

Eswatini Energy Regulatory Authority



Because we care.

Energy Storage Systems (ESS) Regulatory Guidelines for the Eswatini Electricity Supply Industry

February 2024

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1 Preliminaries

In exercise of the powers conferred by Section 21 of the Electricity Act 2007, the Eswatini Energy Regulatory Authority makes the following Guidelines for the proper administration of the Act:

1.1 Citation and Commencement

1.1.1 These Guidelines may be cited as the Eswatini Energy Storage Systems Guidelines, 2024.

1.2 Definitions and interpretation

1.2.1 In these Guidelines, unless the context otherwise requires a word or expression defined has the same meaning, and

- (a) “**Act**” means the Electricity Act, 2007;
- (b) “**Authority**” means the Eswatini Energy Regulatory Authority established under Energy Regulatory Authority Act, 2007;
- (c) “**Applicant**” means a Person who applies for a registration, exemption or a Licence under these Guidelines;
- (d) “**Ancillary Service**” is an electricity service contracted to, provided to, or provided by the System Operator to ensure the quality of supply of electricity in accordance with the Grid Code that can include services defined in the Grid Code on:
 - (i) Frequency Stability, Frequency Support and Frequency Recovery;
 - (ii) Voltage Stability and Voltage Support;
 - (iii) Black Start and Islanding; and
 - (iv) Congestion Management;
- (e) “**Battery Energy Storage System**” (also referred to as “**BESS**”) is a type of ESS where the technology for the storage of electricity employs a chemical storage medium;
- (f) “**Behind-the-Meter**” is used to describe a generator and/or an ESS that is electrically connected at a customer premises and delivers (and/or offtakes) electrical energy to (/from) the transmission or distribution system through the customer’s meter;
- (g) “**Energy Storage System**” (also referred to as “**ESS**”) is a unit that comprises of equipment connected to a single Point of Connection for the purpose of storing electrical energy during a charging process and discharging the stored electrical energy when required;

- (h) **“Electricity Licencing Bylaws”** is a document envisaged under Section 21 of the Electricity Act and developed by the Authority to provide guidance on licencing requirements and processes for the Electricity Supply Industry;
- (i) **“Energy Arbitrage”** is an activity of an ESS installation to purchase electricity at times of low price in order to sell when prices are higher and, for the avoidance of doubt, includes the activity known as peak shaving; Energy Arbitrage can involve import and/or export of electricity;
- (j) **“ESS Installation”** means an energy storage system installed, whether on its own or in conjunction with generation, transmission or distribution infrastructure, or as part of a mini-grid or micro-grid installation;
- (k) **“Eswatini Electricity Company”** (also referred to as **“EEC”**) means the company incorporated pursuant to the provisions of the Swaziland Electricity Company Act, 2007;
- (l) **“Independent Power Producer”** (also referred to as **“IPP”**) is a generator of electricity not owned or operated by a public utility;
- (m) **“Licence”** means a generation, transmission, system operation, distribution, supply, import or export licence or a combination of any of these activities as defined in Section 3 of the Act and includes any condition to which a licence is made subject;
- (n) **“Licensee”** means the holder of a Licence granted by the Authority under Section 5(1) of the Energy Regulatory Act, 2007 and Section 3 of the Electricity Act. 2007.;
- (o) **“Net Present Value Model”** (or **“NPV Model”**) is an economic model used to assess the economic viability of an investment or a project, which calculates the present value of cash inflows and outflows associated with the investment or project, taking into consideration the time value of money;
- (p) **“Opportunity Cost”** is an economic term meaning the value of the next-best alternative when a decision is made;
- (q) **“SAPP Day Ahead Market”** is a market operated by the Southern Africa Power Pool (SAPP) of which Eswatini is a member and which operates and clears in the day preceding the day of physical electricity delivery;
- (r) **“Small Scale Embedded Generation Framework”** (also referred to as **“SSEG or SSEG Framework”**) means the regulatory framework for the Eswatini Electricity Supply Industry developed by the Authority for “behind the meter” generation exclusively for own use;
- (s) **“Technical Codes and Standards”** means and includes Eswatini Grid Code, as amended by the Authority from time to time and any other codes or standards

approved by the Eswatini Standards Authority and enforced by the Authority for the technical regulation of the electricity supply industry;

- (t) **“Wheeling Framework”** means the framework developed by the Authority regulating access to and the use of the national grid by a generator or customer for the wheeling of electricity;
- (u) **“Working Days”** means business days not including Saturdays, Sundays and any other national or public holidays, as the case may be.

