions	Set out the general service condition of the contract that the concession holder must follow	Article 3 – The concession holder is to provide, manage and maintain electrical installations and sell services in accordance to terms and conditions set out in the contract
Specific obligations	Set out specific obligations to be met by the concession holder. Specific obligations may depend on types of systems being operated by the concession holder.	Article 4 – The concession holder is to supply electric power every day for at least seven hours to each customer provided this does not jeopardize the financial situation of the concession holder. Article 5 – Set out specific obligations concerning interior installations for solar systems and grid systems. Article 6 – Set out specific obligations concerning maintenance and replacement of: installation for production and distribution; individual installations based on solar power or any other renewable sources; and interior installations. Article 7 – In case of theft or deterioration attributable to the customer, the concession holder may not be held responsible and may be asked to replace such equipment and installation and charge the customer a monthly amount for the equipment spread over at least one year. Article 8 – the concession holder is obligated to keep records of customers and its operational records and accounts, including customer complaints.
Potential transfer of	Terms for transfer of	Article 9 – allowing for negotiation for the transfer of concession to the concession holder of

Concession Contract Terms / Provisions	Description	Application in Concession Contract between AMADER and Yeelen Kura in Mali
concession	concession to other concession holder or to specific institution.	the Priority Rural Electrification Project (PREP). Just compensation must be paid to the concession holder.
Acceptance of work	Terms or procedures for acceptance of work done by concession holder.	Article 10 – date of provisional acceptance shall be notified at least 5 days after the request was submitted by concession holder, and the date of acceptance may not exceed 15 working days after notification. A statement of provisional acceptance shall be signed by AMADER and the concession holders. AMADER shall announce final acceptance of work at the end of 1 year after the provisional acceptance for electric grids, and 3 months for individual systems.
Inspection and control of operation	Set out power/responsibility to inspect and control the operation.	Article 11 – AMADER has the general power of control over the performance of the Contract. AMADER shall receive financial, accounting, technical, and legal documents from concession holder, shall have the right to request access to all premises. Technical audit shall be conducted every 6 months, and accounting audits shall take place every year.
Obligations of AMADER	Set out the obligations of the counter party of the contract (in Mali's case is AMADER).	Article 12 – AMADER agrees to make every effort to help obtain administrative documents necessary for the execution of the Contract, including establishing the tax and custom regime applicable to the Contract.
Fees, Charges and Rate Conditions and Payment Terms		
Application fees and charges	Set out application fees and charges for any applications for the concession.	Article 13 – Any applicant for preliminary permit or operating licence shall pay a deposit, half of which will be returned if a concession application file is submitted. Deposit will be lost if no concession application is submitted. A handling fee per 5 kW is charges for all concession application. If concession is not granted, this fee will go into the Rural Electrification Fund (REF).
Guarantee deposit	Set out any guarantee deposit payable by the concession holder	Article 19 – Concession holder shall pay a guarantee deposit into a local bank before entering into the concession contract. Amount of penalties and sums due to AMADER by the concession holder in accordance to the Specifications shall be deducted from the deposit, including amounts payable to a third party to ensure continuation of operation. Concession holder shall replenish any amount deducted from the deposit. [*Mention is also needed of what happens to this guarantee deposit amount at the end of the concession period. There is a need to specify whether it will be paid back to the concession holder or forfeited*.]

Concession Contract Terms / Provisions	Description	Application in Concession Contract between AMADER and Yeelen Kura in Mali
Regulation fee	Set out regulation fee to be payable by concession holder.	Article 14 – All operators shall pay an annual regulation fee of 2% of the turnover of the operating and electrification activities governed by AMADER.
Customer prices and rates	Set out prices and rates that can be charges to customers by the concession holder.	Article 16 – Concession holder shall charge customers served by electric grid or equipped with individual installation a rate in accordance to the Specifications annexed to the Contract. Concession holder may disconnect supply of electricity in cases of non-payment.
Subsidies	Set out terms of any subsidies provided to the concession holders	Article 17 – a subsidy agreement defining the amount and means of payment of the equipment subsidy shall be concluded between concession holder and AMADER. The purpose of the subsidy is to contribute to the financing of the infrastructure investment necessary for the provision of electricity to the areas defined, through the concession holder. Article 18 – equipment subsidy shall be paid by AMADER to the concession holder in accordance with the provisions of the Subsidy Agreement. [*Procedures for the payment of subsidies need to be specified, including whether payment depends on completion of works or is to be made on a periodical basis. Procedures for the concession holder to apply for and receive subsidy payments also need to be stipulated*] Article 15 – at the end of the contract term, if the outgoing operator has received subsidies from the REF to finance its activities, AMADER shall receive 25% of the gross bid price, which shall be deposited with REF.
Insurance	Set out any obligations to obtain insurance	Article 20 – Coverage of risks to persons or property and the loss of income owing to an insurable risk shall be mutualised among the operators coming within the purview of AMADER.
Modification and Termination of the Contract		
Entry into force and termination of the Contract	Set out the date when contract is in force, the term/length of the contract, and conditions for termination before the end of the term.	Article 23 – Contract is in force on the date of its signatures by the two Parties, and it shall terminate 15 years from its date of entry. Contract can be terminated ahead of time if: a decision is made to abrogate the Concession Order; a mutual agreement is reached between AMADER and the concession holder; either party fails to remedy a serious breach of its obligations within 45 days from receipt of the notice of injunction to remedy it. Article 25 – each party shall be responsible for any costs it may incur for the negotiation and signing of the Contract.
Conditions to enter into	Set out any condition that has	Article 24 – Contract may not be entered unless the following conditions are met: the

Concession Contract Terms / Provisions	Description	Application in Concession Contract between AMADER and Yeelen Kura in Mali
the Contract	to be met before entry into the Contract.	constitution of the concession holder as a company under Malian corporation law; communication to AMADER of the certificated of insurance required by the regulations in force; proof of payment of the guarantee deposit stipulated in the Contract; signature of the Concession Order by the Minister of Energy; signature of the financing agreement between the operator and AMADER.
Settlement of payments after termination	Set out conditions and procedures for any payments due after the termination of the Contract.	[*Not included in Mali CA*]
Notices	Set out notices procedures and the points of contacts for both parties.	Article 26 – all notices and communications must be in writing and delivered in person with acknowledgement of receipt or sent by facsimile or express mail to the contact details listed in this Contract, or to any other address indicated by addressees on the form provided by the Article.
Modification of the Contract	Set out conditions for modification of the contract.	Article 21 – the terms of the Contract may be modified by AMADER and the concession holder by agreement.
Applicable law	Ensure the contract is in accordance to laws and regulation of the country	Article 27 – Contract shall be executed in accordance with the laws and regulations in force in Mali.
Force majeure	Set out the definition of force majeure and procedures to follow in the case of force majeure events	Article 22 – Definition of force majeure: any unpredictable, unavoidable event beyond the control of the parties that made it impossible to execute the Contract in whole or in part. Either party's inability to fulfil any of the obligations set out in the Contract shall not be deemed a contractual breach if it is due to a force majeure event as defined. Effects of force majeure: the party affected by force majeure events shall notify the other party within 15 days of the occurrence or cessation of such event. As from the date of the notification, both parties shall together make good faith efforts to put an end to the situation. If the event persists, and in the absence of an agreement between the parties, the Contract shall terminate 30 days after the party requesting the termination of the Contract notifies the other party.
Dispute resolution	Set out procedures for dispute	Article 28 – Amicable procedure: the parties shall make every effort to settle any disputes

Concession Contract Terms / Provisions	Description	Application in Concession Contract between AMADER and Yeelen Kura in Mali
	resolutions	arising out of the execution of the Contract or any interpretation thereof, by amicable agreement. Arbitration: any disputes which has not been settled by amicable agreement within 30 days after the receipt by either party of the request for amicable settlement may be referred, by either party, to an arbitration procedure. These disputes shall be decided by the competent courts on the matter in the Republic of Mali.
Other provisions	Set out any other provisions relevant to the Contract.	Article 29 – Independence of contractual clauses: if any clause in the Contract should be found null and void in whole or in part, and to the extent that the applicable law permits, such nullity shall not affect the validity of the rest of the Contract. Article 30 – Contractual document: contractual relations of the parties shall be governed by the Contract, which reflects all agreements between the parties.
Final provisions	Set out any final provisions of the Contract	Article 31 – the Contract cancels and replaces all previous provisions signed between the parties.

Table 3 Specifications annexed to the concession contract

Concession Contract Terms / Provisions	Description	Application in Concession Contract between AMADER and Yeelen Kura in Mali
General Terms		
Service area	Clear definition of the service area covered by the concession.	Article 2 – service area specified in the Annex of the Specification.
Rights of access	Set put the concession holder's right to access public and/or private property, and any procedures to gain access.	Article 3 – Grant the rights of concession holder to use public roads to establish and maintain works in accordance to the concession. The Principal (in this case AMADER) agrees to assist the concession holder to obtain any permits required to access public roads. Concession holder to restore public roads to its original condition, or if it fails to do so, a third party may be asked to do so at the expense of the concession holder. Article 4 – Concession holder has the right to carry out works relating to the authorised service on and under private land. Prior notice shall be given to the interested party at least 1 month before works begins. The owner of the land/property shall give notice to the concession holder of at least 6 months prior to any demolition, repair, heightening, enclosure or construction work.
Environmental protection	Set out rules and procedures in relation to the protection of the environment.	Article 5 –Concession holder shall comply with the legal and regulatory provisions in force relating to protection of sites and the environment, take necessary steps to repair or restore any sites and soils affected by works, keep pollution level at a minimum level, and respect any other environmental frameworks.
Insurance	Set out insurance obligations to be met by the concession holder.	Article 11 – From the start of the Concession Order and throughout the duration of the concession, the concession holder shall take out insurance to: cover potential losses and damages in respect to works, goods and equipment belonging to AMADER due to wrongdoing or inaction of concession holder, unexpected events such as fire, natural event or malice; cover the concession holder's civil liability with regards to its personnel and third parties in terms of bodily injury or material damage. Concession holder shall show proof of payment of the insurance premiums.
Service obligations		
Services to be provided	Definition of services to be	Article 7 – Obligations of customer consent

Concession Contract Terms / Provisions	Description	Application in Concession Contract between AMADER and Yeelen Kura in Mali
	provided by the concession holder.	7.1 Specified services – concession holder to provide: connections with the grids fed by power plants and individual equipment, in particular solar systems, within the specified area and period established in the Annex and to the number of customers stipulated in its request for authorisation. AMADER may modify this schedule as long as the date of completion is not postponed by more than 24 months. 7.2 Unspecified services – concession holder to provide: connections with the grids fed by power plants and individual equipment, including solar panels, after the specified period to new customers who requested, provided the request will not jeopardise the financial situation of the concession holder. Article 8 –to fulfil its obligations, the concession holders shall carry out all work necessary during its concession term, including works on interior installations for solar customers. Article 9 – in carrying out the works, the concession holder must comply with the legislative and regulatory provisions, including technical standards for use of materials and technology. In absence of national standards, reference shall be made to all other IEC standards provided that they are compatible for future works. [*Maintenance obligations of the concession holder would need to be specified*]
Service standards	Set out the standards of service to be met by the concession holder.	Article 6 – Concession holder shall provide continuous electricity service in its service area. Minimum service shall be 7 consecutive hours per day. Hours of supply shall be posted and provided to anyone who requests it. Concession holder shall report in its annual report the number of hours for which electricity is supplied in each service area. Article 20 –Electric current shall be supplied for a minimum of 7 hours per day every day. Concession holder shall deliver the current during those hours, but may interrupt the service for: scheduled maintenance and where immediate repair is required or equipment has broken down. Concession holder shall not pay compensation for interruptions for which it is not responsible. Concession holder shall notify customers at least 48 hours prior to interruptions due to scheduled maintenance. If the scheduled interruption lasted for more than 48 hours, the concession holder shall notify AMADER within 24 hours. When it is an unscheduled interruption, the concession holder shall notify AMADER within 24 hours if the service has not been restored within 48 hours or power interruptions have exceeded a total of 48 hours in a 30-day period. This does not apply to solar PV systems.

