Eskom	Standard	KZN OU

Title: **FUNCTIONAL SPECIFICATION FOR HOUSEHOLD SOLAR PV & BESS INSTALLATIONS – ENKOVUKENI VILLAGE**

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Compiled by	**Approved by**	**Authorized by**
Mohammed Bux	**Riaz Asmal**	**Zetu Nciza**
Snr. Engineer – Standards Implementation	**Manager: Standards Implementation**	**Senior Manager: Asset Creation (Acting)**
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Executive Summary

Eskom's Distribution Division is embarking on a strategic pilot project to electrify eNkovukeni Village, a remote community located on an island within the iSimangaliso Wetland Park in Northern KwaZulu-Natal. This area has historically remained unelectrified due to environmental sensitivities and logistical constraints. In line with Eskom's Just Energy Transition strategy and vision for a modern, decentralised electricity distribution system, the project will deploy off-grid rooftop solar photovoltaic (PV) systems integrated with Battery Energy Storage Systems (BESS) to supply electricity to 54 households.

Each household will be equipped with a 5kW Solar Home System designed to operate independently from the national grid. The solution includes a purpose-built carport-type support structure – fabricated from galvanized steel or treated timber – engineered to support the solar panels and securely house the inverter and battery systems. Smart meters with GSM communication will be installed in accordance with Eskom's standards to enable remote monitoring, billing, and system performance tracking.

This project forms part of Eskom's broader strategy to modernise the distribution grid, support bi-directional energy flows, and enable the integration of Distributed Energy Resources (DERs). It also serves as a key demonstration of how renewable energy technologies can be effectively implemented in isolated communities without compromising environmental integrity. The outcome will not only bring sustainable electricity access to the residents of eNkovukeni Village but also inform future off-grid electrification efforts across similar rural and ecologically sensitive regions in South Africa.

1. Introduction

Eskom's Distribution Division has begun preparing for a restructured electricity distribution industry and the transition to future energy markets. In doing so, the division has acknowledged the need to become more agile, efficient, and customer centric. Its strategic objectives and initiatives have been aligned with Eskom's Just Energy Transition, ensuring a meaningful contribution to the broader success of the organization.

As part of this renewed strategy, the division is working towards developing a modernized distribution grid with the following key features:

1. Bi-directional energy flow, enabling both consumption and generation at the customer level.
2. Integration of Distributed Energy Resources (DERs) through an open, flexible grid architecture.
3. Enhanced service delivery using emerging technologies such as microgrids, smart grids, and smart homes.

To support this transformation, the strategy focuses on deploying the following technologies and solutions:

- Small Scale Embedded Generation (SSEG)
- Battery Energy Storage Systems (BESS)
- Large Scale Distributed Energy Resources
- Containerized Microgrid Solutions
- Rooftop Photovoltaic (PV) Systems

In line with this strategy, the Central Eastern Region has selected eNkovukeni Village as a pilot site for electrification. The village lies within the environmentally sensitive iSimangaliso Wetland Park, a UNESCO World Heritage Site, and falls under the uMhlabuyalingana Local Municipality. Owing to its remote location and ecological importance, the village has historically remained unelectrified.

Several technical options were considered to identify the most suitable electrification approach:

- Grid connection via overhead lines
- Grid connection via cable crossing the Kosi Bay Lakes estuary (excluded due to environmental impact)
- 12m Containerized Microgrid solution
- Microgrid with kiosk and ground-mounted PV arrays (standard still under development)
- Rooftop solar systems with battery storage (no current Eskom standard)

After a detailed assessment, the Rooftop PV Solar System emerged as the most practical and environmentally responsible solution. The chosen approach involves installing 5kW solar home systems for approximately 54 households, ensuring reliable and sustainable electricity access while safeguarding the ecological integrity of the area.

2. Supporting clauses

2.1 Scope

The proposed solution is to supply electricity to each of the 54 households located on an island in eNkovukeni Village, situated in Northern KwaZulu-Natal. Each household will be equipped with a Solar PV system with a nominal output capacity of 5kW.

The scope of work shall include, but is not limited to, the following:

- **Design, fabrication, and installation** of a standalone carport-type structure per household, constructed from either galvanized steel or treated wooden poles. The structure must be structurally engineered to support the full weight of the PV modules and allow for the integration of the inverter and battery enclosure. The design shall aim to maximize the PV capacity installed per site.

- **Installation of solar PV modules** with a combined output of up to 5kW, including a 3.6kW inverter and a 5kWh battery storage system, to ensure reliable standalone power supply.
- **Provision and installation of a weatherproof and lockable kiosk** to house all electrical components, including inverters, batteries, isolators, and protection devices. The kiosk may be mounted on the support structure or positioned adjacent, depending on space and safety considerations.
- **Installation of low-voltage (LV) pole-top distribution boxes**, interconnecting cabling, and smart metering infrastructure in line with applicable Eskom Distribution standards and specifications.
- **Smart metering solution per household**, recommended as a BS Footprint Single Phase Smart Split Meter with a Customer Interface Unit (CIU) and an external GSM modem to enable remote monitoring and control.

2.1.1 Purpose

The purpose of this project is to design and implement standalone rooftop solar photovoltaic (PV) systems with integrated battery energy storage for 54 households in eNkovukeni Village, Northern KwaZulu-Natal. This initiative aims to provide a sustainable, off-grid electrification solution that aligns with Eskom's Just Energy Transition strategy, while ensuring reliable access to electricity for a remote, environmentally sensitive area that has never been electrified.

The project will demonstrate the viability of decentralised renewable energy systems in hard-to-reach communities, using engineered support structures, smart metering, and modern energy technologies to support future-ready energy delivery.

2.1.2 Applicability

This document is applicable exclusively to Eskom's Distribution Division within the Central East Cluster.

2.2 Normative/Informative References

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

[1] ISO 9001 Quality Management Systems.

[2] 240-75655504: Corrosion Protection Standard for New Indoor and Outdoor Eskom Equipment, Components, Materials and Structures Manufactured from Steel Standard

[3] 240-171000418: Major Equipment Requirements for Distribution Solar PV and BESS: SSEG and Microgrids

[4] 240-105658000: Supplier Quality Management Specification

[5] SANS 10142-1: The wiring of premises Part 1: Low-voltage installations.

