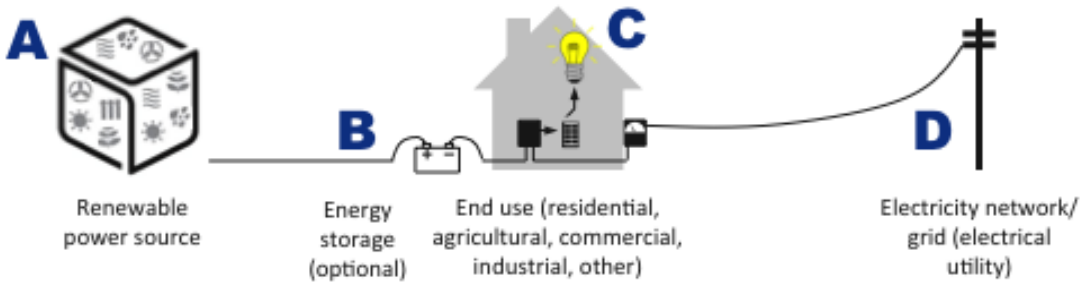
List of standards and specifications of interest to small-scale renewable energy installations

Please note that this is not a conclusive list and may be updated and revised as relevant.



Where:

A – The renewable energy power source. Illustrated as a 'black box' indicative of a range of renewable technology options as defined for the programme.

B – Energy storage. Storage capacity is optional.

C – End use. The offer is available to any consumer type who meets the criteria for the available IDM funding mechanism(s).

D – Network connection. Connecting to the electricity network is optional.

The responsibility lies with the project developer to ensure that all aspects of the installation comply with all relevant quality, safety and performance standards as well as legal and regulatory requirements.

Included here is a list of standards and specifications of potential relevance to the various configurations of the illustrated components. Project developers are encouraged to give consideration to the listed standards as applicable to their specific system, but to note that this is not intended as a conclusive list and all applicable standards remain relevant even if not listed here.

A. Renewable energy power sources

A.1 **Wind**

Standard	Focus	Brief overview of content	Status
EN 61400 (Part 1-25)	Wind turbine generator systems – A certificate for the proposed wind turbine model as evidence of certification in accordance with IEC 61400	IEC 61400-2: Design requirements for small-scale wind turbine systems; 61400-11: Acoustic noise measurement techniques; 61400-12: Wind turbine power performance testing; 61400-23: Blade Structural Testing; 61400-22: Wind turbine certification requirements; 61400-21: Power quality requirements for grid connected wind turbines; 61400-13; Structural loads measurement	Published/drafts
IEC WT 01	IEC System for Conformity Testing and Certification of Wind Turbines Rules and procedures		Published

A.2 **Solar Photovoltaic**

- In order for the proposed **solar module** to be considered proven, it must fulfill the criteria for **protection class II**.