Concession Contract Terms / Provisions	Description	Application in Concession Contract between AMADER and Yeelen Kura in Mali
Technical and quality standards	Set out technical and quality standards to be met by the concession holder.	Article 10 –Concession holder agrees to supply customers with electric current that meets the quality standards set out in the customer regulation. The low voltage supplied shall be 220/380 Volts, with a maximum variation of plus minus 12%. The nominal frequency shall be 50 Hz with a variation of plus minus 5%. These do not apply to solar systems less than or equal to 48V.
Inspection and reporting	Set out the rights for inspection by the Principal, and the reporting obligations by the concession holder.	Article 21 –the concession shall be subject to inspection by AMADER or its appointed representative to verify: conformity of the works to the approved project and good practice; respect for safety and security rules; proper operation of the works; description of the personnel running the operation. Concession holder must keep a complete technical file including the description of energy source, the grid, interior installation and customer equipment as it is built. Business plan of concession shall be subject to regular inspection. Concession holder must keep records containing; investments made and investment plan for the following 3 years; budget for the following year; accounts for the past year; weekly production, fuel consumption and numbers of hours of operation; statistics on customers; power outages cause, number and duration; average monthly prices of electricity sales and rates. Weekly data shall be consolidated into monthly aggregate totals. Financial data shall be sent to AMADER every year, while technical data to be sent to AMADER every 6 months. [*More precise requirements for corporate governance could usefully be given, eg. Annual business plan, strategic/corporate plans every 3 years, etc*]
Rates (tariffs) and collections		
Fixing of rates	Set out how the customer rates are fixed and its components (if any).	Article 7.3 –Electricity rates in the sphere of AMADER's intervention shall be fixed on the basis of 2 components: (i) an energy component reflecting the costs of exploitation and depreciation of the basic infrastructure; (ii) a payment component linked to the pre-financing by the operator of the costs of connection, customer interface for interior installations and electrical equipment.
Categories of customers	Set out conditions for setting up different categories of customers.	Article 22 – Concession holder shall respect principles of non-discrimination in its relations with customers, but it may arrange for different rate conditions or services for different categories of customers if: it objectively defines the categories on the basis of voltage of energy supplied, subscribed demand by the customer, connection situation of the customer;

Concession Contract Terms / Provisions	Description	Application in Concession Contract between AMADER and Yeelen Kura in Mali
		it publicised by appropriate means and makes available when requested, a list of the defined categories and differences in rates or services.
Guarantee deposit or advance payments	Set out the rules and procedures for guarantee deposit or advance payments by customers.	Article 23 – Customers must pay an advance consumption payment to the concession holder prior to the delivery of energy. The amount of the guarantee deposit shall be equal to 1 monthly bill. If the customer is billed according to consumption, the monthly bill shall be estimated by considering the subscribed demand, the number of daily hours of supply and the applicable rate per kWh, and it may not be higher that the value of 50 kWh per kVA of subscribed demand. For solar PV systems, the advance on consumption shall be the standard monthly amount. [*Need to specify what will happen to the deposit at the end of the concession period. Connection fee provisions should also be specified where a connection fee is to be applied.*]
Rates and rate formulas	Set out the rates to be paid by customers and how this is calculated.	Article 25 –Concession holder may set the rates in the contracts it signs with customer, subject to the condition that the same rate must be applied for the same service. If the concession holder receives subsidies for investment costs, the concession holder may set equitable rates that enable it to carry out its operation and has a profitability rate approved by AMADER. The rates and rate formulas shall be approved and published by AMADER. The rates are those indicated in the request for authorisation or those resulting from negotiation for the 1st year of concession. These rates may be adjusted according to the rate formulas in cases where at the start of the installation works, the price of fuel used un the production of electricity or the rate of currency exchange would not be equal to the average values used in the business plan to calculate the rates during the 1st year. Tax rules provide that the first 100 kWh of monthly consumption shall not be subject to value-added tax (VAT).The general conditions for rates and tariffs shall be published in the press and posted, and shall be provided to anyone on demand. (Rate formula is included in the Specification).
Rate adjustments and revision of rate formulas	Set out the conditions and procedures of rate adjustments and revision of rate formulas.	Article 26 – Rate adjustments: rates shall be fixed on January 1 of each year, and shall be adjusted for the first time at the latest on April 30 of the year n+1 of the following year. The operator shall propose the rate to AMADER by October 31 of the year n-1. The concession holder shall produce all the evidence and documents necessary, including operating account, 1 month before the beginning of the following 6 month period.

Concession Contract Terms / Provisions	Description	Application in Concession Contract between AMADER and Yeelen Kura in Mali
		Article 27 – Revision of rate formula: to take into account the changing economic and technical conditions and ensure the rate formulas are representative of real costs, rate level and formulas shall be subject to review at the request of either party in the following cases: (1) If taxes, charges, and fees charged to the concession holders are modified. Concession holder shall produce all the evidence and documents needed or requested by AMADER, including its operating account; (2) If the operating costs of the concession holder have increased due to the enactment of new laws or regulations, or following investments or acquisition not made by the concession holder; (3) One year after the award of the concession; (4) 5 years after the last rate adjustment and indexing formulas where the grid of the *Concessionnaire du Service Public de l'Electricité* is extended: if there is a fluctuation of more than 10% in the medium voltage electricity rate delivered to the concession holder; (5) When service is provided by an autonomous thermal grid: if there is a fluctuation of more than 20% in the price of fuel; (6) After a fluctuation of more than 20% in the currency exchange rate.
Collection of rates	Set out the procedures for collections of rates from customer.	Article 28 – Concession holder shall collect amounts due from customer, with regard to both connection or reconnection fee and monthly bill. In case of non-payment or partial payment, the concession holder shall be authorised to deduct the amounts owed from the deposit paid by the customer. In case of non-replenishment of the deposit by the customer, the concession holder shall be entitled to disconnect the service, both for customers linked to the electrical grid and for those having individual installation. [*Possible need to specify procedures for collection, ie, how customers can pay, how many days after the receipt of invoice must the pay etc, although this could be in the contract between concession holder and customer*]
Cost of reconnecting services	Set out the conditions and procedures for collection of costs of reconnecting services.	Article 24 – Concession holder may disconnect service of customers who do not pay their bills on time, and shall reconnect electrical service to customer as soon as possible after they have settled their bills and in any case, within a period not exceeding 48 hours after receipt of payments of outstanding amounts. Concession holder is authorised to charge a standard fee for disconnecting and reconnecting service, the amount shall be approved by AMADER

Concession Contract Terms / Provisions	Description	Application in Concession Contract between AMADER and Yeelen Kura in Mali
		and indicated in the contract between concession holder and its customer.
Treatment of assets		
Definition of assets	Clearly define different types of assets.	Article 12 – Definition of returnable assets: works and equipment directly involved in the production, transport, distribution, and use of electricity, whether made available to the concession holder, provided by the concession holder, or provided by the two parties. Article 15 – Definition of assets with buyback option: assets other than equipment and works used in the production, transport, and distribution of electricity, which are provided or acquired by the concession holder and are directly allocated to the implementation or maintenance of the service.
Asset regimes	Set out different regimes or treatment for the different types of assets defined.	Article 13 – Returnable asset regime: returnable assets made available to the concession holder are and shall remain the property of AMADER including returnable assets provided by the concession holder. Concession holder shall return the returnable assets to AMADER when the concession period ends. Article 16 – Assets with buyback option regime: these assets are and shall remain the property of the concession holder for the duration of the concession. Concession holder may not dispose of immovable assets with buyback option and may not mortgage them without authorisation from AMADER. Concession holder may, with authorisation of AMADER, use certain assets with buyback option for the provision of service outside the concession.
Accounting treatments	Describes accounting treatments for the different types of assets defined.	Article 14 – Accounting treatment of returnable assets: Returnable assets made available to the concession holder: these assets shall be entered as fixed assets on the assets side and as "rights of the principal" on the liabilities side, or if financed by third parties, "subsidy from third party" on the liabilities side. These assets shall be subject to: depreciation for the duration of their technical life deducted from the corresponding amount in the liabilities side, and a provision for replacement entered on the liabilities side and deducted from income statement. Returnable assets financed by the concession holder: these assets shall be entered as fixed assets on the asset side, without affecting the "rights of the principal", and shall be subject to: repayment of loans and advances entered on the liabilities side and deducted from the

Concession Contract Terms / Provisions	Description	Application in Concession Contract between AMADER and Yeelen Kura in Mali
		income statement for assets whose life is longer than the duration of the concession, and depreciation deducted from the income statement and entered on the liabilities side. Returnable assets provided by AMADER and the concession holder: these assets shall be entered as fixed assets on the asset side and in "rights of the principal" for the part financed by AMADER on the liabilities side. For the part financed by AMADER, the assets are subject to the same provisions as if assets are financed by AMADER, and the part financed by concession holder is subject to provisions as is assets are financed by concession holder. Article 17 – Accounting treatment of assets with buyback option shall be that of the ordinary law of commercial companies.
Return of assets	Procedures for the return of assets to the principal.	Article 18 – on the date of expiry of the concession, AMADER shall automatically have the rights of the concession holder concerning returnable assets, and the concession holder must surrender to AMADER all returnable assets in a normal state of maintenance and operation. The undepreciated provision for repayment of borrowings on the concession holder's balance sheet shall constitute an amount receivable from the concession holder to AMADER, the settlement of which shall not be subject to tax on industrial and commercial profits. Replacement provision on the concession holder's balance sheet shall be owed by the concession holder to AMADER.
Buyback of assets	Procedures for the buyback of assets by the principal.	Article 19 –on the date of expiry of the concession, AMADER may buyback, without being compelled to do so, in full or in part for compensation, those assets with a buyback option which are necessary for the operation of the service. If concession expires after 15 years, AMADER shall notify the concession holder of its intention to buyback the assets at least 6 months prior to expiry date. The value of the assets shall be established by amicable agreement or on the basis of an expert appointed by agreement between parties. The modalities of the settlement shall be agreed on by both parties and if not, the price shall be decided on the date of the buyback.
Other provisions		
Report on breaches	Set out rules and procedures for reporting breach of the concession contract.	Article 29 – on the basis of visits to inspect rural electrification activities, AMADER agents shall submit reports on breaches of the terms of the concession contract and shall propose to the Ministry of Energy any administrative sanctions stipulated in relevant electricity sector laws and regulation. [*How the concession holder can report breaches by AMADER need also be*

Concession Contract Terms / Provisions	Description	Application in Concession Contract between AMADER and Yeelen Kura in Mali
		specified.]
Revocation of the concession	Set out what can cause a revocation of the concession, and the procedure following such announcement.	Article 30 – revocation of the concession shall be subject to a decision by the Minister of Energy. Such decision shall be pronounced against the concession holder who has willingly failed to comply with the existing standards within the time period established by the competent authority. [*The breaches which can cause the concession to be revoked need to be specified, and the procedures to be followed after the Minister has made the decision to revoke the concession, eg whether the concession will be automatically re-tendered, who shall operate the service during re-tendering process etc*]
Force majeure	Set out detailed definition of force majeure events, and procedures to be follow by both parties in such event.	Article 31 – the same definition and description of procedures as in the main contract document. [*Further details needed of what events are to be classified as force majeure, and the detailed procedures of how to handle such event*s.]
Dispute resolution	Set out detailed procedure of how to settle any disputes between the parties, including disputes between the concession holder and the customer.	Article 32 – Dispute settlement procedures 32.1 Conciliation Commission established by the Mayor: any disputes arising between the customer and the concession holder shall be submitted to a conciliation commission established by the Mayor, which shall be composed of dignitaries from the commune who are recognised for their moral authority. 32.2 Conciliation Commission established by the Prefect: in case the dispute involved the Mayor or a member of the communal council, the concession holder may request the local Prefect to set up the conciliation commission. 32.3 Referral to AMADER: if the conciliation commission does not bring about agreement, AMADER shall investigate and take a decision, which may be appealed upon in the competent courts. [*Procedures needed for disputes arising between the concession holder and AMADER]*
Modification of the Specification	Set out terms for modification of the Specification.	Article 33 – Modification may be proposed by the concession holder or AMADER, and shall become valid and enforceable only after approval of the two parties.