[6] 240-120804300: Standard for The Labelling of Electrical Equipment within ESKOM Wires Networks

[7] 240-170000103: Lithium Iron Phosphate Batteries Standard

[8] 240-170000189: Standard for Current and Future Metering Implementation

[9] 240-170000777: Engineering Instruction for Operating LV Networks with Small Scale Embedded Generators (SSEG)

[10] 240-55410927: Cyber Security Standard for Operational Technology

[11] 240-57649065: LV Protection Standard

[12] 240-57855874: Photovoltaic Modules and Regulators

[13] 240-61182045: Maintenance Engineering Standard for Batteries and Chargers

[14] 240-62629353: Specification for Panel Labelling Standard

[15] 240-64636794: Generic Equipment Specification Wire, Wire Marking, Cable Numbering, Fibre Optical Cable Installation and Labelling

[16] 240-75661043: Services Standard

[17] 240-84924080: Metering Requirements for Small Scale Embedded Generation

[18] 240-76628631: Standard for Sealing of Metering Equipment

[19] 240-55146411: Standard for Energy Meter Kiosks: Secure Pole-Top Multi-Way Metering Kiosks

[20] 240-75883830: Steel Grades and Welding Requirements for Steelwork and Overhead Line Hardware Components

[21] 240-75655380: Low Voltage Services Section 1: Electrification

[22] 240-61704085: The Standard for Concentric Service Cable with Tinned Copper and Coated Steel

[23] 240-170000943: Microgrids Planning Standard

2.2.2 Informative

[24] IEC 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements

[25] IEC 61215-1:2021 Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 1: Test requirements

[26] IEC 61215-2:2021 Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 2: Test procedures

[27] IEC 61326-1:2020 Electrical equipment for measurement, control, and laboratory use - EMC requirements - Part 1: General requirements

[28] IEC 61730-1:2016 Photovoltaic (PV) module safety qualification - Part 1: Requirements for construction.

[29] IEC 61730-2:2016 Photovoltaic (PV) module safety qualification - Part 2: Requirements for testing.

[30] IEC 62109-1:2010 Safety of power converters for use in photovoltaic power systems - Part 1: General requirements

[31] IEC 62109-2:2011 Safety of power converters for use in photovoltaic power systems - Part 2: Requirements for inverters

[32] IEC 62619:2022 Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications.

[33] IEC 60529 Degrees of protection provided by enclosures.

[34] NRS 097-2-1:2024 Small-scale Embedded Generation, Utility Interface

[35] SANS 121:2011 Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods.

[36] SANS 657:2011 Steel tubes for non-pressure purposes.

[37] SANS 1200 C, Standardized specification for civil engineering construction Section C: Site clearance

[38] SANS 1200 DA, Standardized specification for civil engineering construction Section DA: Earthworks (small works)

[39] SANS 61000-6-2, 3 and 4: Electromagnetic compatibility (EMC)

[40] SANS 61439 Low-voltage switchgear and control gear assemblies

[41] SANS 61641 Enclosed low-voltage switchgear and control gear assemblies

[42] SANS 61643-12 Low-voltage surge protective devices - Part 12: Surge protective devices connected to low-voltage power systems.

[43] SANS 62305-1 to 4 - Parts 1 to 4: Protection against lightning

[44] Grid Connection Code for Renewable Power Plants (RPPs) Connected to the Electricity Transmission System (TS) or the Distribution System (DS) in South Africa (Version 3)

[45] UL 1741: Standard for Inverters, Converters, Controllers, and Interconnection System Equipment for Use with Distributed Energy Resources

[46] UL 9540: Standard for Energy Storage Systems and Equipment

[47] 240-150128782: Framework for Design Solutions to Connect Customer Owned SSEG’s

[48] 240-152929508: Maximum Generation Limits on LV Networks – Category A1 to A3

[49] 240-170000521: Clarification of Small-Scale Embedded Generation Connection Criteria

[50] 240-61268576: Standard for the Interconnection of Embedded Generation

[51] 240-61523882: LV Operating Regulations

[52] 240-79669677: Demilitarised Zone (DMZ) Designs for Operational Technology

[53] 240-81732810: Operating Guideline for Dedicated LV Networks with Embedded Generation

[54] 240-108650238: Distribution Group Business Plan

[55] NRS 048-2: Electricity Supply – Quality of Supply Part 2: Voltage characteristics, compatibility levels, limits, and assessment methods

[56] SANS 60364-7-712:2018 - Low voltage electrical installations. Part 7-712: Requirements for special installations or locations - Solar photovoltaic (PV) power supply systems.

[57] IEC 61727 Characteristics of the Utility Interface

[58] IEC 62116 Testing procedure of Islanding Prevention Methods for Utility-Interactive Photovoltaic Inverters

[59] IEC 62103 Electronic equipment for use in power installations

[60] IEC 61000-6-1/2 - EMC Immunity

[61] IEC 61000-6-3/4 - EMC Emission

[62] IEC 61215 – Crystalline silicon terrestrial photovoltaic (PV) modules – Design qualification and type approval

[63] IEC 61730 – Photovoltaic (PV) module safety class II qualification

[64] IEC 61701 – Salt mist corrosion testing of photovoltaic (PV) modules.

[65] SANS 60146-2:1999 Semiconductor convertors - Part 2: Self-commutated semiconductor converters including direct d.c converters.

[66] SANS 62619:2022 Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries, for use in industrial applications.

[67] SANS 62620:2023 Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for use in industrial applications.

[68] 240-53114248: Thyristor and Switch Mode Chargers, AC/DC to DC/AC Converters and Inverter / Uninterruptible Power Supplies Standard

[69] SANS 10160-3:2019 Basis of structural design and actions for buildings and industrial structures Part 3: Wind actions

[70] SANS 10400 – South African National Building Regulations

2.3 Definitions

2.3.1 General

Definition	Description
Battery Cycle	Sequence of a discharge followed by a charge, or a charge followed by a discharge under specified conditions.
Battery Management System	Electronic system associated with a battery, which monitors and/or manages its state, calculates secondary data, reports that data and/or controls its environment to influence the battery's safety, performance and/or service life and has the functions to cut off in case of overcharging, overcurrent and overheating.
Charge Controller	Battery charge and discharge regulator that prevents overcharging and over-discharging of a battery in a photovoltaic system by reducing the photovoltaic current, or by disconnecting the load.
Distributed Energy Resources	Generators, including loads having a generating mode (such as electrical energy storage systems) connected to the low or medium voltage distribution network, with their auxiliaries, protection, and connection equipment.
Inverter	Device that changes DC input into AC output.
Small Scale Embedded Generator	Embedded generator rated at up to 1 MVA which includes the energy conversion device (devices), the static power converter (converters), if applicable, and the control and protection gear within a customer's network that operates in synchronism with low-voltage networks. For avoidance of any doubt, the point of generator connection must be at low voltage even if the point of utility supply is not at low voltage.
Standard Test Conditions	Conditions where the irradiance is 1000 W/m², the photovoltaic cell temperature is 25°C, and the air mass is 1.5 – air mass represents the total amount of atmosphere that solar radiation must travel through.

