



REPUBLIC OF BOTSWANA

**MINISTRY OF MINERALS AND ENERGY**

**ROOFTOP SOLAR GUIDELINES (AMENDMENT), 2024**

**REVISION 1, OF 2024**

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## **1. Introduction**

The overarching goal of Botswana's National Energy Policy is to provide an affordable, reliable and adequate supply of energy for sustainable development, as well as to improve access to and efficient use of energy resources. The policy states that the Government will support and facilitate initiatives that increase the contribution of renewable energy to the energy supply mix in order to attain energy security and a low carbon portfolio. In its submission of its climate action plans to the United Nations Framework Convention on Climate Change (UNFCCC) in 2015, Botswana committed to an overall Greenhouse Gas (GHG) emission reduction of 15 per cent (from 2010 emissions level) by 2030.

Botswana further committed to conducting the necessary legislative review, develop a Climate Change Policy and Institutional Framework supported by relevant strategies to achieve the intended reduction. To that end, the Government of Botswana is implementing the Rooftop Solar Programme to create an environment in which end users can generate their own electricity and sell any excess they may have to the Botswana Power Corporation (BPC). The Programme is an alternative suitable mechanism to facilitate private sector participation and increase the uptake of solar energy. It entails the development of Rooftop Solar Guidelines, applicable rules, regulations, standards, tariffs as well as review of processes. These Guidelines define the framework and administrative process for the implementation of small scale grid-tied solar photovoltaic (PV) systems, either roof or ground mounted. The system-wide aggregate capacity of the Programme in the first 12 months was 10 MW and is now revised to 50MW.

### **1.1 Goal of the Guidelines**

The goal of these Guidelines is to enable BPC electricity consumers to generate electricity for their own use while selling any excess to BPC up to the limit as defined by the Ministry.

### **1.2 Objectives**

The objectives of these Guidelines are to provide:

- a) The framework and administrative process for the implementation of small scale grid-tied solar PV systems either roof or ground mounted;
- b) Guidance that will assist in the development of applicable rules, regulations, tariffs and processes;

- c) Guidance to consumers on how they may use the RTS Programme in a compliant manner to generate electricity for their own use and sell any excess to BPC; and
- d) Support for the evaluation of the effectiveness of this type of programme as one part of an overall strategy for enhancing capacity and connectivity in Botswana's Electricity Sector.

## 2. Glossary, Definitions & Abbreviations

**Bi-directional meter:** A device that separately measures electricity flow in both directions (import and export)

**Consumer:** means any person who is supplied with electricity for his/her own use by BPC. Consumers who also generate will be referred to, herein, as "consumers", although in effect they are "consumer/generators".

**Consumption:** Kilowatt hours (kWh) used by the consumer for his/her own use and tracked by the BPC meter.

**Export:** Any kWh that is generated by the Rooftop Solar (RTS) system and sent to the BPC grid through its Point of Connection.

**Generating capacity:** The maximum amount of electricity, measured in kilovolt Amperes (kVA), which can flow out of the generation equipment into the consumer's alternating current wiring system. This is therefore the maximum alternating current power flow which can be generated.

**Grid-tied:** Embedded generation, such as photovoltaic solar, that is connected to the utility electricity grid either directly or through a consumer's internal wiring is said to be "grid-tied". The export of energy onto the utility grid is possible when generation exceeds consumption at any point in time. Such consumers would rely on the utility grid to supply them with electricity when their instantaneous generation is insufficient to supply their instantaneous consumption. Also known as "interconnected".

**Interconnection Agreement (ICA):** A contract between the consumer and BPC that details the terms and conditions of interconnecting an RTS system with the BPC grid. The ICA, signed by both the consumer and BPC, and the Certificate of Completion constitutes the Permit necessary for an RTS system.

**Inverter:** A power device that converts direct current to alternating current at a voltage and frequency which enables the generator to be connected to the utility grid.

**Licence:** For RTS systems above 100 kW, a licence will be issued by BERA to verify that the system meets the full intent and requirements of the Electricity Supply Act. The Licence term will be for 15 years.

