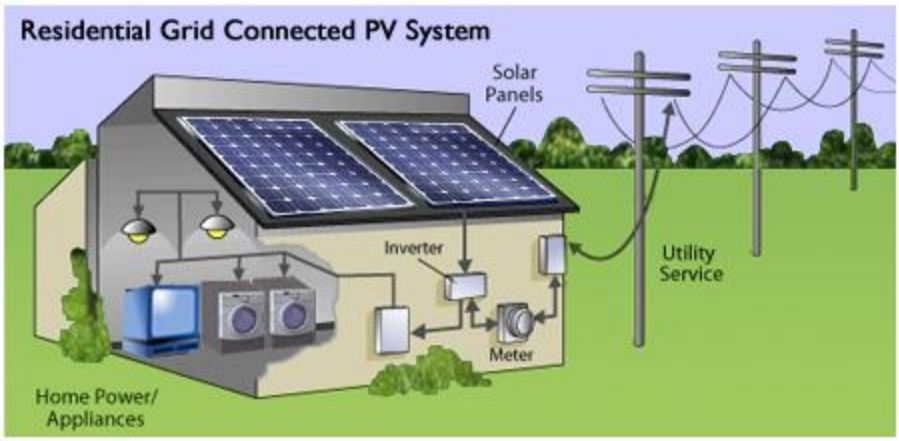
Grid Code

for

Small Scale Distributed Generation

(SSDG)

Version 3.0 - April 2026



Central Electricity Board

Foreword

The purpose of this document is to assist the public to better understand the procedure for application, the requirements of the SSDG Grid Code and other related issues regarding the Small Scale Distributed Generation (SSDG) Project.

Any prospective applicant willing to take advantage of the Small Scale Distributed Generation (SSDG) Scheme is informed that:

I. Compliance to this Grid Code is mandatory

II. The provisions of the Electricity Act shall be adhered to.

III. This Grid Code will be reviewed and updated when the need arises.

Disclaimer

The Central Electricity Board's (CEB's) "Grid Code for Small Scale Distributed Generator (SSDG)", including any periodic revisions, published on the CEB website, constitute the minimum technical requirements for the connection of Distributed Generation (DG), with or without Battery Energy Storage System (BESS), to CEB's low voltage distribution network. The active power injection of DG shall at no time exceed 50 kW $_{ac}$ at the Supply Terminal as measured by the Import / Export meter of the CEB or the maximum scheme capacity as applicable at the time.

The owner of the SSDG may be required to meet additional requirements to ensure that the interconnection meets all local regulations and is safe for use. The requirements set in this Grid Code are based on system conditions that may be subject to change. As such, these requirements shall only be used as a guide. The use of this Grid Code and the information it contains is at the user's sole risk. Neither CEB, nor any of its personnel, makes any warranties or representations of any kind in connection with this Grid Code, including its correctness, accuracy, completeness or adequacy for any specific purpose. CEB will not be responsible or liable for any damage or loss that may arise due to the use of the Grid Code, reliance on the information it contains, or any decisions made based on the Grid Code. CEB reserves the right to revise this Grid Code at any time. Any person wishing to make use of this Grid Code is invited to contact CEB before proceeding.

The CEB reserves the right to modify such technical specifications and requirements of the SSDG system before or during implementation of the SSDG connection process, in order to adhere to the latest operational and safety aspects of the network. The SSDG installation shall abide with the latest SSDG Grid Code and standards at the time of implementation of the project.

Revision

Version	Date	Changes
Version 2. 3	September 2019	Minor revisions
Version 3.0	April 2026	Requirements for SSDG with Battery Energy Storage System (BESS) Included

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CHAPTER 1 - PURPOSE OF GRID CODE

The Grid Code describes the technical criteria and requirements for interconnection of Small Scale Distributed Generators (SSDG) with CEB's low voltage (230/400V) network systems.

The Grid Code caters for the production of electricity and its storage from inverter-based renewable energy sources such as photovoltaic

The Grid Code addresses connections of electricity producers under the SSDG Schemes.

More details on the schemes are available on CEB website https://ceb.mu/projects/energy-schemes

CHAPTER 2 - GRID CODE REQUIREMENTS AND SAFETY ASPECTS

1 Design Parameters

All DGs with export capacity less than 5kWac, shall have either single phase or three phase output.
All DGs with export capacity of 5kWac and above, shall have three phase output only.
All inverters shall be of Grid Forming type

The DGs shall be connected to the 230/400 V system and operated within the parameters as listed in
Table 1 below. The DGs have to be functioning and protect itself within the range of the voltage, current and frequency existing in the CEB's grid.

Table 1:Normal Operating Parameters of the CEB's Low Voltage grid

Description	Range
Voltage	230/400 V ± 6 %
Short Circuit Characteristics	(1 sec) 18 kA, (50 Hz)
Nominal Frequency	50 Hz
Statutory Frequency Deviation	50 Hz ±1.5 %
Operating Frequency Range	47 Hz – 52 Hz

The CEB LV grid is designed as a TT system. The above values are mandatory for all DGs. Same requirements apply for DG with Battery Energy Storage System.

Subject to the requirements of the prevailing scheme, the DG capacity shall also be limited to the technically permissible DG connection capacity of the distribution transformer feeding the customer. Should there be other DGs connected on the same distribution transformer; the total capacity of all these shall be taken into consideration for the acceptance of an SSDG application.

2 Protection Requirements

The coordination and selectivity of the protection system must be safeguarded even with the entrance of new generation into the system. To guarantee this requirement, the protections to be installed are listed in the following chapters and the settings of those protections shall conform at minimum to the requirements of the Grid Code.