2.3.2 Disclosure Classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 Abbreviations

Abbreviation	Description
AC	Alternating Current
BESS	Battery Energy Storage System
BMS	Battery Management System
CEC	Central East Cluster
CMMS	Computerised Maintenance Management System
CMS	Control and Monitoring System
CNC	Customer Network Centre
CoC	Certificate of Compliance
c-Si	Crystalline Silicon
DB	Distribution Board

DC	Direct Current
DER	Distributed Energy Resources
Dx	Eskom's Distribution Division
ECSA	Engineering Council of South Africa
EMS	Energy Management System
EOL	End-of-life
EPC	Engineering, Procurement and Construction
FAT	Factory Acceptance Test
HMI	Human Machine Interface
HVAC	Heating, Ventilation and Air Conditioning
I/O	Input Output
IEC	International Electrotechnical Commission
IED	Intelligent Electronic Device
IP	Internet Protocol
LCD	Liquid Crystal Display
LCD	Liquid Crystal Display
LFP	Lithium-iron-phosphate
LPU	Large Power User
LV	Low Voltage – (<1000V)
M&O	Maintenance and Operations
MCB	Main Circuit Breaker
MES	Maintenance Engineering Strategy
MIS	Maintenance Implementation Standard
MPP	Maximum Power Point
MPPT	Maximum Power Point Tracking
Ni-Cad	Nickel Cadmium
OEM	Original Equipment Manufacturer
OPC	OLE (Object Linking and Embedding) for Process Control
OU	Operating Unit
PV	Photovoltaic
QEM	Quality Event Management
RTU	Remote Terminal Unit
SAT	Site Acceptance Test
SCADA	Supervisory, Control and Data Acquisition
SoC	State of Charge

SoH	State of Health
SSEG	Small Scale Embedded Generator
STC	Standard Test Condition
TCP	Transmission Control Protocol
UPS	Uninterruptible Power Supply

2.5 Roles and Responsibilities

This functional specification has been developed by the KZN OU Standards Implementation Department and will be included in an open tender for the procurement of the outlined solutions.

The appointed evaluation team will be responsible for ensuring that all tender submissions meet the requirements set forth in this document. During the execution phase, the assigned project manager (PM) will oversee compliance of the manufactured, delivered, and constructed products with this specification, or any agreed-upon and approved deviations.

Regarding Maintenance and Operations (M&O), the respective OU/Cluster M&O Managers will be responsible for overseeing all contractual M&O activities. The Contractor, in coordination with the OEMs, will develop and deliver the required Maintenance Engineering Strategies (MES), Maintenance Implementation Standards (MIS), and associated documentation for all relevant asset classes included in the solution.

Eskom will provide the necessary templates and guidance for this process. At the commencement of the M&O phase, the OU/Cluster M&O Managers will ensure the entry of all required plant data into the CMMS (Maximo) system.

Additionally, the Contractor will be responsible for capacity building within Eskom, particularly with respect to training and the development of training materials. All M&O activities performed by the Contractor shall adhere to Eskom Dx's standard processes, such as work management systems and dispatching, to ensure a seamless handover to Eskom Dx at the end of the initial or extended contract period. During this phase, the Contractor shall involve relevant M&O staff in all activities to facilitate effective knowledge transfer and ensure a smooth transition.

2.6 Process for Monitoring

Should the Contractor be appointed to provide maintenance services on the installed Smart Intermediate Solar (5kW) product, the following will apply:

Maintenance processes and requirements will be integrated into the existing work management systems and managed accordingly. For example, during the initial or extended Maintenance & Operations (M&O) contract period, plant data will be captured in the Dx Computerised Maintenance Management System (CMMS), Maximo. Preventative maintenance work orders, as defined in the relevant Maintenance Instruction Sheets (MIS), will then be generated by Dx for execution by the Contractor.

The Contractor will also be required to provide continuous feedback to the KZN Operating Unit (OU) on all breakdown-related activities. The OU, in turn, will ensure that Maximo is regularly updated with this information.

This forms part of the ongoing monitoring process to ensure effective maintenance and operational performance of the system.

2.7 Related/Supporting Documents

[1] KZN-EBC-0406-1037843 Network Engineering & Design Preliminary Report

[2] PowerPoint Presentation: Roof Top PV for Customers on an Isolated Transformer – Business Case

3. Document Content

3.1 Functional Requirements

3.1.1 The Contractor is responsible for the design, engineering, manufacturing, procurement, and supply of all materials and labor. This includes delivery to the site, offloading, construction, erection, installation, as well as off-site and on-site testing.

Note: *The location falls within the Kosi Bay Wetlands Complex, and the proposed project is to be carried out on an island. As such, special logistical arrangements will be required to transport both materials and personnel to the island.*

3.1.2 The Contractor will handle commissioning, performance testing, providing samples, and preparing detailed design and as-built record drawings. Additionally, they will provide maintenance manuals and instructions for the works, all in compliance with the general and performance requirements outlined in this document.

3.1.3 The Contractor shall provide Eskom with all the required asset governance documents, including, but not limited to:

a. Concept design
b. Design philosophy
c. Detail design
d. Test certificates
e. Bills of quantities (BOQ)
f. Design and as-built drawings
g. Quality assurance checklist document
h. Maintenance manuals
i. QEM documents

3.1.4 The scope also covers training relevant KZN OU staff in the maintenance and operation of the system from the start of the M&O contract period, facilitating a smooth handover to the OU at the end of the initial 2-year period.

3.1.5 The Contractor shall deliver the works as specified in this document, along with a complete quality management plan in line with the 240-105658000: Supplier Quality Management Specification [4].

3.1.6 The Contractor is required to apply sound, recognized, and up-to-date engineering practices in all designs, drawings, and manuals. Any deviations from the requirements in this document shall be properly justified and supported by the Contractor.

3.1.7 The Contractor shall conduct a thorough inspection of the designated site and buildings to identify and ensure compliance with all statutory requirements and site-specific details. This includes performing an evaluation of the available space and installation methods to accommodate the installation of PV panels, optimizing the layout to maximize solar exposure. The assessment must also account for the structural load distribution of the mounting solution to ensure it can support the installation.