6 Standardised operations and maintenance agreement (SOMA)

As noted in the previous section, a concession agreement is needed when a mini-grid is to be operated by a private entity which has investment as well as operating and maintenance responsibilities. An operations and maintenance agreement is therefore similar to a concession agreement but has fewer obligations imposed on the operational entity. Correspondingly, the procurement process, which should still be competitive, may be simpler and shorter than that which applies to a full concession.

Given the similarity, we are not presenting a separate term sheet for a standardised operations and maintenance agreement. The format to be followed is the same as the standardised concession agreement, but without references to investment obligations. Furthermore, the O&M operator may be paid a fixed fee (or a performance-related fee) for the services provided, rather than having the fees and charges collected from customers as its revenue. Under the fee payment model, the O&M operator will typically still be responsible for revenue collection from customers, but the amounts collected would be handed over to the mini-grid owner.

7 Standardised tariff methodology (STM)

In this section we describe the key principles that should underlie the setting of tariffs for mini-grid systems. We also describe a number of different tools that can be used to set mini-grid tariffs in a standardised manner.

7.1 Tariff principles

Mini-grid tariffs for small projects should not be regulated

As we describe in Section 1.2 above, mini-grid consumers need electricity more than they need low tariffs. The benefits (both economic and social) of isolated communities gaining access to reliable electricity supply is almost always many multiples of the cost of the supply.

Mini-grid tariffs should not be regulated because the costs of investing in and operating mini-grids are too location and system specific to allow effective regulation. They will vary significantly from mini-grid to mini-grid depending on a number of different factors including the technologies employed, the size of the system, the geographic layout of the system, the level and profile of demand for power, the type of customers, the quality of service etc.

This means a 'one size fits all' approach to tariff setting will not work – it would either deter private investment altogether because tariffs are insufficient to cover costs, or result in customers paying significantly more than the underlying costs of their supply.

Regulators could opt to determine a 'custom-made' tariff for each mini-grid, but this would be an administratively burdensome task that is difficult to get right.

On balance, regulating mini-grid tariffs at initial stages of promoting mini-grid investment will only serve to add to the perceived risks of prospective operators and in doing so deter investment. In the short to medium-term regulators should focus on encouraging mini-grid investment, and postpone efforts to reduce tariffs till electrification has improved significantly and there are many established mini-grid operators. There are alternative ways to ensure that mini-grid power supply is provided on a least cost basis, such as tendering out private concessions as discussed in Section 4.

Regulators can provide training and support as a substitute for tariff regulation. Training and supporting mini-grid operators can help encourage investment and improve sustainability. Regulators can also provide support to mini-grid customers to help them understand how tariffs have been determined.

The exception to the above is for large mini-grids (we suggest a definition of greater than 10MW), where regulators may find it necessary to address concerns relating to affordability given that it concerns a reasonably large population. Regulators should still be very cautious about the effect that such a decision might have on future private investment. The approach to regulating large mini-grids should be similar to

that applied to national grids – i.e. tariffs should fully cover costs (including a return on capital). The Retail Tariff Tool described in 7.2 could be adapted for this purpose.

Mini-grid generation is by nature expensive

The cost of electricity provided by mini-grids will, on average, be more expensive than main grids due to the small size of mini-grid systems (they do not benefit from economies of scale) and their location (they are typically in hard to reach places, where equipment, materials, fuel, and staff are harder to access)[6]. It is important that policy makers and regulators recognise this when setting mini-grid policies or providing support, otherwise expectations may be unrealistic and serve to discourage investment.

One of the key ways that the cost of mini-grid electricity can be reduced is by connecting mini-grid systems to the main grid, because:

- It enables mini-grid connected generation to **sell excess** to the main grid, thereby improving its utilisation and bringing down the average cost of supply.
- There is potential to **purchase bulk** power from the main grid at cheaper rates than can be generated locally.
- The main grid can provide **ancillary services** (reserve capacity, frequency control etc.) that are more expensive to provide locally.

Connecting mini-grids to the main grid does create a potential conflict – investors may prefer the certainty of setting up as an IPP and selling generation to the main grid, rather than get involved in the complexity of operating a mini-grid. But this situation is difficult to avoid (unless you tie the rights to developing a resource to the requirement to supply locally first) and investors will ultimately make their decision based on risk vs. reward. This is again why mini-grid tariff regulation should be avoided – investors are more likely to choose to operate a mini-grid if they are free to charge tariffs that earn them a strong return on their investment.

It is difficult to subsidise mini-grid tariffs

As we describe above, a 'one size fits all' approach to mini-grid tariffs will not work because mini-grid costs are location and system specific. It is tempting, for equity's sake, to try and standardise mini-grid tariffs relative to the national tariff through the use of subsidies.

However making an investor's returns dependent on some form of government subsidy will increase an investor's risks significantly and is likely to deter investment altogether, unless the investor can be given *very* strong certainty that the subsidy will be delivered predictably and consistently over the long term.

[6]There will of course be exceptions, for example those located close to good hydro resources.

For this reason, if regulators want to encourage private investment in mini-grids, they should be very cautious about recommending the comparison or standardisation of mini-grid tariffs with the national electricity tariff.

We do recognise however that the policy of including mini-grids in application of a national uniform tariff will not change overnight and is likely to persist in the thinking of stakeholders. We discuss three possible approaches (and key advantages and disadvantages) to subsidising mini-grid tariffs are as follows:

- **Tender the right to invest and operate the mini-grid out as a concession** (as discussed in Section 4) based on a tariff that is fixed for a period of time. Investors can bid the capital subsidy required to make this tariff financially feasible for them. This is the preferred option for subsidising mini-grids because it mobilises private capital, minimises the regulatory risk of the private operator, and is relatively straight forward to implement.

- **Calculate the average generation cost of mini-grids by technology and then subsidise the difference between that and the national generation cost**, either as an upfront capital subsidy or an on-going operational subsidy. But there are a number of serious disadvantages to this. The major disadvantage is that in the absence of regulation there is nothing stopping mini-grid developers keeping the subsidy as windfall profit. Another disadvantage is that because the subsidy is technology-specific (rather than scheme specific because this would usually be too administratively burdensome to apply on a national scale), the mini-grid tariff may still be different to the national tariff.

- **Have the national utility/main grid operator operate the mini-grid and cross-subsidise its operation from main-grid revenues** or an electrification fund. This is often a very practical solution which many countries apply to improve electrification. It is particularly easy to implement in cases where the main grid is extended and connected to mini-grids. The major disadvantage of this approach is that it does not mobilise private capital. In addition, in many countries the national utility faces enough challenges operating and extending its existing network without taking on the additional challenge of establishing and operating of mini-grids.

Feed-in tariffs are not the solution for isolated mini-grids

Feed-in tariffs (FiT) have proved to be a successful (although in some cases expensive) model for encouraging investment in small-scale renewable generation around the world. They do so primarily by reducing an investor's risk. A FiT typically constitutes fixed price for energy that is locked in for a period time (10-20 years). Crucially, any energy supplied by the FiT generator is guaranteed priority dispatch. This means that whenever a FiT generator has energy to supply, the system operator will take it (and pay for it).

This last feature, guaranteed priority dispatch, is why the FiT model typically cannot be used to encourage significant new generation in isolated mini-grids. Electricity demand (i.e. load) on mini-grids is usually too low to fully utilise the capacity of generators all day (or all year) long, so the mini-grid operator cannot guarantee it will take all of a generator's available energy.

Instead, firm generation (i.e. *not* intermittent by nature, such as thermal, biomass, or hydro generation with storage) will be contracted as per typical Power Purchase Agreement (PPA) – a capacity charge plus an energy charge. Non-firm generation (i.e. intermittent by nature, such as solar, wind, or hydro generation without storage) will be contracted using an energy charge only, but without guaranteed dispatch.[7]

In very small schemes (<1MW), a simple percentage of the retail tariff as payment to an IPP is usually sufficient.

Because it is difficult to give intermittent generators (supplying isolated mini-grids) certainty that their costs will be recovered, it will be difficult to attract renewable IPPs. A more likely commercial arrangement is for the generation to be owned (or part-owned) by the mini-grid network owner/operator. This means that public private partnerships (PPP), such as the concessioning arrangement described in Section 4, may be more successful.

The only circumstances where FiTs can be practically used to encourage investment in mini-grid generating capacity are when:

- The **generation is small** relative to the total size of mini-grid, perhaps up to 10% of peak load. Up to this limit a small intermittent generator can be guaranteed dispatch without creating reliability issues.
- The mini-grid is **connected to the main grid**. This main grid is large enough that the national utility/system operator can offer FiTs for excess mini-grid generation and guarantee dispatch. We discuss calculating FiTs for mini-grids connected to the main grid in Section 7.2 below.

7.2 Tariff setting tools

As we describe above, regulators should focus on encouraging investment in mini-grids and therefore avoid regulating tariffs in the short to medium term future. Instead, regulators can focus on providing training and support, both to mini-grid operators (to encourage investment and improve sustainability) and to customers (to help them understand how tariffs have been determined). The tools will also be valuable to community operated mini-grids, where there might be a tendency to set tariffs that are too low, leading to sustainability problems.

[7]Take or pay provisions can be used to provide non-firm generators with certainty, but can lead to arguments about whether the generation was deemed available or not.

There are a number of different types of tariffs that can apply to the operation of mini-grids, including:

- **Retail tariffs** charged by mini-grid operators to customers.
- **Power purchase tariffs** paid by mini-grid operators to third-party generators for power supply or the main-grid.
- **Feed-in tariffs** (FiTs) paid by the national utility (or system operator as applicable) for power supplied by the mini-grid to the main grid, and arrangements for energy banking.

We discuss tools for calculating each of these tariffs in the following sections. The accompanying spreadsheet-based tools are attached as annexes to this report.

It is important to note that in cases where mini-grid tariffs are aligned with the national tariff (although, as above, we advise against this) main-grid bulk supply tariffs to mini-grids may need to be subsidised to give mini-grid operators sufficient margins to operate. This effectively acts as a cross-subsidy from main-grid customers to mini-grid customers.

Setting mini-grid retail tariffs – Retail Tariff Tool

A Retail Tariff Tool is attached as an annex to this report. It provides a reasonably simple means of determining an average tariff level that covers the cost of supply. It can give mini-grid operators confidence that they are operating sustainably and their lenders confidence that financing costs can be met. Mini-grid operators could publish their tariff calculation (using this tool) as a way of giving consumers confidence that they are paying a fair price for electricity.