**Licensed Technician or Engineer:** This refers to a Technician or Engineer who is certified by the Engineer's Registration Board of Botswana.

**Permit:** A permit, comprised of the ICA signed by both the consumer and BPC as well as the Certificate of Completion to verify that an RTS system has met all technical and safety standards for interconnection with the system grid. The Permit term will be for 15 years.

**Photovoltaic Solar System:** A small scale embedded generation system, also known as PV system or solar power system, designed to supply usable solar power by means of photovoltaics. The system is comprised of solar panels to absorb and convert sunlight into electricity, a solar inverter to change the electric current from DC to AC, as well as mounting, cabling, and other electrical accessories to set up a working system.

**Point of Connection:** An electrical node on a distribution system where the consumer's electrical assets are physically connected to the utility's grid (BPC).

**Rooftop Solar:** PV systems owned by consumers at the same location at which they receive a bill for electric service. The generation from these facilities is primarily intended for self-use, with excess generation eligible to be sold back to the grid. The facilities may be roof or ground mounted and may include battery storage.

**Rooftop Solar Programme:** A programme for grid-tied roof or ground-mounted solar PV systems (with or without energy storage), owned by consumers at the same location at which they receive their electricity bill. The generation from these facilities is primarily intended for self-use, with excess generation eligible to be sold back to the grid. The facilities may be roof or ground mounted and may include battery storage.

**Utility:** The electricity distribution service provider responsible for the electricity grid infrastructure to which the consumer is connected.

**Utility Network (or Utility Grid):** The interconnected network of wires, transformers and other equipment, covering all voltage ranges, and belonging to the Utility.

## **Abbreviations**

AMI	Advanced Metering Infrastructure
BERA	Botswana Energy Regulatory Authority
DOE	Botswana Department of Energy, under the Ministry of Minerals and Energy
BPC	Botswana Power Corporation
kVA	kilovolt-ampere (unit of electrical power, often similar in magnitude to kW)
kW	kilowatt (unit of electrical power)
kWh	kilowatt-hour
MME	Ministry of Minerals and Energy
MW	Megawatt
PV	Photovoltaic
RTS	Rooftop Solar
SAPP	Southern African Power Pool

## **3. General Guidelines**

### **3.1 General definition of the Rooftop Solar Programme (RTS)**

A programme for grid-tied roof or ground-mounted solar photovoltaic (PV) systems (with or without energy storage), owned by consumers at the same location at which they receive their electricity bill. The generation from these facilities is primarily intended for self-use, with excess generation eligible to be sold to BPC.

### **3.2 Operating period**

The RTS will align with and operate for the duration of the NDP11 and NDP12 and upon its completion be evaluated for changes.

In the event of the Programme's termination, any RTS-approved projects will be eligible to continue to operate their RTS under the terms and conditions of the Programme for the duration of the term of their permit or license.

### **3.3 Relevant Legislation**

The Guidelines seek to align with the following legislation:

- a) Electricity Supply Act;
- b) Botswana Energy Regulatory Authority Act;
- c) Botswana Power Corporation Act and By-Laws;
- d) Environmental Impact Assessment Act;
- e) Occupational Health and Safety Act;

- f) Trade Disputes Act; and
- g) Any applicable law of the Republic of Botswana

### **3.4 General Roles and Responsibilities of Key Stakeholders.**

The Department of Energy (DOE), under the Ministry of Minerals and Energy shall be responsible for the oversight and policy direction of the Rooftop Solar Programme, providing general guidance through the Rooftop Solar Guidelines.

BERA shall be responsible for developing the necessary regulations, aligned with the Rooftop Solar Guidelines as needed to guide the interconnection process, set tariffs, establish tariff methodologies, and oversee safety concerns. It will also be responsible for issuing permits and/or licenses, as specified in further detail below.