3.1.8 The Contractor shall identify all maintainable components and required spare parts for the system and must supply and deliver these spares to Eskom at the time of system handover.

3.2 Technical Requirements

The technical requirements for this project will be influenced by the unique environmental and geographical conditions of eNkovukeni. These site-specific factors will shape the design approach, ultimately resulting in a standardised solution that is suitable for all households in the area.

The proposed solution involves an integrated energy system that combines solar PV panels with a BESS. In this setup, PV panels capture sunlight and convert it into electrical energy. A charge controller regulates the flow of energy to ensure optimal charging of the batteries. During the day, the system supplies power directly to the household, and any surplus energy is stored in the BESS. When there is little or no sunlight, such as at night or during overcast conditions, the stored energy is used to power the home.

An inverter will convert the direct current (DC) produced by the PV panels and stored in the batteries into alternating current (AC), which is compatible with household appliances. A smart meter will also be installed to monitor energy usage.

This integrated system ensures a reliable and sustainable power supply for households in eNkovukeni by making use of solar energy during the day and switching to stored energy as needed. It forms a key part of the broader rural electrification effort described in this document.

Importantly, this initiative also supports Eskom's Just Energy Transition (JET) programme, which aims to promote cleaner, more affordable, and equitable energy solutions while supporting economic development and environmental sustainability.

3.2.1 PV Panels

3.2.1.1 Crystalline silicon (c-Si) PV modules will be used for the installation.

3.2.1.2 The usable peak output power specified will be effective from the start of operations, after commissioning and handover.

3.2.1.3 To make the best use of space, the modules shall have an efficiency of at least 19% under Standard Test Conditions (STC), which include an irradiance of 1000 W/m², AM 1.5 spectrum, and a cell temperature of 25°C.

3.2.1.4 During the first year, the actual output power of the PV modules shall be within 3% of the rated capacity.

3.2.1.5 From the second year to the twentieth, the module output power should not drop by more than 0.8% per year, and this will be guaranteed by the OEM.

3.2.1.6 The PV panels shall comply with the requirements as outlined in 240-171000418: Major Equipment Requirements for Distribution Solar PV and BESS: SSEG and Microgrids [3].

3.2.1.7 The Contractor shall supply and install PV modules to meet the specified performance levels for a design lifespan of 25 years, considering the prevailing environmental conditions at the site, which the Contractor is responsible for investigating and determining.

3.2.1.8 All PV modules provided for each site shall be uniform in type, model, size, and batch, sourced from a single manufacturer, and installed per the manufacturer's guidelines.

3.2.1.9 The proposed PV module type must have been operational in similar ambient temperatures (≥38°C) for at least 12 months in commercially financed, non-recourse projects.

3.2.1.10 The peak power of the PV system shall be determined based on the module's rated peak power under Standard Test Conditions (STC), using the sum of the manufacturer's nameplate data sheets for each module.

3.2.1.11 Modules must feature anti-reflective coatings and have corrosion-resistant frames (e.g., Aluminium Alloy, Anodized Aluminium) with valid IEC certifications. The Contractor is responsible for optimizing module arrangements to reduce mismatch losses.

3.2.1.12 A proper sorting method shall be used, ensuring that only modules from the same batch are used within the same string.

3.2.1.13 All transportation, storage, handling, and installation shall follow the manufacturer's specifications to maintain the module manufacturer's warranty.

3.2.1.14 The Contractor shall verify the quality of the PV modules in accordance with the inspection, testing, and commissioning requirements set out in this specification.

3.2.1.15 The provided PV modules shall comply with the minimum technical requirements outlined in the Tender Technical Schedules.

3.2.1.16 All support structures shall comply to the requirements listed in 240-171000418: Major Equipment Requirements for Distribution Solar PV and BESS: SSEG and Microgrids [3]., irrespective if rigid or flexible PV panels are used.

3.2.2 Battery Systems

3.2.2.1 Batteries will be subjected to daily cycling unless the weather is not suitable.

3.2.2.2 Usage will include micro-cycles to adjust for changes in demand and supply.

3.2.2.3 Batteries shall support at least 5000 cycles before their capacity drops to 80% of its original capacity. The capacity at this point (EOL) must be clearly defined.

3.2.2.4 An always online cell-balancing feature shall be available to keep the battery's capacity consistent without needing manual adjustments.

3.2.2.5 The battery energy storage system should be able to restart and function normally after a complete discharge without any manual activation.

3.2.2.6 The battery energy storage system should handle temporary over-current situations, such as the inrush from large equipment, supporting at least a 10% overload for 1 minute. Both the batteries and their inverters shall be capable of this.

3.2.2.7 Batteries should be stacked or placed in a suitable enclosure based on where they are located.

3.2.2.8 All necessary safety laws and regulations, including fire protection and emergency response protocols, shall be adhered to, and not compromised.

3.2.2.9 The battery shall comply with the requirements as outlined in 240-171000418: Major Equipment Requirements for Distribution Solar PV and BESS: SSEG and Microgrids [3].

3.2.3 Inverters

3.2.3.1 The inverters shall be of the hybrid type (bi-directional) that are able to accept power from various power sources (i.e., PV panels, batteries, standby generators, and the grid) and optimally manage the energy from these power sources to ensure a reliable AC supply to the connected loads.

3.2.3.2 Hybrid inverters shall exclusively be used in the solution, utilising a single internal DC bus and single DC to AC inverter step.

3.2.3.3 Only inverters producing pure sine waves shall be used.

3.2.3.4 The inverter shall be suitably rated to carry the full load current as well as the load inrush current. Load inrush current to be limited to within the overload capability of the inverter i.e., 125% for 10minutes and 150% for 1 minute.

3.2.3.5 Inverter systems shall include their own built-in control and protection system.

3.2.3.6 Inverters shall support communication to external data-loggers using the protocols and interfaces specified in this document. Data must be easily obtained at no additional cost to the client (i.e., Wi-Fi or Web Application).

3.2.3.7 Inverters shall support a dedicated generator input, capable of accepting the inverter's full rated continuous power output. This input shall also support the charging of batteries.

3.2.3.8 Individual PV string level monitoring will be provided by the system.

3.2.3.9 The inverter shall have a user friendly, access controlled, Human-Machine Interface (HMI) that allows the user to read settings, configure setpoints and control the inverter based on the user's level of access.