The Retail Tariff Tool provides the framework and mechanism for calculating tariffs, but not the input data. Because the costs of investing in and operating mini-grids are location and system specific (as we describe above), mini-grid operators must input their own costs and system characteristics into the tool.

The tool is made of two main components:

- An **asset base calculation** to determine sustainable tariff levels over the long-term.
- A basic **cash flow analysis** to check that financing costs can be met in the initial years of operation.

We discuss each of these components below. Because the Retail Tariff Tool is intended to be used as a training material, it is important that it be easy to understand and use. It is not being used to regulate prices and therefore does not need to be overly prescriptive; rather it should focus on the key issues that mini-grid operators need to consider.

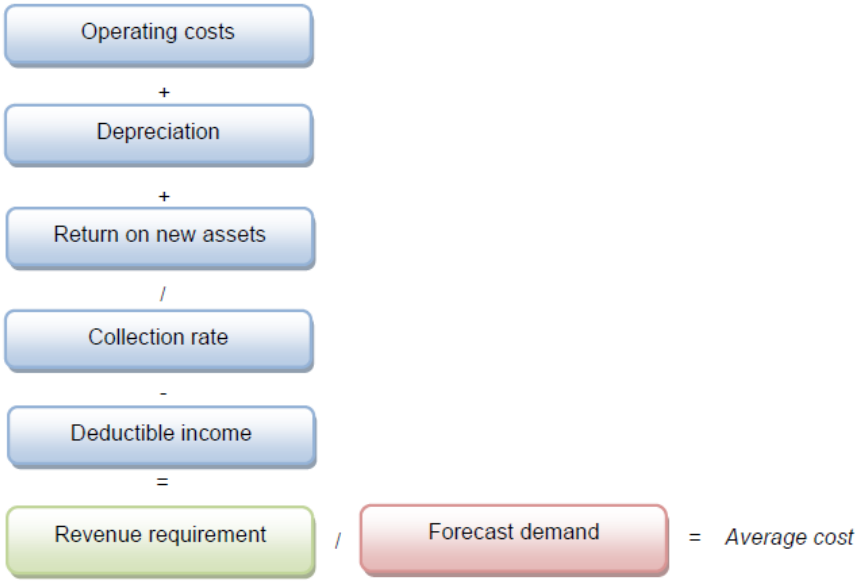
Asset base calculation

This calculation is done on a forward-looking basis – the mini-grid operator enters forecasts costs and energy demand (consumption) for a period of up to 20 years. The Tool then calculates tariff levels such that, so long as the operator achieves the forecasts, it will fully recover its costs over the next five years.[8]

As shown in the figure below, the operator's 'revenue requirement' is a simple sum of parts. We refer to this overall approach as an 'asset base calculation' because it includes depreciation and a return on assets (calculated as the cost of capital multiplied by the value of assets) rather than the actual year-on-year financing costs.[9] This is approach is used internationally to price infrastructure assets because it smooths the effects of 'lumpy' investment costs (thereby avoiding consumers paying tariffs that vary significantly year to year). Over time, the operator will still fully recover the costs of its investments, however the timing of its cash flows does need to be considered and tariffs adjusted accordingly if necessary (as we discuss below).

The asset base approach to pricing suits mini-grids because the systems assets have long lives (typically much longer than the terms of debt financing) and require on-going and regular investment.

Figure 1 Asset base calculation



Other features of the calculation include:

[8] In the interests of keeping it simple and easy to use, the Retail Tariff Tool does not reconcile the difference between forecasts and actuals, although operators can easily add this functionality themselves.

[9]The asset base calculation is based on the concept of Financial Capital Maintenance. It is attractive to investors that are willing to trade higher rates of return for a more stable and better defined cash flow.

- The calculation determines the **average cost of supply**, but does not detail the tariff structure (such as the fixed/energy/demand charges and choice of customer categories). As evidenced by practice around the world, tariff structures are chosen based on a balance of financial, economic, and social considerations which are specific to each network and customer base. Large mini-grids may opt to apply complex tariff structures, while small mini-grids may apply a simple energy only charge (which is equal to the average cost of supply).

- The calculation works irrespective of the **source of power supply**. If generation is contracted through an IPP or bulk supply from the main grid, that cost is part of forecast operating costs, which is passed through into tariffs. If the mini-grid operator invested in the generation assets themselves, then the fuel and maintenance costs of the generators goes into operating costs, while the capital costs of the generators goes into the asset base (along with network and retail capital costs) and depreciation and a return on capital is calculated accordingly.

- Forecast **collection rates** are used to gross up costs, thereby ensuring that the operator will recover the cost of its bad debts.

- **Deductible income** is subtracted from the operator's costs. This refers to any income that is earned from utilising the system assets but is recovered from charges other than the retail tariff. This may include connection and disconnection fees, metering charges, rental of land/properties etc.

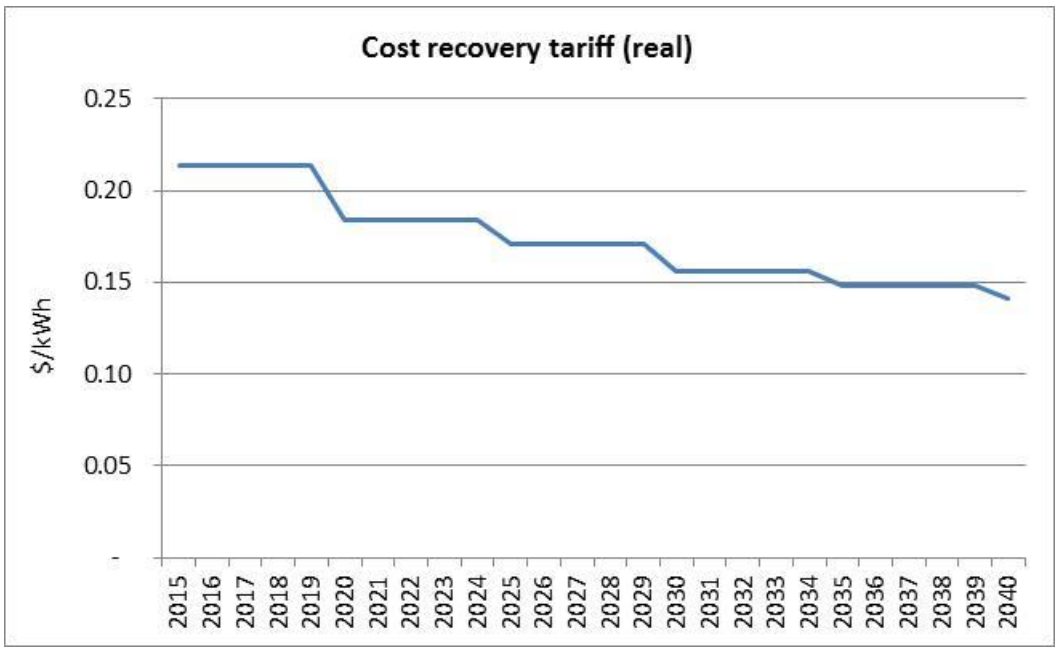
- To keep the calculation of **depreciation** simple, the operator enters an average asset life for each asset category, which is then used to calculate an accelerated depreciation rate (a percentage of the asset value each year).

- **Return on capital** ensures that the operator can recover its cost of debt and earn a return on equity. It is calculated as the depreciated asset value multiplied by the weighted average cost of capital (real, pre-tax).

- Forecasts are all in real terms, i.e. they **exclude inflation**. Both nominal and retail tariffs can be viewed at the end of the calculation.

The figure below shows an example of the results of the asset base calculation. In this example the average tariff is updated every five years and decreases over time due to increasing demand and a largely fixed cost base.

Figure 2 Example of results of asset base calculation



Cash flow analysis

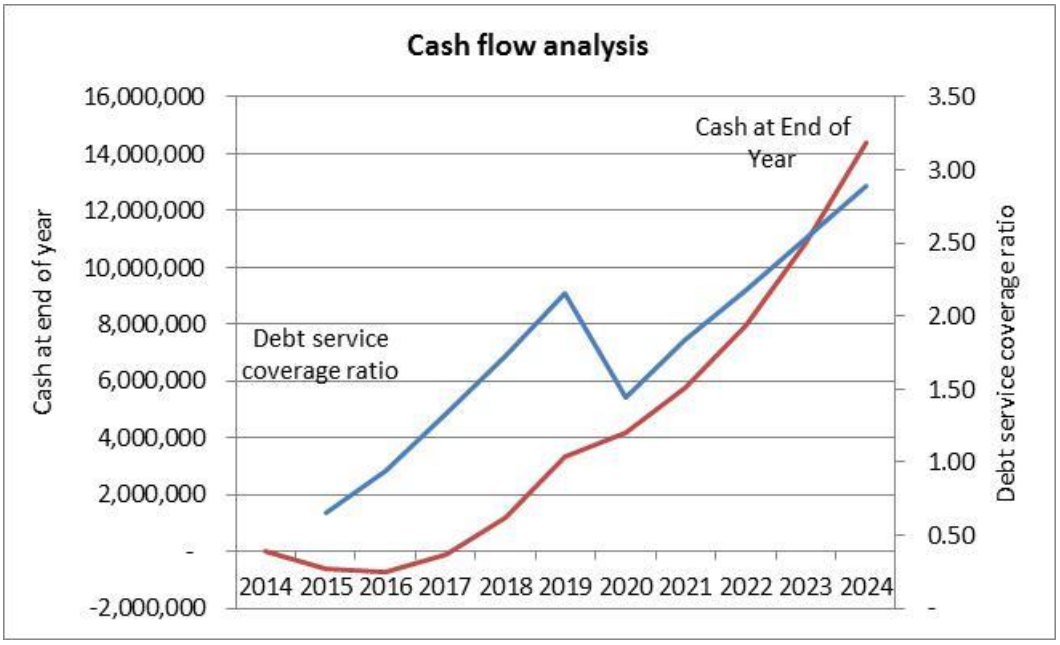
The asset base calculation will potentially create cash flow problems for small investors in new mini-grids during their initial years of operation. These investors potentially face high upfront financing costs (given that loan terms are usually much shorter than the life of the assets) and small investors will often lack the capital resources to manage loan repayments in these initial years.

For this reason we accompany our asset base calculation with a simple cash flow analysis. If this identifies any potential cash flow issues, then the operator can adjust the tariff profile to ensure that financing costs can be met. Over the long-term, investors should be able to refinance and maintain an optimal capital structure, so cash flow should not be such a concern. For this reason the simplified cash flow analysis contained in the Retail Tariff Tool focuses on the first 10 years of operation only.

The cash flow analysis essentially takes revenues collected and deducts operating costs and interest payments to determine operating cash flows. Investment costs and financing costs (i.e. loan repayments less loan proceeds and equity contributions) are then deducted from operating cash flows to determine the cash available at the end of the year. If this drops below zero in any year, then the tariff profile needs to be adjusted to boost cash flow in that year. Tariff adjustments should ideally be revenue neutral, that is, increases in one year to address cash flow issues should be offset by commensurate decreases in future years. Another key indicator that the Retail Tariff Tool calculates is the debt service coverage ratio (DSCR). The DSCR is defined as the ratio of operating cash flow over loan repayments and gives lenders an indication of the ability of the investor to meet its loan commitments. A DSCR greater than 1.2 is a rough guide of a healthy DSCR.

The figure below shows an example of the cash flow analysis produced by the Retail Tariff Tool. In this example it shows that there may be a shortage of cash available for the first 3 to 4 years of the mini-grid investment, and that the profile of the tariff determined in the asset base calculation may need to be adjusted accordingly.