Standard	Focus	Brief overview of content	Status
IEC-EN 61427	Secondary cells and batteries for solar photovoltaic energy systems – General requirements and method of test	Version 2; If storage is used (Secondary cells = Rechargeable batteries)	Published
IEC-EN 61724	Photovoltaic system performance monitoring. Guidelines for measurement, data exchange and analysis	Recommends procedures for the monitoring of energy-related photovoltaic (PV) system characteristics, and for the exchange and analysis of monitored data. The purpose is the assessment of the overall performance of PV systems	Published (Under Revision)
IEC-EN 61727	Photovoltaic (PV) systems. Characteristics of the utility interface	Applies to utility-interconnected photovoltaic (PV) power systems operating in parallel with the utility and utilizing static (solid-state) non-islanding inverters for the conversion of DC to AC. Lays down requirements for interconnection of PV systems to the utility distribution system	Published
IEC/EN 61215	Crystalline silicon terrestrial photovoltaic (PV) modules - Design qualification and type approval	Lays down requirements for the design qualification and type approval of terrestrial photovoltaic modules suitable for long-term operation in general open-air climates, as defined in IEC 60721-2-1. Determines the electrical and thermal characteristics of the module and shows, as far as possible, that the module is capable of withstanding prolonged exposure in certain climates.	Published
IEC 61646	Thin-film terrestrial photovoltaic (PV) modules - Design qualification and type approval	IEC 61646:2008 lays down requirements for the design qualification and type approval of terrestrial, thin-film photovoltaic modules suitable for long-term operation in general open-air climates as defined in IEC 60721-2-1. This standard applies to all terrestrial flat plate module materials not covered by IEC 61215. The significant technical change with respect to the previous edition concerns the pass/fail criteria.	Published
IEC/EN 61730	Photovoltaic (PV) module safety qualification - Part 1: Requirements for construction; Part 2: Requirements for testing	Describes the fundamental construction requirements for photovoltaic modules in order to provide safe electrical and mechanical operation during their expected lifetime. Addresses the prevention of electrical shock, fire hazards, and personal injury due to mechanical and environmental stresses. Pertains to the particular requirements of construction and is to be used in conjunction with IEC 61215 or IEC 61646.	Published
IEC 60891	Photovoltaic devices - Procedures for temperature and irradiance corrections to measured I-V characteristics	IEC 60891:2009 defines procedures to be followed for temperature and irradiance corrections to the measured I-V (current-voltage) characteristics of photovoltaic devices. It also defines the procedures used to determine factors relevant for these corrections. Requirements for I-V measurement of photovoltaic devices are laid down in IEC 60904-1.	Published
IEC 60904	Photovoltaic devices (Part 1-10)	Requirements for I-V measurement of photovoltaic devices are laid down in IEC	Published

Standard	Focus	Brief overview of content	Status
		60904-1.	
IEC 61194	Characteristic parameters of stand-alone photovoltaic (PV) systems	Defines the major electrical, mechanical and environmental parameters for the description and performance analysis of stand-alone photovoltaic systems.	Published
IEC 61345	UV test for photovoltaic (PV) modules	Determines the ability of a photovoltaic module to withstand exposure to ultra-violet (UV) radiation from 280 nm to 400 nm.	Published
IEC 61702	Rating of direct coupled photovoltaic (PV) pumping systems	Defines predicted short-term characteristics (instantaneous and for a typical daily period) of direct coupled photovoltaic (PV) water pumping systems.	Published
IEC 61829	Crystalline silicon photovoltaic (PV) array - On-site measurement of I-V characteristics	Describes procedures for on-site measurement of crystalline silicon photovoltaic (PV) array characteristics and for extrapolating these data to Standard Test Conditions (STC) or other selected temperatures and irradiance values.	Published

A.3 **Concentrated Solar Power**

Standard	Focus	Brief overview of content	Status
IEC62108 for concentrated solar photovoltaic			

A.4 **Biomass**

- As per engineering and relevant specifications.

A.5 **Biogas**

- As per engineering and relevant specifications.

A.6 **Landfill gas**

- As per engineering and relevant specifications.

A.7 **Small hydro**

Standard	Focus	Brief overview of content	Status
IEC 61850-7-410	Hydroelectric Power Plants - Communication for monitoring and control	Specifies the additional common data classes, logical nodes and data objects required for the use of IEC 61850 in a hydropower plant. This publication is of high relevance for Smart Grid.	Published
IEC-EN 61116	Electromechanical equipment guide for small hydroelectric installations	Applies to installations having outputs of less than 5 MW and turbines with diameters less than 3 m.	Published

B. Energy Storage

Standard	Focus	Brief overview of content	Status
IEC-EN 60086	Primary cells and batteries	Provides general specifications for standardisation of batteries, as well as physical and electrical, and safety specifications.	Published (Under revision)
EN 50272	Safety requirements for secondary batteries and battery installations		Published (Work in progress)
IEEE 485	IEEE recommended practice for sizing lead-acid batteries for stationary applications		Published