1.2.2 Unless otherwise specified, in these Guidelines:

- (a) Words importing any one gender includes the other gender and the singular includes the plural and vice versa;
- (b) Words or expressions used in these Guidelines, but not defined, shall have the same meanings respectively assigned to them in the Act;
- (c) Any reference to a statute or statutory provision includes a reference to that provision as amended, re-enacted or replaced and any regulations or orders made under such provisions from time to time; and
- (d) If the date on which an event is scheduled to occur by these Guidelines is a day which is not a Working Day, then the event shall be deemed to occur on the next Working Day.

1.3 Purpose of these Guidelines

1.3.1 The purpose of the Energy Storage Systems Guidelines is to provide guidelines in terms of which ESS services or activities can be licenced, procured, contracted, operated and priced.

1.3.2 The Guideline informs the Authority, investors and stakeholders on the industry standards and requirements to be applied for the safe and environmentally appropriate planning, construction, operation, valuation, trading activities, decommissioning requirements and pricing and tariffs associated with any ESS installation.

1.4 Scope of Guideline application

1.4.1 This Guideline is applicable to the following use cases for ESS installations:

- (a) transmission-connected ESS operated for the purposes of:
 - (i) Energy Arbitrage; or
 - (ii) delivery of Ancillary Service;

- (b) distribution-connected (small scale) ESS operated by an IPP for the purposes of Energy Arbitrage and/or delivery of Ancillary Service;
- (c) Behind-the-Meter ESS operated by a customer for the purpose of Energy Arbitrage or back-up that may (but need not) involve operation in conjunction with a generator in support of the customer's management of its net offtake from the system or, as the case may be, net injection of electricity into the system under the SSEG Framework;
- (d) Mini-grid or Micro-grid operation with one or more generating facilities.

1.5 Licencing requirements

1.5.1 The Electricity Act does not recognise ESS as a separately licensable activity. Based on the ESS use cases set out in paragraph 1.4.1, the following licences will underpin the related ESS activities:

- (a) Transmission-connected ESS:
 - (i) where operated for Energy Arbitrage shall require a Supply licence;
 - (ii) where operated for the provision of Ancillary Services shall be licenced as part of the Transmission assets under a Transmission licence (if operated by the Transmission Licensee) or require Generation Licence if services are provided by an IPP;
- (b) distribution-connected ESS operated by IPP for Energy Arbitrage and/or Ancillary Services shall require a Generation Licence.
- (c) Behind-the-Meter ESS:
 - (i) Where the ESS installed capacity is less than 100kW, such ESS installation shall be required to register with the Authority;
 - (ii) Where the ESS installed capacity is 100kW or above and for own use, it shall be required apply to the Authority for an exemption from the obligation to hold a licence;
 - (iii) Other Behind-the-meter ESS installation of any size that are installed for commercial purposes shall require Generation and Supply Licences issued by the Authority;
- (d) Mini-Grid or Micro-Grid:
 - (i) Micro-grids with installed ESS capacity of less than or equal to 100kW shall be required to register with the Authority;

- (ii) Mini-grids with installed ESS capacity of above 100 kW and 500kW or below shall be required to obtain Generation, Distribution and Supply Licences or a combined licence as may be determined by the Authority.

1.5.2 The Authority shall introduce conditions specific to ESS into any generation, transmission, distribution, or supply licence that incorporates ESS activities or to any conditions relevant to exemptions or registrations issued for ESS installations. Specific conditions tailored to the particular requirements of each ESS operation will encompass but will not be limited to the following:

- (a) the validity period of the licence or exemption;
- (b) compliance with the Grid Code requirements (if applicable);
- (c) adherence to equipment and technical standards, quality of service and quality of supply requirements;
- (d) compliance to tariffs or fee structures (if relevant);
- (e) compliance to other legislation (environment, health and safety);
- (f) compliance monitoring and enforcement; and
- (g) any other conditions determined necessary by the Authority to govern that specific ESS activity.