Figure 3 Example of cash flow analysis



Determining mini-grid power purchase prices – Power Purchase Tool

As we describe in Section 7.1 above, we expect that it may be difficult for isolated mini-grids to attract renewable IPPs, especially those renewable generators which are intermittent by nature (such as solar, wind, or hydro generation without storage) because mini-grid operators will find it difficult to give these generators contractual certainty that they will be used (and therefore paid) a certain percentage of the time. A more likely commercial arrangement is for the generation to be owned (or part-owned) by the mini-grid network owner/operator. This means that public private partnerships (PPP), such as the concessioning arrangement described in Section4, may be more successful in encouraging new generation investment. In very small schemes (<1MW), a simple percentage of the retail tariff as payment to an IPP may be sufficient.

The Power Purchase Tool, attached as an annex to this report, is designed to give mini-grid operators an approximate indication of the costs they can expect to pay for electricity from different types of generators. It can be used in any case where the cost of generation needs to be made explicit – for example under a PPA with an IPP or as part of a joint-venture.

The Power Purchase Tool relies on the user inputting data[10] on the performance characteristics and costs of different generation options (which are location and system specific). It takes these inputs and calculates:

- **Capacity and energy charges.** If the generation type is firm (i.e. the generator can commit to being available) then the tool calculates both these charges, but if the generation type is non-firm (i.e. intermittent so cannot commit to being available) then all of generator costs go into the energy charge.

- **Power purchase costs and annual generation.** This is the expected average annual cost of power supply (excluding inflation and future changes in fuel prices etc.). It also calculates the amount of energy that the generator can supply given the plant's capacity and its expected utilisation.

- **Levelised cost.** This is annual power purchase costs divided by the annual generation, which is effectively the sum of the capacity and energy charges. It can be used to compare different generation options.

Other noteworthy features of the tool include:

- The **levelised cost can be adjusted** to include additional costs borne by the network operator in cases where these costs differ for the generation options being compared. The additional costs include the costs of network reinforcement and network losses on the generation supplied (for example a generator is located far from the network, and therefore a large percentage of its supply is lost before it can be delivered to consumers, therefore the levelised cost should be increased when comparing it to a generator located close to consumers).

- The **average utilisation** of the plant is critical to the calculation of levelised cost. This depends on a number of factors, including the capacity factor of the plant (based the availability of the energy resource) and the demand for generation (both with respect to total load on the system and the optimal dispatch of different generation options). The average utilisation should be an average across the life of the plant/term of the PPA.

- The utilisation should be calculated based on the capacity factor of the plant and the load factor which will depend on the optimal mix of generation available. This value should be averaged across the term/life of the plant.

Firm generation (i.e. *not* intermittent by nature, such as thermal, biomass, or hydro generation with storage) will be contracted as per typical Power Purchase Agreement (PPA) – a capacity charge plus an energy charge. Non-firm generation (i.e. intermittent by nature, such as solar, wind, or hydro generation without

[10]The tool comes populated with dummy data for illustrative purposes only.

storage) will be contracted using an energy charge only, but without guaranteed dispatch.[11]

FiTs for mini-grid generation connected to the main grid – FiT Tool

A FiT Tool is attached as an annex to this report. It provides an example of how regulators or operators can calculate technology-specific feed-in tariffs (FiTs) for mini-grids selling power into the main grid.

As we discuss earlier, FiTs are inappropriate for encouraging new generation in *isolated* mini-grids because load is usually too low to fully utilise the capacity of a generator (which in turn means that the mini-grid operator cannot guarantee priority dispatch).

However a FiT may be offered in cases where generation is small relative to the total size of mini-grid (perhaps up to 10% of peak load) or when the mini-grid is connected to the main grid. In this case the main grid is large enough that the national utility/system operator can offer a FiT for excess mini-grid generation and guarantee dispatch. The FiT Tool can be used in either of these cases, although its focus is on mini-grids connected to the main grid.

The general principle of a FiT is that it is a standardised rate for the purchase of electricity from renewable sources. It should be remunerative enough for developers to invest in a generator. In the case of mini-grids, the FiT becomes a rate at which a generator can sell any excess energy to the main-grid, thereby covering part of its costs and reducing the amount it needs to charge mini-grid customers.

There are two possible main approaches to calculating FiT values, which can be briefly summarised as follows:

- **Avoided cost of generation** – In this case a single FiT applies for all types of generation, regardless of the underlying technology. It gives a large incentive for investment in the lower cost renewable technologies. The avoided cost will typically be set as the Long Run Marginal Cost of fossil-fuel based generation. The big disadvantage of this approach is that it can result in large windfall profits for investors in cheap renewable technologies or sites.

- **Average cost of generation** – In this case a separate FiT applies for each type of generation, usually categorised by technology type and sometimes also by size. Each FiT is calculated based on assumed 'average' conditions. The average cost should be determined on real-world costs, so should provide sufficient incentive to any generator that can equal or better the average, across different generation types.

The choice of avoided cost or average cost pricing should be carefully considered, the pros and cons of each going beyond our brief summary above. Countries that

[11]Take or pay provisions can be used to provide non-firm generators with certainty, but can lead to arguments about whether the generation was deemed available or not.

have already adopted FiTs for small-scale renewable IPPs will have adopted one of these approaches (or a combination), and it is sensible to calculate mini-grid FiTs in a consistent manner to avoid distorting investors' decisions.

One possibility is to combine the two approaches by calculating technology-specific FiTs based on the average cost of generation, but to cap these at the avoided cost. This approach is commendable because it ensures that electricity consumers are not burdened with higher electricity tariffs than necessary. Whether or not to offer FiTs for a particular technology or to cap FiT levels is ultimately a policy decision, which should be made balancing economic, environmental and affordability objectives. A word of caution though – over the past decade many countries around the world (particularly in Europe) offered generous FiTs without any caps or limits on uptake and are now burdened with significantly higher average costs of electricity generation.

The FiT Tool calculates FiT levels based on the *average* cost of generation. The *avoided* cost of generation is typically determined as part of the national power system planning process and therefore does not require a dedicated tool.

The key features of the FiT Tool are as follows:

- The user inputs **key characteristics** of the applicable generation type. These include the technology type, installed capacity, and average capacity factor.

- The **average capacity factor** is a particularly important input. This should be the maximum utilisation that the generator can achieve subject to the availability of its energy source (e.g. a run of river hydro might have an average capacity factor of around 50%, while a biomass plan might be closer to 90%). If a generator were only supplying a mini-grid, its utilisation might be significantly less than the capacity factor because there is insufficient demand for the power, but in cases where the main-grid is willing to buy its excess generation on a must-take basis, then this capacity factor should be achievable. Because the cost of investing in the renewable generator will be recovered through an energy-only charge, the higher the capacity factor the lower the required FiT to cover costs. (Note that the average capacity factor here is different to the average utilisation which is an input to the Power Purchase Tool. The average capacity factor is what the plant could generate if there was no limit on demand, whereas the utilisation factor depends on demand for the generation).

- The user inputs **investment costs**. These include feasibility, development, and construction costs. They may also include the costs of connecting to the transmission system in cases where the generator is responsible for bearing these costs. Investment costs should also take account of interest during construction.

- The user inputs **operating costs**, including fuel costs (if applicable) and both fixed and variable operating and maintenance costs.

- The user inputs **financing terms**, including the initial gearing (i.e. the percentage of investments financed using debt), the loan period, the interest rate on the loan, the interest rate during construction, and the investor's pre-tax return on equity. The FiT will ultimately be calculated to achieve this return on equity by the end of the period.

- All inputs should be the '**average**' of those expected to be developed in the country. Ideally the inputs should be determined based on a database of actual and prospective generation projects and on comprehensive resource studies (such as hydrology studies, wind maps etc.)[12]. The definition of 'average' can change over time – it can be set reasonably low initially while there are still many good generation sites available, and then increased as the most favourable sites are developed. Regulators should establish simple databases to collect this information and make it a requirement of any future FiT generation projects that they provide data on actual costs and performance for the benefit of updating FiTs in the future (generators who have already signed on to a FiT will not be affected by updates, given that their FiT is 'locked in' for the fixed duration of the contract).

- The FiT Tool provides a full **cash flow analysis** over the FiT period (20 years is assumed as the default, although this can easily be modified). The 'bottom line' is the return to the equity investor. An example of the cash flow analysis is provided in the table below.

- The user then uses the Excel "Goal Seek" function to **calculate the FiT** level that achieves the inputted return on equity.

The FiT Tool assumes that FiTs will be indexed to inflation over the life of the FiT agreement.

Other possible adaptations to the FiT Tool that regulators may want to consider include:

- **Front-loaded FiTs** to boost investors returns in the initial years of operation, to help them cover their financing costs

- **Linear tariffs** for technologies which exhibit strong economies of scale and therefore the tariff should depend on the size of the installation; otherwise larger installations will make windfall profits. Linear tariffs are preferable to fixed size categories which distort investor incentives when sizing their generating plant.

- **Currency options** so that investors can choose between local or foreign currency denominated FiTs. This can help reduce an investor's risk by aligning their revenues with their cost base. Note that FiTs should be indexed to inflation relevant to the currency in which it is denominated.

[12]The tool comes populated with dummy data for illustrative purposes only.

Table 4 FiT Tool example of cash flow

Year		-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Operating cash flows																							
Revenue from FiT	$m			0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Fixed costs	$m			-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15
Variable costs	$m			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interest on loan	$m			-0.27	-0.24	-0.22	-0.19	-0.16	-0.14	-0.11	-0.08	-0.05	-0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net operating cash flow	$m	-	-	0.47	0.49	0.52	0.55	0.57	0.60	0.63	0.66	0.68	0.71	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Investing cash flows																							
Investment costs	$m	- 2.43	-2.43																				
Net investing cash flow	$m	- 2.43	-2.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Financing cash flows																							
Proceeds on loan	$m	1.70	1.70																				
Principal paid on Loan	$m			-0.34	-0.34	-0.34	-0.34	-0.34	-0.34	-0.34	-0.34	-0.34	-0.34	-	-	-	-	-	-	-	-	-	-
Equity contributions	$m	0.73	0.73																				
Net financing cash flow	$m	2.43	2.43	-0.34	-0.34	-0.34	-0.34	-0.34	-0.34	-0.34	-0.34	-0.34	-0.34	-	-	-	-	-	-	-	-	-	-
Net cash flows																							
Cash at Beginning of Year	$m	-	-	-	0.13	0.28	0.46	0.67	0.90	1.16	1.45	1.77	2.11	2.48	3.21	3.95	4.69	5.43	6.16	6.90	7.64	8.37	9.11
Net Change in Cash	$m	-	-	0.13	0.15	0.18	0.21	0.23	0.26	0.29	0.32	0.34	0.37	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Cash at End of Year	$m	-	-	0.13	0.28	0.46	0.67	0.90	1.16	1.45	1.77	2.11	2.48	3.21	3.95	4.69	5.43	6.16	6.90	7.64	8.37	9.11	9.85
Investor returns																							
Annual return on equity	$m	- 0.73	-0.73	0.13	0.15	0.18	0.21	0.23	0.26	0.29	0.32	0.34	0.37	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
IRR	%	18.0%																					
Target ROE	%	18.0%																					
Difference	%	0.0%																					

Energy banking for mini-grids connected to the main grid

Energy banking does not require a tariff as such. Instead arrangements should be put in place so that small mini-grids can offset any generation they supply to the main grid against their bulk purchases. We discuss the key issues below rather than provide a 'tool'.

Energy banking arrangements are relevant to small mini-grids that do not have sufficient spare generating capacity to make it worthwhile entering into a FiT agreement, but do depend on the main grid for top-up and from time to time (depending on the time of day or month) will have some spare capacity that they can sell back to the main grid.