C. Installation

Standard	Focus	Brief overview of content	Status
SANS 10142 – 1: 2009	"The Wiring Code' (The wiring of premises Part 1: Low voltage installations): Installations smaller than 1,000,V a.c. or 1,500V d.c	Covers requirements for the design, erection and modification of specific, fixed, medium-voltage electrical installations in distribution systems between the point of control and the point of consumption, with nominal voltages above 1 kV a.c. not exceeding 22 kV a.c. and up to and including 3 000 kW installed capacity, so as to provide safe and proper functioning for the use intended.	Published
NRS 052-3:2008	Off-grid solar home systems	Installation, earthing, energy storage, etc.	
IEC-EN 60870-5-102	Telecontrol equipment and systems – Part 5: transmission protocols – section 102: companion standards for the transmission of integrated totals in electric power systems	Standardizes the transmission of integrated totals representing the amount of electrical energy transferred between power utilities, or between a power utility and independent producers on a high voltage or medium voltage network. This publication is of high relevance for Smart Grid.	Published
IEC-EN 62056	Electricity metering – Data exchange for meter reading, tariff and local control	Provides specifications for electric metering in terms of data exchange for meter reading, tariff and local control. These standards are of high relevance for smart grid.	Published
IEC-EN 61334-4	Distribution automation using distribution line carrier systems – Part 4: Data communication protocols	The management of the communication profile. These standards are of high relevance for smart grid.	Published
NRS 057-4	Electricity metering Part 4: Code of practice		

D. Network connection

Standard	Focus	Brief overview of content	Status
IEC 62271-100	High voltage alternating current circuit breakers	This standard is applicable to AC circuit-breakers designed for indoor or outdoor installation and for operation at frequencies of	

Standard	Focus	Brief overview of content	Status
		50 Hz and 60 Hz on systems having voltages above 1 000 V.	
IEEE 1547 (part 1 - 6)	IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems	This standard focuses on the technical specifications for, and testing of, the interconnection itself. It provides requirements relevant to the performance, operation, testing, safety considerations, and maintenance of the interconnection. It includes general requirements, response to abnormal conditions, power quality, islanding, and test specifications and requirements for design, production, installation evaluation, commissioning, and periodic tests. The stated requirements are universally needed for interconnection of distributed resources (DR), including synchronous machines, induction machines, or power inverters/converters and will be sufficient for most installations.	Published
EN 50438	Requirements for the connection of micro-(co)generators in parallel with public low-voltage distribution networks	The draft European standard EN 50438 outlines the requirements for the connection of micro-generators in parallel with public low-voltage distribution networks and defines micro generation as a source of electrical energy and all associated equipment designed to operate in parallel with the low voltage system, rated up to and including: 1) 25A at low voltage [230V], when the network connection is single phase, or 2) 16A at low voltage [230/400V], when the network connection is three phase.	Draft
IEC 61850	Basic communication structure for substation and feeder equipment		Published
IEC 61850-7-420	Communications systems for Distributed Energy Resources (DER) - Logical nodes	IEC 61850-7-420:2009(E) defines IEC 61850 information models to be used in the exchange of information with distributed energy resources (DER), which comprise dispersed generation devices and dispersed storage devices, including reciprocating engines, fuel cells, microturbines, photovoltaics, combined heat and power, and energy storage. Utilizes existing IEC 61850-7-4 logical nodes where possible, but also defines DER-specific logical nodes where needed.	Draft
NRS 097	Grid interconnection for embedded generation: Installations <100kW	Standards for connecting to the grid that includes aspects such as safety and protection, metering and utility compatibility.	Published
DST 34-1665	Distribution Standard for the Interconnection of Embedded Generation (DSiEG): Installations 100kW – 1 MW*	Interconnection standard covers legal requirements, operational safety, and network interface. This standard serves to fulfil Eskom Distribution's obligation under Section 8.2(4) of the South African Distribution Code: Network Code.	Published
	The South African Distribution Network Code Ver 5.1: Installations 100kW - 1MW* (<1,000 MW)	Requirements for RE generator connection, control and frequency operation.	Published
NRS 029	Current transformers for rated ac voltages from 3,6kV up to and including 420kV	This specification specifies the characteristics of current transformers for rated a.c. voltages from 3,6 V up to and including 420 kV, for use with electrical measuring instruments, electrical protection devices, or both, at a	Published