3.2.3.10 The HMI shall indicate the system status and raise local warnings and alarms visually and audibly.

3.2.3.11 The inverter shall be able to function as an off-grid (grid forming) inverter.

3.2.3.12 The inverters shall be single-phase.

3.2.3.13 The output voltages shall comply with requirements as stipulated in SANS 10142-1 - The wiring of premises Part 1: Low-voltage installations.

a. 230V ± 10% for single-phase systems,

3.2.3.14 The inverters shall be suitable for mounting in a pole mounted cabinet.

3.2.3.15 The inverter shall comply with the requirements as outlined in 240-171000418: Major Equipment Requirements for Distribution Solar PV and BESS: SSEG and Microgrids [3].

3.2.3.16 The Contractor provides an inverter arrangement that gives overall optimal energy yield over the life of the Project, considering the site conditions.

3.2.3.17 Inverters selected shall conform to the following specifications:

a. Inverter minimum nominal capacity (without deration)

b. Inverter is selected with respect to local climatic and environmental condition and is equipped to operate in high temperature regions,

c. The inverter type or series offered has been deployed and in operation on field (with ambient temperature up to ≥ 38 °C) in past 12 months,

d. The inverter power is not derated for the temperature range between -10 °C and +45 °C,

e. Inverters selected has a minimum of 10 years product guarantee against manufacturing defects.

3.2.3.20 The Contractor confirms the inverter manufacturer's warranties for the site-specific environment and installation type. The Contractor also mentions if the inverter warranties can be extended. Possible extension of warranties is preferred.

3.2.3.21 The Contractor provides the list of spare parts required for the operation of inverter over 15 years period, recommended by the inverter manufacturer.

3.2.3.22 Inverters meet the following general requirements:

a. Due to maintenance reasons and a conservative spare part approach, inverters of the same type, model and size from the same manufacturer is deployed over the whole project.

b. Inverters are equipped with communication capabilities as required by the CMS; all inverters shall be controlled/supervised by the same software or CMS system.

3.2.3.23 The inverter shall comply with safety requirements according to IEC 62109 [28 & 29].

3.2.3.24 All inverters shall be provided with lockable DC disconnect switch and AC disconnect switch for isolation.

3.2.3.25 An IP protection class of at least IP21 is required for indoor mounting of the inverters and at least IP65 [31] is required for outdoor mounting.

3.2.3.26 All transportation, storage, handling and installation of the inverters are in accordance with the specifications from the manufacturer, as to not void the inverter manufacturer's warranty.

3.2.4 AC & DC Reticulation

3.2.4.1 All wiring shall comply with SANS 10142-1, The wiring of premises Part 1: Low-voltage installations [5].

3.2.4.2 The AC and DC circuit breakers, contactors and switches shall comply with the relevant parts of SANS 60947 series of standards.

3.2.4.3 All LV switchgear and control gear shall comply with the requirements of SANS 61439 [38] or equivalent technical standards.

3.2.4.4 The ability of the assembly of LV switchgear to limit the risk of personal injury, damage of assemblies and its suitability for further service because of an internal arcing fault shall be in accordance with SANS 61641 [39 & 40] or equivalent technical standards.

3.2.4.5 Fuse-links for the protection of solar photovoltaic (PV) energy systems shall comply with all the requirements of SANS 60269-1, Low-voltage fuses Part 1: General requirements and SANS 60269-6:2021, Low-voltage fuses Part 6: Supplementary requirements for fuse-links for the protection of solar photovoltaic energy systems.

3.2.4.6 The PV wires shall comply with SANS 62930, Electric cables for photovoltaic systems with a voltage rating of 1,5 kV DC.

3.2.4.7 The DC connectors for the PV wires shall comply with SANS 62852, Connectors for DC-application in photovoltaic systems - Safety requirements and tests.

3.2.4.8 The combiner and fuse boxes shall be rated for outdoor environments, specifically designed to withstand corrosive conditions, with a minimum design life of 25 years. These boxes shall remain corrosion-free throughout their lifespan and provide at least IP65 ingress protection as defined by IEC 60529 [31].

3.2.4.9 The combiner box shall be capable of housing devices for overcurrent protection for each string, string-level monitoring equipment, an on-load disconnector switch for array isolation, and surge arrestors for overvoltage protection.

3.2.4.10 The combiner box shall include DC string protection for each string and operate at a maximum DC voltage of 1000V DC.

3.2.4.11 The DC combiner box shall include, at a minimum, lightning, and overvoltage protection. Surge protection shall be provided on both the DC and AC sides of the solar system.

3.2.4.12 The DC combiner box shall feature an array on-load disconnect switch for protection and isolation, which meets the following criteria:

a. Accessible without opening the combiner box.

b. Lockable for safety.

c. Double-pole, capable of isolating both positive and negative PV array cables.

d. Rated specifically for DC operation.

e. Able to break under full load conditions.

f. Rated for the system voltage and maximum current expected.

g. Clearly labelled with safety signs.

3.2.4.13 The combiner box shall include a DC short circuit protection device to disconnect the supply in case of fault conditions.

3.2.4.14 The combiner box shall be equipped with sun shields if exposed to direct sunlight. To prevent overheating, reduced terminal occupancy is considered in the design. The installation location shall be easily accessible and provide a secure working base.

3.2.4.15 Clear cable labelling and a single-line diagram of the connections shall be included inside each combiner box.

3.2.4.16 The combiner box shall have a minimum ingress protection rating of IP65.

3.2.4.17 The fuse box shall include individual fuses for each input coming from the combiner box.

3.2.4.18 The fuse box shall also be equipped with sun shields when exposed to direct sunlight, and reduced terminal occupancy is considered to prevent overheating. The installation location must be easily accessible and provide a secure base for working on the device.

3.2.4.19 The service connections may be overhead or underground depending on the cost, suitability, and other factors. If cables are to be underground, the cable shall be buried at least 600mm below ground level. The trench detail shall be in accordance with DDT 0854.

3.2.4.20 The bedding & blanket layers of the trench (trench bedding) shall be free of stones, sharp objects and rocks that may cause damage to the cable. If the site material does not meet this requirement, then bedding and blanket layers soil shall be imported.

3.2.4.21 The backfill shall be carried out using the same material excavated from the trench provided it is free from rocks and other sharp objects which may damage the concentric cable. If the site material does not meet this requirement, then backfill soil shall be imported.

3.2.4.22 The service connection shall be a concentric cable in accordance with 240-61704085 (The Standard for Concentric Service Cable with Tinned Copper and Coated Steel). The standard size shall be 6 mm^2 for 20 A supplies.

3.2.4.23 A protective HDPE pipe shall be installed around the concentric cable as illustrated in drawing D-DT-0367 and D-DT-0360. The pipe shall be secured to the pole with stainless steel strapping D-DT-3131.