1.6 Energy storage services

1.6.1 The type of licence to be granted to an ESS owner and/ or operator will depend on:

- (a) the existing licence(s) held by the prospective ESS owner and/or operator; and
- (b) the use to which the ESS is applied,
as set out in paragraph 5.1.

1.6.2 An ESS Installation may be used in more than one activity. One or more of the following services may be provided by an ESS Installation:

- (a) energy market services through Energy Arbitrage (including peak shaving services), which can be traded (once market rules make the activity feasible) with:
 - (i) the Non-exclusive Central Buyer as envisaged in the IPP Policy;
 - (ii) contestable customers; and/or
 - (iii) cross-border traders through SAPP markets;

- (b) provision of ancillary services that may include:
 - (i) frequency stability services (synthetic inertia, short-term primary reserves, frequency restoration secondary reserves and replacement tertiary reserves);
 - (ii) voltage stability services;
 - (iii) black start and islanding services;
 - (iv) congestion and constraint management services (also referred to as a grid investment deferral service); and
 - (v) as may be determined by the Authority;
- (c) Behind-the-Meter services to individual customers; and
- (d) Mini-grid and Micro-grid services in conjunction with generation facilities.

2 Types of licence, licence exemptions and licensee obligations

2.1 Licence type

2.1.1 Each licenced activity (generation, transmission, distribution or supply) that has an ESS component will include ESS specific licence conditions as set out in paragraph 1.5.2.

2.2 ESS and Exemption from Licencing

2.2.1 Licence exemptions will be in alignment with the other regulatory frameworks developed by the Authority.

2.2.2 Registered parties under paragraph 2.2.1 connected to the Grid will be regulated indirectly by the relevant Distribution Network Operator with respect to:

- (a) adherence to equipment and technical standards; and
- (b) environment, health and safety requirements;
- (c) other requirements determined by the Authority and set out in the EEC transmission or distribution licence.

2.2.3 A grant of a licence exemption shall not constitute an exemption from obligations to comply with any official regulations of other official bodies with regard to matters such as safety, environment, construction and any other responsibilities that may be imposed.

2.3 On-site ESS and SSEG Framework

2.3.1 On-site SSEG ESS installations are those installed behind the consumption meter. The relevant requirements specified in the SSEG Framework will apply to these installations.

2.4 ESS in Mini-Grid and Micro-Grid applications

2.4.1 Mini-grid and Micro-grid ESS installations are those that occur in conjunction with Mini-grid or Macro-grid installations. The relevant requirements specified in the Mini-grid and Macro-grid Guidelines will apply to these installations.

2.5 Monitoring and Compliance

2.5.1 ESS installations shall be subject to the monitoring and compliance regime of the licenced activity of which it forms part and as may be determined by the Authority.

2.5.2 Owners and/or operators of ESS assets and services shall be required to provide essential information about their operations to the Authority within six months following the conclusion of their financial year or as may be required by the Authority from time to time. This information may include:

- (a) detailed annual financial statements, offering a comprehensive overview of the licensee's financial performance and fiscal health.
- (b) the business plan and forecasts for the upcoming financial year, outlining the licensee's strategic objectives, anticipated activities, and financial projections.
- (c) an updated inventory of their generation plants, transmission networks, and distribution networks, which helps maintain an accurate record of their infrastructure assets.

2.5.3 ESS installations shall be required to comply with:

- (a) the Grid Code, which outlines technical and operational standards for electricity infrastructure and operation, further outlined in Section 4;
- (b) applicable Quality of Supply Standards which govern the reliability and quality of electricity supply;
- (c) applicable Quality of Service Standards which pertain to the level of service and customer experience provided by electricity service providers;
- (d) the keeping of records and the supply of information as required under the specific licence; and

- (e) any other requirements as may be determined by the Authority and stipulated in the relevant licence.

2.6 Dispute Resolution

- 2.6.1 When a dispute involving an ESS licenced activity arises, the Authority, if requested by any party to the dispute, may act as a mediator or arbitrator in accordance with Section 40 of the Act.
- 2.6.2 The Authority may, on approval of the parties involved, appoint a suitable person to act as mediator or arbitrator on its behalf and any action or decision of a person so appointed is deemed to be an action or decision of the Authority.
- 2.6.3 The decisions rendered by the Authority in arbitration are final and binding on the parties that are in dispute.