Standard	Focus	Brief overview of content	Status
		service frequency of 50 Hz.	
NRS 030	Electricity distribution – Inductive voltage transformers for rated ac voltages from 3,6kV up to and including 145kV for indoor and outdoor applications	This specification is based on SABS IEC 60044-2 for single-phase voltage transformers and BS 7729 for three-phase voltage transformers and covers the requirements for inductive voltage transformers for rated a.c. voltages from 3,6 kV up to and including 145 kV for indoor and outdoor applications, for use with electrical measuring instruments and electrical protection devices, or both, at a service frequency of 50 Hz.	Published
NRS 031	Alternating current disconnectors and earthing switches (above 1000V)	This specification specifies the characteristics of alternating current disconnectors (isolators) and earthing switches, designed for indoor and outdoor installations, for voltages exceeding 1 000 V and for a service frequency of 50 Hz. It also applies to the operating devices of these disconnectors and earthing switches and to their auxiliary equipment.	Published
NRS 037-1	Telecontrol Protocol for stand-alone remote terminal units		Published
NRS 048-2	Electricity supply - Quality of supply Part 2: Voltage characteristics, compatibility levels, limits and assessment methods	Standard for quality of supply for utility connections and for standalone installations too. Necessary for survival and correct performance of customer equipment.	Published
NRS 048-4	Electricity supply – Quality of supply Part 4: Application guidelines for utilities	Standard for quality of supply for utility connections and for standalone installations too. Necessary for survival and correct performance of customer equipment.	Published
NRS 054	Rationalized User Specification - Power Transformers	This specification applies to oil-immersed, air-cooled, three-phase, power network transformers with ratings equal to or greater than 2,5 MVA and with HV winding up to and including 132 kV. Although the general conditions in this specification might also be applicable to similar oil-filled equipment like generator transformers and shunt reactors, this specification alone should not be used for their purchase because the specific requirements for generator, arc-furnace, testing, HVDC, SVC, dry type transformers and HV shunt reactors are not covered in this specification.	Published
SANS 1019	Standard voltages, currents and insulation levels for electricity supply	Covers standard voltages and currents for use in a.c. transmission, distribution and reticulation systems (and in equipment for use in such systems) having a nominal frequency of 50 Hz and a nominal voltage exceeding 100 V, based on the standard values given in IEC 60038 and IEC 60059. Also covers standard phase-to-earth insulation levels applicable to equipment for use in such systems at an altitude not exceeding 1 800 m.	Published
ESKPVAAN6	Apportioning of quality of supply parameters		Published
SCSASAAL9	MV and LV Reticulation Earthing		Published
SCSASACB6	Medium Voltage		To be re-