BPC shall set design standards and specifications, interpret and implement the provisions of the policy and regulations, thereby allowing Consumers to interconnect their rooftop solar system to the grid. BPC may also propose changes to BERA on matters that are subject to BERA regulatory approval, for BERA's consideration and approval. In the process, it should ensure overall safety, adherence to the overall technical guidelines, and follow good commercial practices.

The Consumer shall ensure compliance with the Guidelines in the event the Consumer decides to sign up for the RTS Programme and meets the eligibility criteria. Such compliance includes the engagement of a licensed Electrician, Technician or Engineer to design the solar system; ensuring that the Consumer obtains all the applicable permits and licenses as provided for in the Guidelines, and ensuring the timely payment of all costs and charges that the Consumer is responsible for as detailed in the Guidelines such as the installation costs.

## **4 Eligibility**

### **4.1 Eligibility Criteria**

To be eligible for this Programme a consumer shall:

- a) be a BPC consumer;
- b) site the rooftop system on the same property as the meter that will measure the consumption and export of the electricity;
- c) adhere to the limitations in capacity and sizing contained herein; specifically, the following capacity limitations apply to this Programme:
  - Domestic – up to 35 kW of generating capacity.

The applicant will be awarded up to maximum (Single phase at 13.8kW and Three Phase at 35kW)

- Commercial & Industrial – up to 1MW of generating capacity. The size of a system may not exceed 110% of the consumer's consumption over the 12-month period immediately preceding the date of application.

Consumers are allowed to apply for multiple permits and/or licenses, as long as the total generating capacity of the RTS systems does not exceed limits as indicated in clause (a) above for each domestic consumer and 1MW for each Commercial & Industrial consumer as mentioned in clause (b) above.

Example 1: A C&I consumer, meeting the above criteria from Section 4.1, with the generating capacity not exceeding 1MW, each property could have the following RTS systems: 300 kW and 250 kW and 350 kW, totalling 900 kW.

#### **4.2 System Design**

It is the responsibility of the consumer to engage a licensed Electrician, Technician or Engineer in designing the solar system. A system can be mounted on a building roof or ground-mounted.

The RTS systems should be designed with Islanding Protection feature to detect loss of grid power and automatically (within two seconds) shuts off the solar inverter irrespective of connected loads to stop feeding power back to the grid. The Consumer may choose the design that allows their system to remain operational in isolation from the grid for own consumption, which may require additional equipment.

#### **4.3 Energy Storage**

A consumer may also install energy storage at the consumer's discretion.

### **5 Permitting & Licensing**

#### **5.1 System-wide aggregate capacity**

This nationwide Programme is limited to a system-wide aggregate capacity of 50 MW. A total of twenty percent (20%) will be reserved for domestic consumers while eighty percent (80%) is for C&I. Thereafter, the Ministry, in consultation with BPC, will determine the system-wide aggregate capacity for the remaining tenure of the Programme every 3 years.



## 5.2 Definitions of Licence and Permits for RTS systems

For all domestic and C&I projects in this Programme, the RTS consumer must obtain a Permit, to ensure that its project meets all technical and safety standards. The Permit constitutes the Interconnection Agreement and the Certificate of Completion, as described below:

- a) **Interconnection Agreement (ICA)** – A consumer is required to execute an ICA with BPC. The ICA for domestic consumers will be standardized and simplified, requiring minimum terms and conditions relating to safety and technical standards.
- b) **Certificate of Completion** – After installation and inspection of the RTS system, BPC (or its representative) will certify its completion, deeming the ICA as final and in effect.

For C&I projects sized between 100 kW to 1MW, the RTS consumer must obtain a Licence (over and above the Permit), according to the BERA Act.

## 5.3 Permit and Licence Terms

The term of the Permit (ICA) and/or Licence will be for 15 years, upon which time it will require renewal. In event of Programme termination, an RTS-approved project will be able to continue to operate under the terms and conditions of the Permit or Licence until the expiration date of that Permit or Licence.