3.2.4.24 Where the concentric cable enters the dwelling, suitable protection shall be applied around the cable to prevent damage to the insulation. (Where metallic dwellings are entered a steel compression gland shall be used.)

3.2.4.25 The concentric cable used on all new services shall be installed without joints from the smart split meter pole-top box into the small power distribution unit or readyboard, which is mounted in the customer's premises.

3.2.4.26 Compliance with standards 240-75655380 (Low Voltage Services Section 1: Electrification) and 240-75661043 (Services Standard) is mandatory to meet the electrification requirements outlined in the scope.

3.2.5 Protection

The PV-BESS system shall be equipped with the following self-protection features, ensuring autonomous operation in a safe state without external user intervention:

3.2.5.1 Subsystem Self-Protection

a. Protection against user commands that could cause the system to operate outside its intended design parameters.

b. Protection against internal faults, including faults in other subsystems, ensuring the system transitions to a safe state autonomously.

3.2.5.2 Fault Protection Design – the system shall be specifically designed to handle the following fault conditions:

a. Earth leakage protection.

b. Low impedance fault protection.

c. High impedance fault protection.

d. Overload protection.

e. Over-voltage and under-voltage protection.

3.2.5.3 The power supplies shall include the following protections of which shall feature automatic reset functionality upon fault removal:

a. Over-temperature protection.

b. Current overload cut-outs.

c. Over-voltage limiting.

3.2.5.4 The Contractor may propose additional protection and risk mitigation measures to safeguard the system against other significant risks, which should be clearly outlined in the tender submission.

3.2.6 Metering

3.2.6.1 A metering system shall be installed to measure and record the total power consumption of loads supplied by the PV-BESS (Photovoltaic-Battery Energy Storage System) installation. A smart metering solution is required for this purpose.

Table 1: Single-phase smart meter to be used for the Smart Intermediate Solar (5kW) system.

SAP Material No.	Material Description	Product Description	Product Drawing Reference
0750644	METER ELECT SERV: SMART(1PH BS GSM) 80A	SINGLE PHASE BS SPLIT SMART METER WITH CIU + INTERNAL/PLUG-IN GSM MODEM	D-DT-9423

3.3 Structural Requirements

The structural design must prioritise ease of maintenance for the PV panels. While the concepts presented in KZN-EBC-0406-1037843 Network Engineering & Design Preliminary Report should be considered, the Contractor is encouraged to propose improved or alternative designs that enhance maintainability and overall system performance. In doing so, the following requirements must be fully complied with.

3.3.1 Enclosure Specifications

3.3.1.1 All enclosures shall be protected against water and dust ingress with a minimum rating of IP55 as per IEC 60529.

3.3.1.2 Outdoor enclosures shall include measures to prevent condensation build-up.

3.3.1.3 The structures must be designed to withstand the harshest expected environmental conditions, with appropriate corrosion protection measures.

3.3.1.4 The structural material shall be at least 6mm thick and made from 3CR12 stainless steel or other corrosion-resistant materials.

3.3.1.5 All enclosures must be protected against vermin and insect intrusion.

3.3.1.6 All enclosures shall be adequately reinforced and fitted with handling facilities (as per ISO standards) to allow for safe transportation, handling, and placement using standard cranes, sling sets, forklifts, or other lifting equipment.

3.3.1.7 The enclosures proposed for housing the inverter and battery should preferably be designed as pole-top mounted solutions ensuring compliance with safety, accessibility, ventilation, and environmental protection requirements.

3.3.1.8 The Tenderer may propose additional protection and mitigation measures to safeguard the PV-BESS against any identified significant risks. These measures shall be detailed in the tender submission.

3.3.1.9 Corrosion protection shall be applied to all metallic enclosures according to 240-75655504: Corrosion Protection Standard for New Indoor and Outdoor Eskom Equipment, Components, Materials and Structures Manufactured from Steel Standard.

3.3.1.10 Energy meter kiosks shall comply with the requirements outlined in standard 240-55146411: Standard for Energy Meter Kiosks – Secure Pole-Top Multi-Way Metering Kiosks.

3.3.1.11 An earth stud shall be provided as indicated in the drawings. The earth stud shall be an M8 35mm stainless steel set screw (welded onto the bottom), spring washer and nut.

3.3.1.12 The neutral bar shall be effectively connected to this earth stud by a green/yellow $10mm^2$ PVC insulated earthing conductor.

3.3.1.13 All earth connections shall be as short as possible and shall not be coiled.

3.3.1.14 Supply and service cable glands shall be provided for the fitment of cables.

3.3.1.15 The doors' surrounds shall incorporate a splash-proof sill around the inner border of the door opening of the kiosk.

3.3.1.16 The roof shall form part of the box and shall not be a separate item.

3.3.1.17 Indents shall be made to the roof to create a slight pitch on the roof to allow water to run off.

3.3.2 Locking Mechanism

3.3.2.1 The locking mechanisms shall be designed for high-risk areas, where vandalism is likely, and safety risks and non-technical losses are high.

3.3.2.2 All enclosure doors must be recessed to be flush with the sides of the enclosure.

3.3.2.3 Exterior doors shall be reinforced with additional steel strength members, diagonally welded on the inside surface from corner to corner.

3.3.2.4 Heavy-duty hinges shall be used for all exterior doors.

3.3.2.5 The doors shall be fitted with stainless steel internal hinges.

3.3.2.6 The enclosure shall be lockable by means of an 8 mm diameter shackle padlock.

3.3.2.7 A four-point locking mechanism (top-centre, bottom-centre, left-centre, right-centre) with bars operated by a heavy-duty door handle shall be installed.

3.3.2.8 A box shall be installed over the lever lock to protect the locking mechanism from vandalism. The box shall have 5 x 20 mm slotted holes over the top and side surfaces of the box.

3.3.2.9 Alternative locking mechanisms may be proposed for review by Eskom. The proposal shall include operational details and information on the effectiveness of the system in preventing unauthorized access.

3.3.3 Noise Control

The maximum noise level generated by the system, including any associated equipment, shall be limited to 65 dBA, measured at 15 meters in any direction from the site perimeter.

3.3.4 Material Specification: Photovoltaic Support Structures

3.3.4.1. All support structures shall comply to the requirements listed in this section.

3.3.4.2. The support structure shall be earthed as indicated in drawing D-DT-4407 sheet 1D.

3.3.4.3. Steel used in the fabrication of structural steelwork shall comply with the latest requirements of SANS 50025-2 unless otherwise specified. All imported steel shall undergo a landing test that includes mechanical (tensile, impact, and bending) testing and chemical composition.