3 Licence application

3.1 ESS requirements in a licence application

- 3.1.1 An ESS operator applicant for a licence shall apply for a type of licence consistent with the applicants existing or prospective activities (as specified in paragraph 1.6.2) and will apply in accordance with the Electricity Licencing Bylaws, 2016; the applicant will use the part of the application form requesting additional information and will provide the following such information and attachments with regard to the applicant and the proposed ESS facility:
 - (a) regarding the applicant:
 - (i) prior experience in the development and operation of ESS or proof that the necessary competency to undertake the development, construction and operation of the proposed ESS installation is available;
 - (ii) prior experience of developing and operating the specific technology proposed to be installed or proof that the necessary competency to develop and operate the specific technology proposed ESS Installation is available;
 - (iii) track record in the safe and economic management of ESS Installations;
 - (b) regarding the proposed ESS investment:
 - (i) type of technology proposed;
 - (ii) scale of the investment in terms of proposed rate of injection of electricity into the system, rate of offtake of electricity from the system and hours of storage capacity to be facilitated;

- (iii) location and other physical characteristics;
- (c) ESS development plan; regarding the technical aspects of the proposed Installation:
 - (i) the technical details of the proposed investment and plans in accordance with the requirements set out in Section 4.
- (d) regarding the economic aspects of the proposed investment:
 - (i) proposed operation of the ESS Installation and the types of service to be offered by the Installation;
 - (ii) business case demonstrating viability of the investment in accordance with the requirements set out in Section 5.

4 Technical, environmental and system planning requirements

4.1 Grid Code requirements

4.1.1 All ESS Installations shall comply with the requirements of the Grid Code.

4.2 Technical requirements in a licence application

4.2.1 A BESS Installation owner and/or operator shall be required to integrate the following into the Licence application:

- (a) an Environmental Social and Management Plan that includes at a minimum:
 - (i) an Environmental Assessment with an appropriate Environmental Compliance Certificate from the Eswatini Environment Authority;
 - (ii) a Transport Management Plan for equipment and materials used in construction and operation of the ESS Installation;
 - (iii) a Hazardous and Non-Hazardous Waste Management Plan;
 - (iv) a Pollution Prevention and Control Plan;
 - (v) a Fire Safety Management Plan as set out in paragraph 4.4;
 - (vi) a Construction Environmental Management Plan;
 - (vii) an Operational Environmental Management Plan; and
- (b) a Siting Plan as set out in paragraph 4.5; and
- (c) a Decommissioning Plan as set out in paragraph 4.6.

4.3 Environmental and Social Management Plan

4.3.1 Licence Applicants must develop and submit an Environmental and Social Management Plan, which must include, at a minimum:

- (a) an Environment Assessment made in accordance with the provisions of the Environment Management Act, 2002, which must have been submitted to the Eswatini Environment Authority and which explicitly includes the impacts of the ESS technology;
- (b) an Environment Impact Mitigation Plan detailing how the applicant proposes to mitigate negative impacts during development and during operation;
- (c) a Transport Management Plan that describes the methods for safe transportation of dangerous goods, which will be assessed by the Authority in accordance with the UN Manual of Tests and Criteria Part III (UN 38.3) as updated from time until such time as a specific Eswatini standard is set;
- (d) a Hazardous and Non-Hazardous Waste Management Plan, for Battery ESS disposal, IEC 62485 can be adhered to until such time as a specific Eswatini standard is set;
- (e) a Pollution Prevention and Control Plan that will be specific to the hazardous and non-hazardous wastes produced although fire may be the key target of this plan for BESS and, as such UL9540 and NFPA855 may be used; and
- (f) a Fire Safety Management Plan as described in paragraph 4.4.

4.3.2 The ESS developer shall conduct an Environmental Impact Assessment to identify and mitigate potential hazards. This assessment must cover disposal of hazardous materials (e.g., lithium-ion batteries), the management of toxic chemicals, and the risk of soil or water contamination.