## 5.4 Application Process

- a) Potential RTS consumer applies with BPC to install a system of a certain size on its property. Until the aggregate capacity limit is reached, the programme will be open to participate on a first come-first serve basis.
- b) Documents required are filed with BPC, through an online application system:
  - **Application** –The Application Form shall provide for an attestation that all environmental requirements have been (or will be) met. BPC will confirm the electricity needs after receipt of the application. The Application Form will be completed online, directly on the BPC website.

For PV systems greater than 100 kW, the application will be automatically forwarded to BERA for review and issuance of a Licence to the consumer. BERA will inform BPC of the issuance of such applicable authorization.

- **Interconnection Agreement** – A conditional standard ICA developed by BPC and approved by BERA. The consumer is expected to fill in the consumer information as well the installer sections ICA prior to installation, agreeing to install the system as per the terms and conditions of the Interconnection Agreement. After successful commissioning of the RTS system, the consumer is then expected to sign the ICA.

For PV systems greater than 100 kW, the conditional ICA will be signed by the consumer and BPC, upon approval of the Licence by BERA.

- c) If all documents are in order, BPC puts the consumer on the queue of applicants. The capacity requested is subtracted from the running balance of Programme capacity available. BPC will conduct necessary studies or analyses to confirm availability request at the Point of Connection. BPC will notify the consumer of the outcome of their application.
- d) BPC will maintain a Registry of such systems, providing access to BERA, that will include information provided from the Application and any other relevant data. BPC will regularly monitor for Permits (ICA) expiring, while BERA will monitor for licenses that may be expiring.
- e) The consumer will be given a period of six months (6) upon award by BPC, to procure, install and certify the system.
- f) The consumer and its representative Licensed Electrician, Technician or Engineer will commission the system for Certification. BPC, or its representative, shall test and commission the installed RTS system. For systems sized between 100 kW to 1 MW, BERA may also witness the commissioning. The Certification process shall be to ensure that the system meets all the conditions of the Interconnection Agreement. Upon Certification, the BPC representative shall sign the Certificate of Completion on behalf of BPC, deeming the ICA as final and in effect.
- g) The system is eligible to be put into service upon certification.
- h) The validity period for the awarded consumer to procure equipment and implementation is six (6) months failing which the consumer will be removed from the programme and the capacity is added back into the Programme..
- i) For good cause, if the consumer requests, BPC may grant an extension to the deadline, in consultation with BERA.
- j) If the consumer is removed from the Registry and wishing to reapply for the programme, they can do so after three (3) months of being removed from the programme

## **5.5 Renewal and Expansion of Systems**

- a) Renewal of System – BPC will notify a consumer within 60 days of the expiration of the Permit. If planning to renew, the consumer must submit its intent to do so and complete the Application Process from 6.4.6 above. Upon receipt of Certificate of Completion, BERA will renew the term of Licence for projects above 100 kW.
- b) Expansion of System – If a consumer intends to expand a system with a current Permit or Licence, the consumer must follow the entire Application Process anew.

## **6 Access, Indemnity, Legal Requirements**

### **6.1 Right to curtail**

In the event of operating conditions that may result in BPC electrical grid parameters not meeting minimum quality of supply, safety standards or non-availability of an off-taker, it may become necessary to curtail Rooftop Solar consumers. It is expected that these limitations would be of a temporary nature, applied only during abnormal system conditions or low load periods.

### **6.2 Adapting rules & regulations**

In the event of changes to the energy sector or associated relevant rules, regulations, policies, laws and/or standards, Rooftop Solar Programme consumers may be required to upgrade these systems to meet new specifications or standards. Existing RTS consumers may be exempted from amendments unless BPC files application, agreed to by BERA, to require remediation to rooftop solar projects.

### **6.3 Right to deny access**

BPC has the right to deny access to any RTS consumer to interconnect with the system grid. It is mandatory that all consumers wishing to install a Rooftop Solar System, regardless of generation capacity, complete the relevant sections of the application process in full, and that the Conditional ICA is signed by BPC before system installation commences. BPC will ensure that, amongst other considerations, there is availability of capacity to accommodate the Rooftop Solar system. If the consumer is willing to take on the necessary upgrades and its associated costs to interconnect, then BPC may consider the Application. Consumers should not purchase equipment prior to signing the Conditional ICA, as approval is not guaranteed and BPC shall not be held liable for equipment expenses where approval is denied.