3.3.4.4. S355JR galvanised steel shall be utilized for all structural elements.

3.3.4.5. Table 2 below indicates sections and dimensions with the associated material grading. All structures and hardware components utilized to construct the mounting structure for the Smart Solar Intermediate (5kW) system shall comply with this.

Table 2: Sections and dimensions along with associated material grading

Sections	Dimensions	Material
1) I & H	All sizes	S355JR

2) Plates		All sizes	S355JR
		Other, 275MPa yield	S275JR
3) Channels		All sizes	S355JR
4) Angles		Equal angles 45x45 and less	S275JR
		Equal angles 50x50 and higher	S355JR
5) Unequal Angles		All sizes	S355JR
6) Flat Bars		90mm wide and less	S275JR
		100mm wide and above	S355JR
7) Rounds	General	40mm diameter and less	S275JR
		30mm diameter and above	S355JR can still be specified
	Steel reinforcements	Straight round bars - R6, R8 and R10	S275JR
		Weld mesh fabric ref. no. 245	S275JR
		Y10-Y40 high tensile steel bars	S450J0
		40mm diameter and less	S275JR
8) T		Cut out of I or H sections	S355JR
9) Compound Girders for Cranes Gantries		All sizes	S355JR
10) Plate Girders		All sizes	S355JR
11) Square Solids		Up to 50mm square	S275JR
		50mm and above	S355JR
12) Lipped Angles, Lipped Channels, Lipped Z and Top Hat Sections		2,5mm thick and less	S275JR
		2,5mm thick and higher	S275JR
13) Circular Hollow Sections, Square Hollow Sections and Rectangular Hollow Sections		Hollowed sections made from square or rectangle flat sheet, 2.5mm wall thickness and less	S275JR
		63mm diameter and higher, 2.5mm wall thickness and higher	S355JR

3.3.4.6. Structure foundations technical requirements:

a. The structure foundations shall depend on site soil classification. The following soil classifications are applicable:

   i. Type '1' soils: competent soil with equal or better consistency (strength or toughness) than one would encounter in stiff cohesive soils or dense cohesionless soils above the water table. This soil must have a broad balanced texture (constituent particle sizes) with high average combinations of undrained shear strength and internal angle of friction, with minimum values of 80kN/m^2 and 30° respectively. The minimum natural specific weight shall not be less than 17kN/m^3.

   ii. Type '2' soils: a less competent soil than type "1", with equal or weaker consistency than one would encounter in firm to stiff swelling cohesive soils, or dry poorly graded loose to medium dense cohesionless soils above the water table. The minimum undrained shear strength shall be 40kN/m^2, and the minimum natural specific weight shall not be less than 15.5kN/m^3.

   iii. Type '3' soils: dry loose cohesionless soil or very soft to soft cohesive soil.

   iv. Type '4' soils: submerged cohesionless and cohesive soils. This includes all soils below the permanent water table, including soils below a re-occurring perched water table, or permeable soils in low-lying areas subjected to confirmed seasonal flooding.

b. Depending on the prevailing soil type, the geotechnical design parameters as per Table 3 below shall be applied when designing foundations.

Table 3: Geotechnical design parameters

Parameter	Types '1' & '2' soils	Type '3' soil	Type '4' soil
Allowable soil bearing pressure	150kPa	100kPa	50kPa
Allowable toe bearing pressure	200kPa	125kPa	65kPa
Undrained shear strength	40kN/m2	–	–
Minimum dry Density	1550kg/m3	1400kg/m3	1000kg/m3
Density of reinforced concrete	2400kg/m3	2400kg/m3	1400kg/m3

3.3.4.7. The methodology defined in SANS 10160-3 shall be used for all support structure designs, making use of the following standard parameters:

a. Design gust speed for a 50-year return period of 50m/s,

b. Design working life of at least 25 years,

c. Use terrain category A and D and see which one will provide the worst load case, which should then be used (refer to SANS 10160-3:2019, Table 2),

d. Altitude 0m.

3.3.4.8. Site layout considerations:

a. Site clearance and grubbing operations shall be carried out in accordance with SANS 1200 C.

b. Site to be prepared as per civil engineer's instruction before any earthworks are undertaken.

c. All earthworks to be carried out in accordance with SANS 1200 DA.

d. All unsuitable materials must be removed and disposed of, then import G5/6 material if required.

e. All approved material to be stockpiled separately and later be reused as per civil engineer's instruction.

f. The contractor shall timeously submit field and laboratory test results of relative compaction densities as required to the civil engineer.

g. All PV structure foundations must have the same top level.

h. PV support structures shall be earthed through the foundations as indicated on D-DT-5240 sheet 6, refer to D-DT-4407 sheet 1D.

3.3.5 Direct Lightning Stroke Protection for Structures

a. A minimum of Lightning Protection Level (LPL) II, in line with SANS 62305, shall be provided.

b. The air termination system shall be designed using the rolling sphere method to determine its required dimensions.

3.4 Equipment Warranty

The Contractor shall provide an equipment warranty in accordance with the minimum requirements outlined in Table 1. In addition to, and without limiting, the defects liability period, the Contractor shall offer a comprehensive warranty covering all equipment, including strategic components. No equipment warranty provided shall limit or negate any other warranties.

Upon achieving operational acceptance of the installation, the Contractor shall transfer the ownership of all manufacturer equipment warranties to the Employer.

Table 4: PV-BESS Equipment Warranty

Equipment	Minimum Warranty Period (in Years)
PV Module - Product Warranty against Manufacturing defects	10
PV Modules – Performance	25
Mounting Structures – Duration of Warranty (Materials)	20
Mounting Structures – Lifetime Design Warranty	25
Inverter	10
Batteries	15
Civil Works	1

3.5 Labelling and Marking of Equipment

a. All labelling of panels shall comply with the requirements of Eskom standard 240-62629353: Specification for Panel Labelling Standard [17].

b. All markings of wiring and cables in substations shall comply with the requirements of Eskom standard 240-64636794: Generic Equipment Specification Wire, Wire Marking, Cable Numbering, Fibre Optical Cable Installation and Labelling [18].

c. The Contractor shall establish a detailed labelling and codification system for the CMS to accurately identify all instruments, cables, cable cores, equipment enclosures, network hardware, power supply systems, signals, OPC tags, and other components. This system shall adhere to Eskom's specified identification and labelling formats as outlined in the referenced specifications.