The principle of energy banking is that when main-grid connected mini-grids consume more than they generate, they are charged for the net amount (at the bulk tariff). But in months when they supply more to the main grid than they consume, they are allowed a free banking facility. By this is meant that the surplus electricity fed into the grid is recorded and this 'saved' balance can be drawn down and used in subsequent months. To keep things simple and minimise administrative costs, there is no charge for this banking service.

The size of the mini-grid should naturally be limited by the fact that the mini-grid operator will not be paid for any surplus generation, and therefore it will tend to scale the size of its generation so that main-grid purchases and sales roughly balance over the longer run. If the mini-grid has significant excess capacity, it should be advantageous for it to enter into a FiT contract instead.

8 Standardised power purchase agreement (SPPA)

Standardised PPAs are needed where bulk power is bought from a generator, or from the national grid for retail sale to mini-grid customers. In the grid-connected case, a PPA would also needed for the purchase of power by the national utility from the mini-grid.

As in other sections, what is presented here is a standardised 'term sheet' that will allow legal drafters in any SADC country which wants to apply this model to draw up a PPA that is suitable for a mini-grid. The basis for the table below are two existing SADC PPAs:

- Tanzania's Standardised PPA for purchase of capacity and associated electric energy to the isolated mini-grid that is part of the small power framework promulgated by EWURA
- Zimbabwe's Small Hydropower Proposed Model Power Purchase Agreement prepared for ZERA in December 2012.

The Tanzania PPA is available on-line fromhttp://www.ewura.go.tz/newsite/index.php/sppmenu

In addition, as part of this project two PPA templates have been prepared and are provided as stand-alone documents:

- PPA Template based on Kenyan and Tanzanian examples
- PPA Template based on Zimbabwean practice

These are word files which can be drawn upon and edited for use by any SADC country that is drafting mini-grid PPAs.

The two PPA templates have superficial differences reflecting differing legal drafting styles. Matters of substance that are different in the Zimbabwe-based PPA are:

- Provision for Step in Rights by a Lender to the Seller (Article 3.5)
- Provision for continuation of the PPA should the mini-grid be connected to the main grid (Article 3.6)
- Provision for compensation for consequential damages and any prejudice to Lenders in case of termination on notice or default (Article 4.2)
- Details of agreed tariff structure, including indexation

These features are not intrinsic to the second (Zimbabwe) PPA template, and could readily be adapted into a PPA that is based on the first (Kenya/Tanzania) template.

Table 5 Power Purchase Agreements

Terms / Provisions	Description	Application in PPA for isolated grid in Tanzania	Comparison with PPA for small hydro in Zimbabwe
General Terms			
Preliminaries	Clear statements of the purpose of the agreement, the parties to the agreement, the area and services covered by the agreement, and applicable and relevant laws.	Included as a preamble to the PPA, stating the parties to the agreement, the government policy that encourages private sector in small power project, the responsibility of the Ministry of Energy and Minerals (MEM) in administering the policy, the empowering regulation of Energy and Water Utilities Regulatory Authority Act, and the general intention of the Seller to sell electricity to the Buyer, and the intention of the Buyer to purchase electricity from the Seller. [*Definition of services to be provided is included in Article 1 – Definition, see below*]	Separate articles are provided for purpose of agreement (Article 1), relevant policy, administering ministry and laws and regulation, and intentions of Seller and Buyer (Article 2).
Definitions	Clear definition of particular words or phrases used in the PPA	Article 1 – Definition Article 1 (e) – Buyer's Entitlement: The Facility's electric energy, not to exceed the maximum dependable load-carrying ability of the Facility exclusive of energy required for the Facility use, expressed in kilowatt, agreed to be committed by the Seller for sale and delivery to the buyer, as set forth in Appendix B. [*To be clearer, this definition should be included in the Preliminary statements. Details of technical specification can be provided in the Appendix, as is the case in this PPA example.*]	Article 2.2 - Definition
Commencement of the PPA	Clear statement of the commencement of the PPA, any conditions to be met before commencement, and obligations of parties in force straight after commencement date.	Article 3 (e) – Milestone: The Commencement Date of Operation shall be within 2 years from the date of signing of this PPA. If the Seller does not achieve the Commencement Date of Operation, the PPA shall be deemed null and void unless the parties agree to an extension of the PPA. Article 2 (a) – Delivery entitlement: after the Commencement Date of Operation the Seller agrees to deliver and sell the Buyer's Entitlement to the buyer for the term and at the price	Article 4.1 Notwithstanding the date of signature this Agreement shall be deemed to commence on... *[Date]* and the Commercial Operation Date of the Project shall be … *[Date]*, or such other earlier or later date as the Parties may subsequently agree and record in writing, and shall, unless or until terminated in terms of the

Terms / Provisions	Description	Application in PPA for isolated grid in Tanzania	Comparison with PPA for small hydro in Zimbabwe
		stated in the PPA. Article 2 (b) – Acceptance and purchase of entitlement: after the Commencement Date of the Operation the Buyer agrees to purchase the Buyer's Entitlement for the term and at the price stated in the PPA.	relevant provisions of this Agreement, remain in force for fifteen (15) years or such other period which is not less than the minimum period required for the Project to satisfy obligations to equity and debt providers.
Term of the PPA	Clear statement of the term of the PPA.	Article 3 (a) – Term: the PPA shall commence and, subject to the termination provisions in the PPA, shall continue for the period of 15 years, measured from the Commencement Date of Operation, or the date of interconnection of the isolated grid, whichever is earliest. Date of Interconnection should be issued by the Buyer to the Seller as per the interconnection article of this PPA.	The Agreement may be extended for a further period to be determined by mutual consent upon written notice given at least twenty-four (24) months before the end of the initial term. The notice period and duration of any subsequent periods shall be determined by mutual written consent.
Termination and default	Conditions and procedures for the termination of the PPA and in the case of default.	Article 3 (b) – Default: a party to the PPA is deemed to be in default if it experiences each or any of the defined Events of Default: • If the Seller fails to complete, abandons, or cancels construction of the Facility, or does not achieve the Commencement Date of Operation; • The adjudged bankruptcy, dissolution, or liquidation of either party, in which case the bankrupt, dissolved or liquidated party shall be deemed in default; • If either party fails to perform or observe any of the covenant, terms, conditions, or provisions of the PPA and the failure was not rectified within 60 days of written notification of the failure. However, if the failure cannot be rectified within 60 days, the defaulting party have 1 year to rectify the failure, given that the actions to rectify the failure did not commence more than 60 days after the	Article 3.7- Default: A Party shall be entitled to issue a notice of an event of default if the other Party fails to perform its obligations for reasons within its control. Events of default include failure to fulfil the obligations as set out in the PPA, failure to supply or pay, failure to take or pay which results in non-dispatch of the Seller's generating plant without compensatory payment; failure to respond to a request to cure an event of default within agreed timelines; or any other material breach of provisions of the agreement.

Terms / Provisions	Description	Application in PPA for isolated grid in Tanzania	Comparison with PPA for small hydro in Zimbabwe
		failure notification. • If without reasonable excuse, either party fails to make an undisputed payment when due and non-payment continues for more than 90 days. • Due to the compulsory expropriation, acquisition or nationalisation of the material assets or equity of the Seller of the Facility by any instrument of the Government of Tanzania. • The dissolution or reorganisation of the Buyer such that he or she or his/her successor cannot perform his obligations. • Either party contests and denies the enforceability of this PPA. Article 3 (c) – Default procedures and cure: (1) Notice: When an Event of Default occurs, the non-defaulting party shall give written notice to the defaulting party and may pursue any remedies provided under this PPA, or may terminate this PPA. (2) Step In Rights: In the Event of Default or Emergency, and the defaulting party is prevented from temporarily from fulfilling its obligations, including restoring the operation of the Facility, either party may elect to provide notice to all parties of their intention to step in to the rights and obligations of the defaulting party and attempt in good time to remedy the situation. [*A clear definition of Emergency events should also be provided*] (3) Step In Costs: The party exercising the Step In Rights shall maintain and produce records of costs incurred to attempt to remedy or cure the situation, and the defaulting party shall reimburse such reasonable and documented expenses. The indemnity provisions of this PPA shall	Article 3.7- Default: Upon the occurrence of an event of default the aggrieved Party shall, within 7 days notify the other Party in writing and either demand performance or compensation for any loss suffered. An aggrieved Party shall be entitled to serve notice of termination in case the event of default remains without cure or efforts at curing, for 60days. Failure to perform as a result of force majeure shall not be considered an event of default, provided written notice to the other Party is submitted within 48 hours of the occurrence of the event.

Terms / Provisions	Description	Application in PPA for isolated grid in Tanzania	Comparison with PPA for small hydro in Zimbabwe
		apply to the exercise of any such Step In Rights. Article 3 (d) – Specific performance: if money damages is not sufficient remedy for the Event of Default or breach of this PPA, the non-defaulting party shall be entitled to specific performance to remedy such breach. [*A procedure to be followed at the end of the PPA should also be included, as it will be different from an Event of Default*]	
Sale and purchase of Buyer's Entitlement	Set out the procedures and rules of operation of the defined Facility, and the sale and purchase of Buyer's Entitlement	Article 2 (d) – Operation of Facility: The Seller shall not be responsible for any direct damage as because of his inability to deliver the Buyer's Entitlement, unless it is a result of severe negligence. The Seller's liability will not be limited in the event that the Seller reduces the Buyer's Entitlement, without Buyer's consent, for the purpose of selling capacity and associated electric energy to any third party, or for the purpose of producing any other form of energy capable of being produced at the Facility apart from the Seller's entitlement. Article 2 (e) – Forecasts: The Seller shall produce a two year forecast, before the start of operations and on/before each subsequent contract year, of its anticipated operations that includes: • Anticipated monthly generation availability and • Scheduled Outages for each year However, there will be no penalty to the Seller in cases where the actual amount of electric power capacity and delivery or the set times of delivery are different from the forecasted ones. The Seller however has to ensure that the Buyer's entitlement is met and notify the Buyer if he cannot meet the agreed plan of delivery. Article 2 (f) – Scheduled outages: The Seller is responsible for informing the Buyer about outages and their estimated	Article 5.4- Supply of power and energy: For planning purposes the Seller shall, at times and in a format to be agreed by the Operations Committee, provide to the Seller annual, monthly and day ahead forecasts of available capacity and estimated energy output. From the Commercial Operation Date actual power and energy readings shall be recorded and stored in accordance with procedures to be determined by the Operations Committee. If actual supply is more than 10% plus or minus the forecasted supply, revised forecasts should be conducted and the Seller shall pay a shortfall penalty related to its selling price.

Terms / Provisions	Description	Application in PPA for isolated grid in Tanzania	Comparison with PPA for small hydro in Zimbabwe
		duration, one month in advance for scheduled ones and as soon as possible for , including an estimate of the duration of the outage, for an unscheduled one. Article 2 (g) – Transmission System Operation: The maintenance and interconnection of the transmission system is a responsibility of the Buyer provided that he owns the transmission grid. The Buyer should cooperate with the Seller to balance load to maximise the system's ability to accommodate the Buyer's entitlement. [*Further adjustment should be made for the cases where the Buyer doesn't own the transmission system*] Article 2 (h) – Interruption of acceptance and purchase: Despite the nature of the contract of the PPA, the Buyer might interrupt the purchase or refuse to purchase his entitlement from the Seller's Facility in cases where this violates the Good Utility Practice. Also, if the Buyer's system with which the Facility in interconnected experiences an emergency, the Buyer holds the right to interrupt the taking of all or a portion of the Buyer's Entitlement for so long as it is minimally necessary under Good Utility Practice. Article 2 (i) – Interruption of delivery: The Seller may interrupt, reduce or cease to deliver the Buyer's Entitlement only to the extent that the Seller reasonably determines that such interruption, reduction, or cessation is necessary in order to install equipment in, make repairs, replacements, investigations and inspections of, or perform maintenance on the Facility which directly affect, the delivery of the Buyer's Entitlement. In such case the Seller is responsible for notifying the Buyer at least 24 hours in advance and provide an estimate of the duration of the interruption.	