Standard	Focus	Brief overview of content	Status
(DST 34-906)***	Earthing Practice		published
DSP 34-392	Specification for digital transducer based measurement system for electrical quantities		Published
DST 34-462	Standard design for Distribution protection schemes		Published
DST 34-540	Distribution Standard for the application of Sensitive Earth Fault protection		Published
DST 34-542	Distribution voltage regulation and apportionment limits		Published
NRS 057-4	Electricity Metering Part 4 : Code of Practice	The regulatory requirements is applicable to electricity metering in its entirety, including all equipment requirements, design requirements, maintenance requirements, metering data capturing and data retention requirements and service agents requirements	
NRS 097	Grid interconnection of embedded generation	Standards for connecting to the grid that includes aspects such as safety and protection, metering and utility compatibility.	
SANS 1019	Standard voltages, currents and insulation levels for electricity supply	Covers standard voltages and currents for use in a.c. transmission, distribution and reticulation systems (and in equipment for use in such systems) having a nominal frequency of 50 Hz and a nominal voltage exceeding 100 V, based on the standard values given in IEC 60038 and IEC 60059. Also covers standard phase-to-earth insulation levels applicable to equipment for use in such systems at an altitude not exceeding 1 800 m	
IEC 60068-2-1	Environmental Testing – Part 1 Cold	Covers cold tests applicable to both non heat-dissipating and heat-dissipating specimens	
IEC 60068-2-2	Environmental Testing – Part 2 Dry Heat	Covers dry heat tests applicable both to heat-dissipating and non-heat-dissipating specimens	
IEC 60068-2-30	Environmental Testing – Part 30 Damp heat, cyclic (12h + 12h cycle)	This part of IEC 60068 determines the suitability of components, equipment or other articles for use, transportation and storage under conditions of high humidity – combined with cyclic temperature changes and, in general, producing condensation on the surface of the specimen. If the test is being used to verify the performance of a specimen whilst it is being transported or stored in packaging then the packaging will normally be fitted when the test conditions are being applied.	
IEC 60255-30	Electrical relays Part 3 : Single input energizing quantity measuring relays with dependent and independent time		
IEC 60255-6	Electrical relays Part 6 : Measuring relays and protection equipment		
IEC 60255-21	Electrical relays Part 21 : Vibration, shock,		

Standard	Focus	Brief overview of content	Status
	bump and seismic tests on measuring relays and protection equipment (all sections)		
IEC 60255-22	Electrical relays Part 22 : Electrical disturbance tests for measuring relays and protection equipment (all sections)		
SANS IEC 60529	Degrees of protection provided by enclosures (IP Code)	Covers circuits supplied at nominal voltages up to and including 1 000V AC. or 1 500V DC.	
SANS IEC 61000-4	Electromagnetic compatibility (EMC) : Test and measurement techniques (all sections)	This standard specifies the metrological and technical requirements for continuous totalizing automatic weighing instruments of the belt conveyor type, hereinafter referred to as “belt weighers”, that are subject to national metrological control. It provides standardized requirements and test procedures for evaluating metrological and technical characteristics in a uniform and traceable way	
South African Distribution Code (all parts)	Specific requirements for the connections of Embedded Generators	The SA distribution code includes a section of specific requirements for the connection of embedded generators. The distribution code (section 8.4.1.1 (1)) requires that all embedded generators of nominal capacity of 10MVA shall in addition to the requirements of the distribution code, also comply with Section 3.1 of the South African Grid Code: Network Code.	
South African Grid Code (all parts)	This code contains connection conditions for generators, distributors and end-use customers.	Section 3.1 specifies the minimum technical and design requirements for embedded generators.	

E. General or site related as relevant

- Environmental authorization as required by NEMA for each project (Department of Environmental Affairs & Tourism in terms of Environment Conservation Act, No. 73 of 1989 and National Environmental Management Act, No. 107 of 1998, (as amended))
- Written confirmation of a water allocation for all the water needs of the Project from a water services provider registered as such in terms of the Water Services Act, 108 of 1997 or a written non-binding confirmation of water availability from the Department of Water Affairs
- Consent of the Civil Aviation Commissioner to erect a potential obstacle to aviation or confirmation form the civil aviation authority that no such consent is necessary.
- Proof that an integrated water use license application for all anticipated water uses in terms of the National Water Act, 36 of 1995 has been made or a legal opinion that none is required
- A waste management license as required by the National Environmental Management Waste Act, 59 of 2009, or a legal opinion that none is required
- An atmospheric emission license as required by the National Environmental Management: Air Quality Act, 39 of 2004, or a legal opinion that none is required

- Occupational Health & Safety Act, No. 85 of 1993 as amended
- All relevant bylaws.