4.3.3 Where the ESS is intended to include Battery Energy Storage, a Battery Safety Management Plan must be made, which will include:

- (a) the philosophy for BESS in case of a fire, or other environmental events such as flooding;
- (b) the principles for the development of the site, in the form of a risk assessment, with the intended mitigations that the developer will meet;
- (c) where standards for BESS are not otherwise included in the Grid Code Connection Code:
 - (i) a BESS Equipment Standard, which will include minimum functional requirements that BESS must meet for connection to the supporting infrastructure including the fire detection and suppression philosophy; and

- (ii) BESS Site Design Requirements.

4.4 Fire Safety Management Plan

4.4.1 Licence Applicants must develop and submit a Fire Safety Management Plan consistent with international standards as part of a licence application.

4.4.2 The Fire Safety Management Plan must include, at minimum, information on:

- (a) hazard detection systems;
- (b) means of protecting against incipient fires;
- (c) ventilation and/or cooling strategies for protecting against thermal runaway, fires, and explosions;
- (d) plans to address extreme weather, earthquakes, or other environmental threats that may occur; and
- (e) a plan to train local responders so that they are equipped to handle potential emergencies as safely as possible.

4.4.3 The international standards by which plans will be assessed and evaluated (until such time as Eswatini standards are established, which includes standard PRD/SZNS PAS 076: 2023 covering battery storage) are:

- (a) At component level:
 - (i) UL 1973: standard for batteries for use in stationary, vehicle auxiliary power and light electric rail applications. The scope of this standard details the requirement for battery components to comply with a specified level of quality, resilience and ability to operate safely, which is to be confirmed by robust testing procedures.
- (b) At BESS integration level:
 - (i) UL 9540: Energy Storage Systems and Equipment. This is a comprehensive safety standard developed to ensure BESS safe and reliable operation. This standard covers system level design and operation requirements covering a range of battery storage technologies and system types. To comply with this standard, testing and certification processes must be undertaken.
 - (ii) UL 9540A: Test method for evaluating thermal runaway fire propagation in BESS. UL 9540A is a testing method which evaluates thermal runaway propagation in ESS and is considered a critical safety test under UL 9540. Under this testing procedure, the fire suppression capabilities of the system are rigorously tested and must demonstrate full working capacity in order to satisfy UL 9540A.

- (c) At installation of ESS - Construction Environmental Management Plan
 - (i) NFPA 855: Standard for the installation of stationary ESS. This is an internationally recognised standard from the USA National Fire Protection Association which covers the design, construction, installation, commissioning, operation, maintenance and decommissioning of stationary ESS. Covering various technologies and installation types, NFPA 855 is one of the most comprehensive ESS standards detailing the installation or project level, which covers the minimum requirements for mitigating hazards associated with ESS, ensuring installations are operated appropriately, considering vital life safety factors, including both explosion control and fire safety.

4.5 Siting Plan

4.5.1 An ESS Installation Licence applicant must develop and submit to the Authority as part of the licence application a Siting Plan which must detail, at a minimum:

- (a) Undergrounding on-site utility lines;
- (b) Maintaining the site free of vegetation;
- (c) Following noise, height, and setback requirements;
- (d) Fencing or enclosing of the site; and
- (e) Installing screening or other measures to minimise visibility impacts.

4.5.2 The international standards by which plans will be assessed and evaluated (until such time as Eswatini standards are established) are:

- (a) NFPA 1: Fire Code. A globally recognised and comprehensive fire standard covering all aspects of fire code regulations and hazard management. This standard covers a broader perspective on fire safety and can be referenced to guide Eswatini fire safety on a more general level, which may provide a platform for a top-down approach to legislation development.
- (b) NFPA 5000: Building Construction and Safety Code. NFPA 5000 defines a fire safety rubric specifically focussed on safeguarding life and public welfare. When developing BESS plants, consideration should be taken both to the welfare of personnel involved in construction and operation, but also to the general public.
- (c) UKPN 07-0116: Fire protection standard for UK Power Network property and operational sites.

- (d) BS 5839 Part 1 2017: Fire detection and fire alarm systems for buildings – Part 1: Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises.
- (e) BR 187: External fire spread: building separation and boundary distances.