3.6 Certificate of Compliance

The Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), administered by the Chief Inspector of Occupational Health and Safety under the Department of Labour, mandates that all electrical installations must comply with the requirements of SANS 10142-1. The Act also requires that a Certificate of Compliance (CoC) be issued for each installation by an accredited person, such as a master installation electrician, installation electrician, or a single-phase electrical tester, as defined in the standard. This certificate must be in the format prescribed in SANS 10142-1 (refer to section 8.8).

In line with these requirements, every electrical installation must be properly inspected and tested, and a valid CoC must be issued to the owner. Eskom is responsible for ensuring that a CoC has been issued before the electrical supply is connected.

3.7 Handover and Commissioning

All tests, inspections, and pre-commissioning activities will be conducted in accordance with the 240-150128782: Framework for Design Solutions to Connect Customer-Owned SSEGs [45].

Until SANS 10142-1-2, The Wiring of Premises: Specific Requirements for Embedded Generation Installations Connected to the Low Voltage Distribution Network in South Africa, is officially published, all SSEGs shall, upon commissioning, be signed off using Eskom's established EGI Compliance Test Report [Annexure A]. This will serve as an interim solution to ensure the compliance of SSEG installations.

4. Authorization

This document has been seen and accepted by:

Name and surname	Designation
Brenda Cebekhulu	Senior Manager: Asset Creation (KZN OU)
Eugene van Heerden	Technologist: Network Planning
Zanele Mhaule	Senior Engineer: Network Engineering & Design (KZN OU)
Mohammed Rashid	Manager: Maintenance & Asset Management
Neville Booyens	Senior Engineer: Standards Implementation (KZN OU)
Patric Kabaze	Senior Technologist: Standards Implementation (FS OU)
Nairob Mthembu	Manager: Network Engineering & Design (KZN OU)
Riaz Asmal	Standards Implementation Manager (KZN OU)
Rudi Kleinhans	Standards Implementation Manager (FS OU)
Zaheer Saib	Manager: Control Plant Maintenance

5. Revisions

Date	Rev.	Compiler	Remarks
September 2025	0	MY Bux	Draft functional specification document compiled for the installation of solar PV and BESS as an electrification solution for the eNkovukeni Village.
September 2025	1	MY Bux	First issue.

6. Development team

The following people were involved in the development of this document:

- Mohammed Bux
- Riaz Asmal
- Yadev Harigen
- Yusuf Peer
- Zanele Mhaule

7. Acknowledgements

- Andre Bekker
- Eugene van Heerden
- Thomas Jacobs

ANNEXURE A: EGI Compliance Test Report

Note 1. In terms of South African legislation, the user or lessor is responsible for the safety of the embedded generation facility.
Note 2. ECSA Professional body registration required for signing off this EGI compliance test report.
Note 3. All listed items need to be completed for this form to be valid:
Note 4. All tests and requirements in this form must be done in person or witnessed in person by the signatory, for this form to be valid.
Note 5. A copy of the signed Certificate of Compliance (CoC), to be submitted as an annexure to this report. This certificate will exclude the EGI components but include all components of the circuit from the Customer Distribution Board up to the terminals at the end of the cable connected to the Embedded Generator. The EG installation shall be certified to comply with all prescriptions in this test report by the ECSA professional (PrEng or PrTech) competent registered person.
Note 6. When confirmation is required, answer “Yes” or “N/A” unless specifically instructed to indicate “Yes”. The report shall not be issued if any “No” answers appear.
Note 7. Supplementary information is provided at the end of the form to further explain what is needed in order to complete this report.

1. CERTIFICATE OF COMPLIANCE (CoC) NO. Issued under SANS 10142 -1		Date of Issue:
2. Name of building		
3. Physical Address of installation		
4. Type of EG installation: Inverters, batteries, standby generator, other (specify all combinations used)		
5. Total Generation Capacity installed in kWp (DC) AND total kW (AC)		
6. EGI compliance to all inspection and test requirements in NRS 097-2-1 and ALL grid codes (Indicate YES in confirmation)		

7. Signage boards installed at relevant places, agreed with Utility, and in accordance with SANS standards (Indicate YES in confirmation)	
8. Dead Grid Safety Lock (DGSL) Confirm manufacturer details and required electrical tests completed. (Indicate N/A if there is a lockable isolation switch installed that has been agreed with Utility - refer to item 8 in the SUPPLEMENTARY NOTES for more details)	N/A
9. Electromechanical switch with a coil energized from the utility side (Indicate N/A if there is a lockable isolation switch installed that has been agreed with Utility- refer to item 9 in the SUPPLEMENTARY NOTES for more details)	N/A
10. Lockable isolation switch that is accessible to Utility is installed (Indicate YES or N/A. N/A is applicable if a DGSL or electromechanical switch is installed that has been agreed with the Utility.	
11. Have operating instructions been provided for the installation? (Indicate YES in confirmation)	
12. Make of inverters Manufacturer detail – Include details of the inverter test certificates as annexure to this report Model No.'s for all generator units / Inverters No. of generator units / inverters installed including the KW size for each unit / inverter	

13. Islanding test (indicate YES in confirmation of test completion)	
14. Synchronization test (indicate YES in confirmation of test completion)	
15. Notices applied to all control points and the areas containing the EGI in accordance with Electrical Machine Regulation 5. (Indicate YES in confirmation)	
16. Where an alternative supply is installed, it complies with the SANS requirements in respect of these type of connections including a changeover switch and indicator. (Indicate YES in confirmation)	
17. Structural requirements, as per SANS 10400, related to the EGI identified and addressed (indicate YES or N/A)	
18. Reverse power flow blocking protection has been installed and commissioned to prevent reverse power flow into the utility distribution electricity network (Indicate YES or N/A)	
19. Protection settings have been set to comply with NRS 097-2-1 and the approved generation capacity maximum output of the inverter has been limited by appropriate hardware or software settings. (Indicate YES in confirmation)	

I (competent person's name) hereby declare that I have inspected the installation, examined the associated design and documentation. I have witnessed the relevant tests. I confirm that the information given above is correct and complies with the Grid Codes, NRS standards, SANS standards and the applicable statutory requirements.

ECSA Pr Eng or Pr Tech, Registration No. ……………………..…

Date: ……………………………..

I confirm that I am "competent" in terms of the ECSA act and regulations.

Name of Competent Person: ……………………………………… (in good standing with the ECSA)

Telephone No. ……………………………………………………..………..

Email Address: ……………………………………………………..………..

Signature: ……………………………………………………..………..