## **6.4 Change of Ownership**

If a transfer of ownership of a property takes place in which an RTS system is installed, the current owner will need to notify BPC of the change and the new owner will be required to sign a new ICA. For projects above 100 kW, BPC would forward the request for a Change of Ownership to BERA to amend the Licence accordingly. Alternatively, the RTS system should be disconnected and removed from the Programme.

## **6.5 Installation, Removal or Decommissioning of System:**

Domestic and small business applying for structures/buildings under construction should wait for three months to establish consumption trend. These are new applicants without consumption history.

Commercial and Industry consumers should wait for three months to establish consumption trend. These are new applicants without consumption history.

If a consumer decides to remove or cease operation of the RTS system, BPC must be notified, and BPC must verify that the system has been physically disconnected from the grid. For projects above 100 kW, the consumer will also need to notify BERA of the discontinuance of the Licence. Costs to remove wiring which connects the inverters with the grid will be borne by the consumer.

BPC will provide a Certificate of Compliance that the system has complied with removal and decommissioning procedures and update the Registry as such.

## **7 Technical Standards**

RTS systems should comply with the necessary standards and regulations in order for the system to be approved and put into operation. In addition to the legislation listed above in Section 3.3, BPC, in consultation with BERA, will provide the minimum applicable technical standards as contemplated in the RTS rules and regulations to the RTS Programme on its website as well as referenced within the ICA's terms and conditions. In order to ensure full compliance, a consumer should engage a licensed Electrician, Technician or Engineer.

## **8 Metering, Billing and Other Related Costs**

### **8.1 Good standing of Accounts**

Consumers should be in good standing with BPC. RTS applicants in arrears will not be considered.

Application for an RTS programme in one yard having multiple meters is not allowed. Only meters registered under the same account will be aggregated.

## **8.2 Who pays for what:**

- a) The consumer is responsible for any installation costs from the Point of Interconnection (typically the meter for a domestic consumer).
- b) If the system network is oversubscribed or cannot accommodate the RTS system, the consumer will be responsible for any changes (and the associated costs) required to the utility network upstream of the connection point to proceed with its interconnection.
- c) The consumer is responsible for the cost of any special grid studies or tests that need to be carried out to obtain the required ICA.

## **8.3 Metering**

A bi-directional meter, with four quadrant capability to support independent registers for import (kWh consumed), export (kWh generated) and net measurements regardless the meter mode of operation (prepaid/postpaid) as determined by BPC will be provided and installed by BPC at the consumer's cost. The same meter will be of multiple tariff to support the required time of use (TOU) tariff. The meter will be owned by BPC as a non-utility funded asset.

For the purposes of gathering statistics on renewable energy production, it is recommended that installations below 100 kW should install their own energy meter to record the RTS plant energy production. For installation at or above 100 kW it is mandatory that consumer has the energy meter on their RTS plant.

## **8.4 Billing**

Consumers are billed according to the regular billing cycle for kWh. Excess kWh generated and exported to the grid over the consumer's use are credited towards the next billing cycle. The kWh generated less consumed should be clearly represented on each monthly bill.

The meter will register the energy imported from BPC and the excess energy exported to BPC. These two, energy imported from and exported to BPC will be reconciled on monthly basis to also reflect the Net energy.

Reimbursement is applicable to Commercial & Industrial Consumers on postpaid metering system and are billed monthly based on Net Metering values of the imported and exported electrical energy.

As for customers on prepaid metering system, reimbursement is not applicable due to the fact that pre-paid meters automatically credit electrical energy to the customer for electricity exported into the network until such a time BPC install meters which are capable of performing Net Metering values of the imported and exported electrical energy.

Any excess energy exported by the consumer will be rolled over to the next billing cycle. Only the charges relating to the kWh units, energy part, of the consumer bill are affected, the fixed charge part, non-energy part of the consumer's bill will not be credited for excess energy exported to BPC. If, over any particular month, the consumer is a net importer (their net export is negative), the consumer will be billed for the energy supplied during that month as per the approved BPC tariff schedule.