Terms / Provisions	Description	Application in PPA for isolated grid in Tanzania	Comparison with PPA for small hydro in Zimbabwe
		Article 2 (j) – Coordination: In the event of interruption, the Buyer shall coordinate efficiently to minimise its duration. Prior to initiating a disruption of the Buyer's Entitlement, the Buyer shall inform the Seller at least twenty-four hours in advance. Article 2 (k) – Power factor: The Buyer is responsible for establishing the voltage level and power factor of the Facility to parallel its system requirements to provide ancillary services. Unless otherwise requested by the Buyer, the Seller's Facility must be capable of operating at a power factor of 0.8 lagging, and the Seller shall operate the Facility at a power factor of between 0.8 and 1.0 at the point of delivery to the Buyer. Article 2 (l) – Synchronisation: For the first time that the Seller's Facility starts operating in parallel with the Buyer's grid, the Seller, as well as when it resynchronises after a cessation of operation, the Seller should notify the Buyer in writing at least 30 days before. Article 2 (m) – Standards: The Seller shall comply with all applicable standards as approved by the Authority.	
Metering and operation	Set out the metering and operational obligations of the parties.	Article 4 (a) – Delivery Point Responsibilities: The transmission and delivery of the agreed Entitlement of the Buyer at the Delivery Point is the sole responsibility of the Seller, including all the incurring expenses. Article 4 (e) – Induction Generators: The Seller shall pay the Buyer, at prevailing rates approved by the Regulator, the cost for all energy consumed from the Buyer to excite the induction generators, unless such energy is netted from that sold hereunder. Power factor correction capacitors should be provided from the Seller for each induction type generator.	Article 5.2- Interconnection and statistical metering facilities: The Seller shall finance and design the interconnection statistical metering plant and equipment to

Terms / Provisions	Description	Application in PPA for isolated grid in Tanzania	Comparison with PPA for small hydro in Zimbabwe
		Article 4 (f) – Metering: The Seller shall own and maintain the primary metering equipment employed, complying with the regulator's standards, for purposes of measurement and billing under the PPA. The Seller shall provide a suitable location for the metering and telemetering equipment if the Interconnection Point is at the Facility. Article 4 (g) – Meter Reading: The Seller is responsible of reading the meter at the end of each month and is obliged to provide the Buyer access to the Facility for inspecting meters and examining the operation of the Facility, without interruption the Seller's normal business operations. Article 4 (h) – Meter Accuracy: The Seller is responsible for testing the metering equipment at his own expense, while the test of the accuracy of the meters can be requested by either Party. Inaccurate meters (by more than 0.5%) shall be fixed or replaced by the Party that owns them. Article 4 (i) – Meter Calibration: Testing and calibration of meters, shall be performed pursuant to metering standards set by the Regulator. Calibration shall occur before use of the meters to first record the output of the Facility. Article 4 (j) – Transfer of Title to Power: The Buyer shall be in exclusive control and possession of the delivered capacity and associated electric energy and shall be solely responsible for same. Article 4 (k) – Operation: The Facility shall be operated by the Seller in a manner consistent with Good Utility Practice and proper safety considerations. Article 4 (m) – Data: Any damage caused to the Seller's interconnection facilities, resulting from the operation of the Seller's interconnection equipment is the sole responsibility of	specifications to be agreed with the Buyer and the Regulator. Article 5.5. - Meter reading, billing and collection: The Parties shall jointly read the billing and statistical meters. A reading shall not be invalid due to the absence of any Party. Bills for payment shall be based on the readings from the Main Revenue Meter. In the event that this meter is not available or is inaccurate, then the Check Revenue Meter reading shall be used. In the event of failure of both Main and Check Revenue Meters, the Statistical Meter readings shall be used pending rectification of the problem with the Revenue Meters. In the unlikely but possible event of a failure of all metering, bills shall be based on agreed estimates until the repair and re-commissioning of the meters.

Terms / Provisions	Description	Application in PPA for isolated grid in Tanzania	Comparison with PPA for small hydro in Zimbabwe
		the Seller.	
Interconnection with main grid	Set out procedures, conditions, and rules to connect to the main grid	Article 4 (b) – Interconnection: The Seller's interconnection facilities shall be designed and operated at the Seller's expense and that includes any metering equipment located at the Buyer's grid substation. If the Buyer operates the transmission system into which the Facility is interconnected, He shall have the right to review the design as to the adequacy of the protective apparatus provided. Article 4 (c) – Interconnection Standards: The Buyer's requirements and standards shall apply to the installation and to the operation of all of the Seller's equipment and to the interconnection. Article 4 (d) – Interconnection Compliance: The Buyer has the right to inspect the Seller's interconnection equipment to ensure compliance with Good Utility Practice, without interfering with the Seller's normal business operations. Any discrepancies noted should be corrected by the Seller and until then the Buyer is not required to pay for the Entitlement. Article 4 (l) – Interconnection Liability: Any damage caused by the Seller's interconnection equipment will be the liability of the Seller. Article 3 (f) – Interconnection of the Isolated Mini-grid to the Main-grid (set out termination procedures if system include interconnection): The Buyer shall notify the Seller about the intention to terminate the Agreement 6 months before the expected date of interconnection of the isolated mini-grid to the main-grid. • Upon such termination, the Buyer shall be entitled to enter into a new Agreement based on the rules and regulations applicable to Small Power Projects on the	Article 5.1. – Construction of generation facilities: The Seller shall take all reasonable steps to obtain the permits and approvals required to ensure the licensing, financing, design, construction and commissioning of the power generation facilities within the agreed specifications and estimated timeframe and cost. The Seller shall obtain the approval of the Buyer and the Regulator of the technical specifications and shall not vary them without their consent. The Parties shall establish a Joint Operations Committee as soon as is practicable following the signing of this Agreement in order to facilitate coordination of all construction activities to avoid or minimise delays to the Commercial Operation Date. Article 5.3. – Operation and maintenance of Seller's facilities: The Seller shall be responsible for operating and maintaining its Project facilities in accordance with prudent utility practice. Through the Operations Committee, the Buyer shall be permitted to undertake audits or witness tests to confirm adequacy of the Seller's operation and maintenance processes.

Terms / Provisions	Description	Application in PPA for isolated grid in Tanzania	Comparison with PPA for small hydro in Zimbabwe
		Main-grid. • If, there is more than one buyer eligible to enter into an Agreement with the Seller, the Seller's choice of buyer shall prevail. • An application for interconnection and sale of electricity including an updated single-line diagram shall be submitted by the Seller to the new buyer no later than 90 days prior to the Date of Interconnection of the Isolated Mini-grid to the Main-grid. • The Term of such new PPA shall be 15 years from the Date of Interconnection of the Isolated Mini-grid to the Main-grid.	
Billing and payment	Set out the procedures for billing and payment	Article 5 (a) – Billing: The Seller shall read its Facility meters on the final day of each month for determination of the electric energy delivered to the Buyer. The results shall be supplied to the Buyer within 15 days following each such reading. Article 5 (b) – Payment: The Buyer shall pay the Seller all amounts due for the delivered electric energy on or before the Due Date, pursuant to the rates set forth in Appendix A. Any amounts unpaid after the Due Date shall bear interest payable to the Seller by the Buyer at the Prime Rate compounded on a monthly basis. Either party may dispute any claimed delivery or payment by written notification to the other Party within 1 year of receipt of a meter reading. In this case the Party that wins the dispute shall get from the other party the disputed amount plus interest compounded monthly. Such payments should be made within 15 days of the date of the dispute's decision. Article 5 (c) – Estimation: In the event that any data required for the purpose of determining amounts owed to the Seller are	Article 6.3- Dispatch and payment: The Buyer agrees to dispatch all the available capacity and net energy output delivered by the Seller's generating plant. The Buyer shall take or pay for an agreed level of available capacity and associated energy on the basis of the tariff calculation methodology and shall either bank surplus energy on behalf of the Seller or pay for the surplus energy at spot market prices. The Buyer shall settle all monthly bills in full within 10 working days of receipt of a bill. All payments not made by due date shall attract a penalty interest rate equivalent to the overdraft interest rate of the Seller's bank. In the event of disputed bills requiring the

Terms / Provisions	Description	Application in PPA for isolated grid in Tanzania	Comparison with PPA for small hydro in Zimbabwe
		unavailable when required, such data shall be estimated based upon actual data in the next subsequent payment month. Article 5 (d) – Alternative Meter Data: To determine the amount of the Buyer's Entitlement delivered in any billing period, recordation of amounts, billing, and payment will be based on the first available of the following options: • The primary Facility meter measurement(s) when that meter is accurate or • The Facility's secondary meter measurement when that secondary meter is positioned to record the electric energy delivered and accepted, and fulfils the accuracy requirements; • Where all meters fail to accurately register the electric energy delivered and accepted, the average monthly data for the Facility from the same month in the prior Contract Year, if available, as reasonably adjusted for the particular billing period can be used to estimate the amount of electric energy delivered and accepted. Where such data are not available, the average monthly electric energy delivered during the previous 6 billing periods prior to meter failure shall be used to estimate energy delivered by the Facility for the billing period. Article 5 (e) – Set Off of Amount Owed: Either Party may set off undisputed amounts owed by it to the other Party regarding the Facility against undisputed amounts owed by the other Party to it regarding the Facility under this Agreement.	full dispute resolution process to be followed, the Purchaser shall continue to make payments but without prejudice to the recovery of any overpayments, together with interest.
Relationship of parties,	Set out the relationships of parties, limitations of	Article 7 (a) – Immunity: Each party waives all immunity or sovereign and represents, warrants, and covenants, that it will	

Terms / Provisions	Description	Application in PPA for isolated grid in Tanzania	Comparison with PPA for small hydro in Zimbabwe
limitations of liabilities, indemnity	their liabilities and indemnity	not assert such immunity at law or at equity. Article 7 (b) – Third Party Beneficiaries: With the exception of Lenders, the Parties shall not grant any remedies to any third party beneficiary under this Agreement. Article 7 (c) – No Other Relationship: The Parties of this Agreement should have no relationship apart from independent contractors for the sale and purchase of electric energy generated at the Facility. Article 7 (d) – Limitation of Liability: Neither the Buyer nor the Seller and their respective employees shall be liable or responsible to the other Party for damages of any nature, resulting from performance nor non-performance of obligations pursuant to this Agreement, including, claims in the nature of lost revenues. Article 7 (e) – Indemnity: Each Party shall defend the other Party and its respective employees, against any liabilities arising by reason of bodily injury, or damage to property sustained by any person: (i) caused at facilities owned by the Party (ii) caused by an act of negligence or wilful misconduct of the Party or by an employee of the Party. The Parties shall cooperate in the mutual defence of any such claim. Article 7 (f) – Adjusted Indemnity: If the Buyer and the Seller are both determined to have been negligent parties or to have engaged in wilful misconduct as per subpart (e), the obligations to indemnify of the Seller and the Buyer shall be appropriately adjusted based on the percentage of the responsibility of each Party for such loss. Article 7 (g) – Insurance: The Seller shall insure the Facility for comprehensive general liability and property damage from a recognized insurance provider, with primary limits of liability	Article 5.6. – Indemnities and default liabilities: The Seller shall indemnify the Purchaser for any damage, injury or loss to life and property, as a direct consequence of an event of default, act of commission or omission attributable to the Seller. Unless an extension of time has been agreed, the Seller shall also pay liquidated damages to the Buyer for each day there is a delay to the anticipated Commercial Operation Date for reasons within the control of the Seller. Liabilities shall be limited to a financial limit to be agreed by the Parties in accordance with prudent utility practice and shall exclude claims for consequential damages of any nature. Article 3.8. –Insurance: For the duration of the Agreement, each Party shall maintain comprehensive insurance coverage for the replacement value of their portion of the Project facilities.