4.6 Decommissioning Plan

4.6.1 An ESS Installation Licence applicant must develop and submit to the Authority as part of the licence application a Decommissioning Plan which must include, at minimum:

- (a) a description of the steps that will be taken to bring the site back to its original condition upon decommission and must include:
 - (i) returning the site to previous soils and land use;
 - (ii) restoration and revegetation;
 - (iii) surface water drainage and control; and
 - (iv) recycling/disposal of all materials (from Batteries to foundations concrete);
- (b) cost estimates;
- (c) a funding plan and allocation of resources and efforts towards decommissioning, salvage and land rehabilitation; and
- (d) a contingency plan for handling damaged batteries, where applicable.

4.6.2 The Decommissioning Plan shall include safety protocols to protect the well-being of personnel involved in the process including providing proper training, use of appropriate protective equipment and implementing procedures for isolating power sources to prevent accidents like electrical shocks or fires.

4.6.3 Where appropriate, the Decommissioning Plan must include safe routes to the recycling of precious metals found in batteries. The Plan must identify effective recycling supply chains that have a proven history in environmental safety.

4.6.4 For the avoidance of doubt, the Decommissioning Plan must be applicable also to replacement of ESS (particularly BESS) components during the lifetime of the project and not only at final decommissioning of the site.

4.6.5 The ESS owner and/or operator shall twenty-four (24) months prior to the intended date of decommissioning submit an updated Decommissioning Plan to the Authority for approval before commencement of decommissioning.

4.7 Regulation during development and operation of the ESS

4.7.1 The Authority shall monitor the development and operation of ESS installations to ensure ongoing adherence to the licence conditions, applicable laws, codes, regulations and standards. This will include:

- (a) implementation of the Construction Environmental Management Plan and the Operational Environmental Management Plan, with periodic review and update;
- (b) review of the Battery Passport that should be sought in the case of BESS for the recording of all factors relating to the BESS and its ongoing state; and
- (c) potential implementation of the Decommissioning Plan.

5 Tariff and pricing requirements

5.1 Objectives and Guiding Principles

5.1.1 The objectives and guiding principles of this Guideline with regard to the commercial and economic operation of ESS Installations as follows are with regard to the market framework in which any ESS Installation operates:

- (a) cost reflectivity: market mechanisms must be designed in a way that the charges for ESS services accurately reflect the actual costs incurred by EEC when providing these services;
- (b) transparency: charges for ESS services should be clearly defined with a comprehensive description of what these services encompass.
- (c) non-discrimination: any unfair advantages or disadvantages for market participants should be avoided; in the context of ESS services, if two ESS providers, or any other wholesale offtakers, are purchasing electricity from EEC or any other generator, they should be subject to the same network charges.

5.1.2 To implement the principles set out in paragraph 5.1.1 effectively, EEC must develop wholesale tariffs that it will submit to the Authority for approval in addition to its retail tariffs.

5.1.3 To ensure that the integration of ESS into the market is both fair and economically efficient, the Authority may establish specific market operation guidelines for ancillary services.

5.2 ESS as wholesale trader and energy charge

5.2.1 ESS Installations may be allowed to participate in wholesale energy markets in the same way as conventional generators.

- 5.2.2 ESS Installations primarily engage in the trading of energy at the wholesale level and do not require the range of services that network operators and supply licensees provide to retail customers including: ensuring the security and reliability of the electricity supply, maintaining the quality of supply, addressing customer needs, and managing the distribution of electricity to end-users.
- 5.2.3 Until such time as the Authority deems that a competitive wholesale market is in place:
- (a) the Single Buyer, must buy electricity offered by ESS Installations at the Opportunity Cost of electricity that could have been bought on the SAPP Day Ahead Market and delivered to the border of Eswatini; and
 - (b) the Single Buyer shall sell to ESS Installations any electricity they request for their own use at the Opportunity Cost of electricity that could have been sold to the SAPP Day Ahead Market and delivered outside the border of Eswatini.
- 5.2.4 The Single Buyer shall use all reasonable endeavours to accept electricity offered for sale by an ESS Installation or to sell electricity to an ESS Installation pursuant to paragraph 5.2.2 and will give its reasons for failure to do so to the Authority within the later of twenty-four hours of such failure or at the start of the next business day.
- 5.2.5 For the purposes of trading in electricity with ESS Installations, the Single Buyer will develop a standard trading agreement to be offered to any ESS Installation that will be approved by the Authority in which will be detailed:
- (a) the mechanisms for the ESS Installation to submit volumes to be bought by or sold to it in any hour;
 - (b) the mechanisms for determining the price at which it will buy or sell electricity to an ESS Installation;
 - (c) the terms by which security cover instruments may be posted by the Single Buyer or ESS Installations in order to guarantee payments for trades made between it and ESS Installations;
 - (d) terms for billing and settlement of trades between the Single Buyer and ESS Installations; and
 - (e) any other terms deemed necessary for trades between the Single Buyer and ESS Installations.
- 5.2.6 For the avoidance of doubt, the trading agreement referred to in paragraph 5.2.5 is for the trade of electricity and not for ancillary services for which separate agreements will be drawn up in accordance with paragraph 5.5.