For applicable consumers accruing demand charges, aggregate demand will be adjusted over each billing cycle for the first 6 months of the RTS system's operation.

## **8.5 Banking of kWh credits**

Credits will be carried forward for a duration of 6 months, known as "banking". Upon which time, BPC will reconcile the consumer "bank" and pay the consumer for the remaining credits. Any banked kWh should be clearly represented on each monthly bill.

BPC will pay the C&I consumers for any banked credits at the avoided cost rate of P 0.98/ kWh. The avoided cost rate, or wholesale cost of power and its distribution, will be determined by BPC on an annual basis, as approved by BERA and advised to consumers.

C&I consumers with energy storage will benefit more credits than the consumer without the storage provided that such energy is delivered at peak hours. The avoided cost rate will be calculated equivalent to the rates of buying such energy from the SAPP market

The cost will be informed by the applicable tariff at the time of use referenced from the least cost price for the sales of electricity from the SAPP market during Peak hrs. For example, the meter will be configured based on the pre-determined TOU tariff such that any excess power exported to BPC during off-peak hours will be of standard tariff as indicated above and any export at peak hours will be registered at a non-standard tariff which will be a little more expensive.

The domestic consumers on pre-paid metering are automatically credited with units by the meter as electricity is exported into the network. Reimbursement for domestic consumers in monetary form is not currently applicable due to the fact that pre-paid

meters automatically credit electrical energy to the consumer for electricity exported into the network.

Reimbursement in monetary form is applicable to Commercial & Industrial Consumers on postpaid metering system because they are billed monthly based on Net Metering values of the imported and exported electrical energy. The reimbursement will be done in every six (6) months.

#### **8.6 Arrears**

If a consumer becomes in arrears with an operational RTS solar system, routine disconnection and reconnection procedures will apply.

#### **9 Dispute Resolution**

Any disputes between BPC and the RTS consumer may be resolved promptly through mutual consultations. Further grievance shall have recourse under the relevant regulations under BERA's jurisdiction.

#### **10 Auditing of RTS systems**

BPC will periodically audit a sample of RTS systems, as per the procedures approved by BERA, conducting an inspection of such systems to ensure all technical and safety standards are met. Thereafter, BPC will submit in its audit findings to BERA. All documentation and information pertaining to the auditing and site visits will be retained by BPC for BERA and the Ministry to review upon request.

#### **11 Non-compliance**

If at any time an RTS system is not complying with the Guidelines, Rules or associated regulations for this Programme (e.g., technical, safety, environmental), BPC may disconnect the consumer's system immediately and without notice, and notify BERA of the system's non-compliance. BERA has the authority to impose sanctions for non-compliance with Guidelines and Rules.

Applicants who increase capacity or do system modifications after award without BPC consent will be decommissioned from the RTS system programme.

#### **12 Evaluation & Reporting**

BPC will report on a quarterly basis the performance of the Rooftop Solar Programme. The report should include the following data and analyses:

- i) any technical and/or financial issues;

- ii) aggregate kWh generated and exported, as well as other relevant data;
- iii) number of active and decommissioned RTS systems, including geographical (city, zone, feeder, etc.) and demographic information captured from the net metered participant register; and
- iv) audit findings.

The Ministry, in consultation with BPC, will determine the system-wide aggregate capacity for the remaining tenure of the Programme every 3 years.”

### 13 Amendments

The Minister reserves the right, at his discretion, to change or modify these Guidelines at any time. If the Minister makes a change to the Guidelines, any application that has been filed will be processed under the (old) Guidelines in effect at the time the application was filed.

### 14 Implementation of the RTS Programme

Implementation of the RTS Programme will be subject to all applicable policies and relevant laws of the Republic of Botswana.



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Lefoko Maxwell Moagi  
**MINISTER OF MINERALS AND ENERGY**

Date: 28/08/2024