Terms / Provisions	Description	Application in PPA for isolated grid in Tanzania	Comparison with PPA for small hydro in Zimbabwe
		at all times during the duration of the Agreement equal to not less than the replacement value of the Facility.	
Risk Management	Set out the general risk management of the PPA, including definition of risks and the allocation of risks	Not included	Article 7 – The PPA follows the principle of allocating risks to the Party that is best able to manage the risks. The Article includes: sovereign risk, construction risk, hydrological risk, operating risk, fiscal policy risk, monetary policy risk, market risk, and payment risk.
Force Majeure	Set out the definition and procedure of force majeure events.	Article 6 (a) – Force Majeure (definition and list of events that are considered force majeure events in this PPA): For purposes of this Agreement, the term 'Force Majeure' shall mean any event, including but not limited to any act of God, fire, earthquake, civil unrest, etc, not within the reasonable control of the Party whose performance is adversely affected: Article 6 (b) – Not Force Majeure Events: Any obligations of either Party which arose before the occurrence of the Force Majeure event causing non-performance shall not be excused as a result of the occurrence of a Force Majeure event. Article 6 (c) – Force Majeure Protocol: No default as a result of an event of Force Majeure shall occur, provided that the adversely affected non-performing Party shall: • Provide prompt notice in writing to the other Party, of the occurrence of the Force Majeure event giving an estimation of the event's expected duration and the probable impact on the performance of its obligations; • Exercise all reasonable efforts to continue to perform its obligations; • Expeditiously take or initiate action to correct or cure the Force Majeure;	Article 3.6- Force majeure: A Party shall be deemed to be experiencing an event of force majeure if it is unable to discharge its obligations as a result of circumstances beyond its control as defined in this Agreement. A Party experiencing an event of force majeure shall be required to notify the other Party of the occurrence of such event within 48 hours of becoming aware of such an event. The Party experiencing an event of force majeure shall be expected to take all reasonable steps within its control to restore its ability to perform as quickly as possible. If the event persists for 365 days without any prospects for successful resolution, either or both Parties may give notice to terminate the agreement without prejudice to any claims for performance of obligations.

Terms / Provisions	Description	Application in PPA for isolated grid in Tanzania	Comparison with PPA for small hydro in Zimbabwe
		• Exercise all reasonable efforts to mitigate or limit damages to the other Party, • Provide prompt notice to the other Party of the cessation of the Force Majeure. Article 6 (d) – Force Majeure Effects: If a Party is rendered wholly or partly unable to perform its duties and obligations under this Agreement because of a Force Majeure event, that Party shall be temporarily excused. Article 6 (e) – Force Majeure Duration: If a Party cannot fulfil its obligations under the Agreement because of a Force Majeure for 2 years, the other Party may terminate the Agreement by 90 days written notice.	
Dispute Resolution	Set out procedures for dispute resolution.	Article 8 – general definition and first point of resolution of any disputes between parties Article 8 (a) – Appeal to the Authority: If between 60 days and 80 days of a dispute notification, this is not resolved to the mutual satisfaction of the Parties, the Parties shall abide by and act in accordance with the Authority's written decision resolving such dispute pending a final legal appeal of such resolution. Article 8 (b) – Binding External Arbitration: Between 60 days and 80 days from the initial notification of a dispute, the Seller may elect to refer such dispute to a neutral external arbitrator. The Seller, in this case shall be responsible to reimburse the reasonable expenses of the Buyer to participate in this arbitration if it is held outside of Tanzania. Once the Seller makes this election, the decision of the arbitrator(s) is final and binding on the Parties, unless the binding arbitration has not reached a final decision within 360 days of the mutual referral of the dispute.	Article 3.10.1. - Amicable settlement: Any dispute between the Parties on any matter arising from the interpretation or performance of this Agreement shall in the first instance be amicably settled between the Parties. Article 3.10.2.- Appeal to Regulator: If the Parties are unable to settle a dispute within 60 days, they shall submit the matter to the Regulator for resolution. Article3.10.3.- Arbitration: The Parties agree to submit any matter that is not settled amicably or by the Regulator to a final and binding resolution by an Arbitrator agreed to by both Parties. If the Parties fail to agree on a single Arbitrator the matter shall be determined by a panel of three arbitrators, appointed by mutual

Terms / Provisions	Description	Application in PPA for isolated grid in Tanzania	Comparison with PPA for small hydro in Zimbabwe
			agreement.
Delegation and assignment, restructuring	Set out procedures for delegation, assignment and restructuring.	Article 9 (a) – Assignment, delegation: The Seller shall not assign or delegate any of its rights without the prior written consent of the Buyer and the Authority. The Seller may delegate some of its rights to an affiliate for the operation of the Facility and to Lenders for the purpose of financing. Article 9 (b) – Restructuring: In case of restructuring of the electricity sector, the Buyer warrants that it will cause any successor(s) to assume any of the power transmission obligations of the Buyer under this Agreement, as well as purchase obligations to the Seller in writing. Article 9 (c) – Opt-Out Election: Any time up until 5 years prior to the termination of this Agreement, the Seller shall have the election to opt-out of this PPA, but only for the purpose of participating in the Restructured power market.	Article 3.5.- Assignment and step in rights- Except as otherwise provided for in the Agreement or with the written consent of the other Party, which consent shall not be unreasonably withheld, this Agreement or any of its rights and obligations shall not be ceded or assigned. It is noted and agreed that the Seller, as Developer of the small hydro power project, may be required to assign its rights to a Lender as security for loans. A Lender exercising step in rights shall be entitled to assume all the rights and obligations of the Seller.
Representations and warranties	Set out representations and warranties by parties to the PPA.	Article 10 – each parties represents and warrants to the other that: (a) It is legally established to do business in Tanzania (b) The execution of this PPA is duly authorised as required by its enabling authority or its by-laws, and does not conflict with any laws, rules or regulations affecting or binding the parties (c) There is no legal or administrative action pending that prohibits or impairs the part from performing under this PPA (d) This PPA constitute a valid, legal and binding obligation of the party (e) The execution, delivery and performance of this PPA will not contravene any provisions of other agreements to which the party is bound.	Article 3.4 The Parties warrant and represent to each other that they are legally competent to enter into this Agreement and to assume their obligations therein.

Terms / Provisions	Description	Application in PPA for isolated grid in Tanzania	Comparison with PPA for small hydro in Zimbabwe
Miscellaneous	Set out any other provisions relevant to this PPA.	Article 11 (a) – Modifications: The PPA may not be modified or amended except in writing signed on behalf of both Parties and approved by the Authority. Article 11 (b) – Cooperation: It shall be the Seller's obligation to take all necessary actions to satisfy all applicable legal requirements regarding the Facility. The Buyer shall cooperate with the Seller to obtain all necessary consents. Article 11 (c) – Entire and Complete Agreement: This PPA constitutes the entire and complete final agreement between the Parties relating to the subject matter hereof, substituting all previous agreements to the subject matter hereof. Article 11 (d) – Choice of Law: The interpretation and performance of this PPA shall be in accordance with and controlled by the laws of the government of Tanzania. [Or in accordance with the laws of the country where the Facility is located] Article 11 (e) – Waives: There shall be no implied waivers under this Agreement. The failure of either Party to require compliance with any of the outlined provisions shall not affect that Party's right to later enforce same. Article 11 (f) – Severability: If any clause of this Agreement is ruled invalid or unenforceable by a court of competent jurisdiction, it shall not affect the remainder of the Agreement if the other clauses are not affected by the invalid clause. Article 11 (g) – No Interpretation of Headiness Article 11 (h) – Notice: Any notice, invoice, or other communication related to this Agreement shall clearly bear the date of its creation, be in writing and delivered by personal service, electronic transmission with proof of receipt and	Article 3.9. - Amendments: Either Party may request the amendment of provisions of the Agreement. Any amendments to the agreement shall only take effect upon the written consent of the Parties. Amendments to an Annexure shall be in the form of a substitute Annexure duly signed and dated by the Parties. Article 3.11. – Notices and communications: All notices and communications, shall be in writing and addressed to the designated representatives, and shall be deemed to have reached the other Party on the date of delivery.

Terms / Provisions	Description	Application in PPA for isolated grid in Tanzania	Comparison with PPA for small hydro in Zimbabwe
		reading, or telecopy, with a subsequent copy mailed postage prepaid, properly addressed.	
Appendices			
Tariffs	Set out the tariffs and/or tariff calculations or formulas.	Appendix A – Tariffs for Delivery of the Buyer's Entitlements The tariff payable shall be based on the avoided costs of the Buyer, as approved by the Regulator applicable to each calendar year of the Agreement. The tariff has to be within the limits set by the Regulator. More specifically, the applicable tariff during the duration of the PPA cannot be less than the tariff payable in the year of execution of the PPA and it cannot be more than 1.5 times the of the year of execution of the PPA.	Appendix A: Tariff Calculation Methodology a) Tariffs shall be calculated on the basis of the supplier's costs. Where the supplier has not been selected on the basis of competitive bidding, the Regulator shall use benchmark costs of similar plants. b) Transparent disclosure of costs: the tariff charged by the Seller to the Purchaser shall be based on costs established on an open book approach. c) The Regulator shall determine the reasonable rate of return: by approving the parameters used in the standard formula for computing the rate of return. d) Maximum dispatch: to maximize the national benefit of run of river small hydro power projects the tariff shall be designed to encourage maximum dispatch. e) Supply or pay and take or pay: the Seller is obliged to supply and the Purchaser is obliged to take an agreed level of capacity and energy. f) Price cap: the avoided cost at national level shall determine the tariff

Terms / Provisions	Description	Application in PPA for isolated grid in Tanzania	Comparison with PPA for small hydro in Zimbabwe
			ceiling. g) Tariff reviews: costs and tariffs shall ordinarily be reviewed and adjusted annually but the Parties can, with the approval of the Regulator, agree to shorter or longer review periods.
Detailed description of the Seller's facility	Described in detail the Seller's services to meet the Buyer's Entitlement, can include standard operating measures and technical standards	Appendix B – Description of the Seller's Facility As per the template in Appendix B, the Seller is responsible for providing detailed information on the fuel type, capacity, the buyer's entitlement, the running time and the voltage of the Facility.	Appendix C – Description of the Seller's Facility As per the template in Appendix B, the Seller is responsible for providing detailed information on composition of the Operations Committee, safety rule, procedures for emergency control, procedures for maintenance during planned and forced outages, and calibration, testing and maintenance of meters.
Technical detail of grid interconnecti on requirements	Set out the technical detailed for grid interconnection requirements	Appendix C – Grid Interconnection Requirements: The requirements set out in Appendix C need to be fulfilled by the Seller prior to the interconnection and include the delivered voltage, the power factor of the Facility and a diagram on the interconnection arrangements showing the generators, switchgear, transformers, protection systems and transmission lines, their capacity, rating and voltage levels.	Appendix B- Technical Diagrams and Description of Generating Plant and Interconnection Facilities: Appendix B of the PPA requires the Seller to provide diagrams of the electrical connections identifying the interconnection, synchronising and metering points and size of generating unit.

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