5.3 ESS use of the network

- 5.3.1 All use of system charges will be made in accordance with the Wheeling Framework.
- 5.3.2 When generating for grid supply, ESS Installations will deliver electricity to the grid and metered through the ESS facilities' export meters and shall not incur any charges for the use of the electricity network.
- 5.3.3 When charging from the grid, ESS Installations shall incur use of system charges to reflect the use of the transmission and/or distribution networks to take delivery of energy in accordance with the terms of the Eswatini Wheeling Framework; there will be no charges for delivery of services (including security and quality of supply, retail metering and billing services) additional to those necessary for delivery of electricity to the ESS Installation.

5.4 ESS Business Case Development

- 5.4.1 Each ESS developer shall make a business case using a standard business model as a case for being granted a licence. The business model shall include the following:
- (a) an economic NPV Model of Energy Arbitrage where:
- (i) the underlying value of ESS is in Energy Arbitrage and all revenue streams are based on the difference between the cost of energy purchased and the value of energy sold;
- (ii) the formulae for calculation are as follows:

$$NPV_{MW} = \left(\sum_{y=1}^n \frac{(R_y - FC_y)}{(1+r)^y} \right) - I/MW$$

where:

NPV_{MW} is Net Present Value/MW;

R_y is net annual arbitrage revenue of the ESS;

FC_y is annual fixed costs of operation (O&M, etc);

I is annual investment cost;

MW is the generation capacity of the ESS;

n is number of years (y) of the calculation;

r is the discount rate to be applied;

y is a year of operation of the ESS with one being the year of investment.

The derivation of R comes from the formulae:

$$R_y = \sum_{n=1}^{num} \left(P_{ny} - \frac{C_{ny}}{1-l} \right)$$

where:

- P_{ny} is the selling price per MWh of the ESS during sales opportunity n in year y ;
- C_{ny} is the purchase price per MWh of the ESS to procure the energy to replace energy sold during sales opportunity n in year y ;
- l is the % energy lost in charging the ESS by 1 MW;
- num is the number of revenue earning arbitrage opportunities in year y ;
- n is a revenue earning arbitrage opportunity.

- (b) The NPV model referred to in paragraph (a) shall be developed on the basis that there is no price inflation over the lifetime of the investment.
- (c) The public utility (EEC), investing in an ESS shall justify it on commercial grounds using the same NPV Model regardless of whether it is financed in the same way as a generation asset or as a transmission asset.

5.5 Ancillary Services and pricing

5.5.1 In the absence of an Ancillary Services Framework in Eswatini, ESS investment for Ancillary Services may be considered for:

- (a) Frequency control services valued at a level where the System Operator is indifferent between purchasing the service as an option to avoid purchasing the service on the South African Power Pool Markets or other regional players;
- (b) Locational reserves estimated from the cost of locational curtailment where the locational reserve is absent. This applies for both congestion costs and voltage constraints.
- (c) Black start capability will be valued at the cost of an ESS installing grid forming capability.

6 Other requirements and transition

6.1 Ancillary Service transitional arrangements

6.1.1 The System Operator shall develop a standard set of ancillary service contracts to be reviewed and approved by the Authority. Such contracts shall adhere to option theory pricing at levels where the System Operator is indifferent to buying ancillary services from ESS or from any generator or, for that matter, demand-side provider.

6.1.2 The Authority will determine whether it is in the best interest of consumers that the System Operator offers the contracts referred to in paragraph 6.1.1 to ESS Installations.