In case of short circuits on the DG's side of the Supply Terminal, the SSDG shall adjust its protections in such a way that will avoid unnecessary trips and at the same time avoid that the incident propagates to the CEB LV network.

In case of incidents originating external to the DG, like short circuits on CEB's side of the Supply

terminal i.e. the CEB LV network, fluctuations of frequency or voltage, DG will give priority to the network protection to clear the incidence and act accordingly with the coordination and selectivity principles of the protections system.

2.1 Availability of Protection

The applicant shall ensure that all equipment is protected and that all elements of the protection, including associated inter-tripping, are operational at all times. Failure of the protection will require the DG to be taken out of service.

The DG shall be protected against:

(1) Overload
(2) Short circuit within the DG
(3) Earth faults in the LV grid close vicinity of the SSDG
(4) Over Current
(5) Abnormal Voltages (Table 2)
(6) Abnormal Frequencies (Table 2)
(7) Lightning
(8) Loss of Mains (applicable for grid tied operation mode)

A DG should be equipped with all necessary protection systems, as recommended by the manufacturer and relevant international standards, to ensure that all the equipment and apparatus powered by the DG operate within their technical limits.

2.2 DC Functions of protection apparatus

All protection apparatus functions shall operate down to a level of 50% of the nominal DC supply voltage of the DC system, or the system must be able to safely disconnect and shutdown when operation conditions are outside the nominal operating DC voltage specified in the DC system specifications.

2.3 Protection Flagging, Indication and Alarms

All protective devices supplied to satisfy the CEB's requirements shall be equipped with operation indicators. Such indicators shall be provided to enable the identification of which devices caused a particular trip.

Any failure of the applicant's tripping supplies, protection apparatus and circuit breaker trip coils shall be supervised within the applicant's installation, and the applicant shall be responsible for prompt action to be taken to remedy such failure.

2.4 Trip Settings

The basic trip settings for grid-tied DG must comply with the values stated in Table 2. However, for DG configured for islanding operation with no export to the grid, the trip settings shall nevertheless be implemented to cater for switch in operation mode due to malfunction or human intervention.

Table 2: Default Interface Protection Settings

Parameter	Symbol	Trip Setting	Clearance Time
Over Voltage ([a])	U>>	230 V + 10 %	0.2 s
Over Voltage	U>	230 V + 6 %	1.5 s
Under Voltage	U<	230 V – 6 %	1.5 s
Over Frequency ([b])	f>	50 Hz + 1.5 %	0.2 s
Under Frequency	f<	50 Hz - 6 %	0.5 s
Loss of Mains	df/dt Vector shift	2.5 Hz / s 10 degrees	0.5 s

([a]) If the DG can generate higher voltage than the trip setting, the step 2 over voltage is required.

([b]) The trip setting for over frequency is set lower than the maximum operating frequency defined in

Table 1 in order to avoid contribution of the DG to rising frequency.

The trip setting may be modified as per CEB's request on a case-to-case basis.

Note: Voltage and frequency are referred to at the Supply Terminals.

2.5 Network Islanding

2.5.1 DG without Battery Energy Storage System

DG without Battery Energy Storage system shall not supply power to the CEB's network during any outages. It may only be operated during such outages to supply the applicant's own load (isolated generation) with a visibly open tie to the CEB's network. The DG shall be disconnected from the CEB's network within 0.2 seconds of the formation of an island as shown in Table 2.

2.5.2 DG with Battery Energy Storage System

DG with Battery Energy Storage System can operate in islanding mode. However, if it is operating in grid tie mode exporting power to the CEB's network it shall disconnect from the CEB's network within 0.2 seconds of the formation of an island as shown in Table 2.

2.6 Re-connection

Following a protection-initiated disconnection, the DG is to remain disconnected from the network until the voltage and frequency at the supply terminals has remained within the nominal limits for at least 3 minutes under grid tied mode. Automatic reconnection is only allowed when disconnection is due to operating parameters being outside the normal operating range stated in
Table 1, not if disconnection is caused by malfunctioning of any devices within the DG installation.

2.7 Synchronizing AC generators

The DG shall provide and install automatic synchronizing features. Check Synchronizing shall be provided on all generator circuit breakers and any other circuit breakers, unless equipped with appropriate interlock, that are capable of connecting the DG to the CEB's network. Check Synchronizing Interlock shall include a feature such that circuit breaker closure via the Check Synchronizing Interlock is not possible if the permissive closing contact is closed prior to the circuit breaker close signal being generated by close command being activated.

2.8 Earthing Requirements

Earthing shall be according to IEC 60364-5-55.

For systems capable of operating in isolated generation, protection by automatic disconnection of supply shall not rely upon the connection to the earthed point of the utility supply system.

When a DG is operating in parallel with the CEB's network, there shall be no direct connection

between the cogenerator winding (or pole of the primary energy source in the case of a PV array or Fuel Cells) and the CEB's earth terminal.

A DC source or DC generator could be earthed provided the inverter separates the AC and DC sides by at least the equivalent of a safety isolating transformer. However, consideration would then need to be given to the avoidance of corrosion on the DC side.

At the CEB's grid TT earthing system is normal. The neutral and earth conductors must be kept separate throughout the installation, with the final earth terminal connected to a local earth electrode.

Warning Notice that: ***"CONDUCTORS MAY REMAIN LIVE WHEN ISOLATOR IS OPEN"*** shall be conspicuously displayed at the installation.

3 Power Quality

3.1 Limitation of DC Injection

The DG should not inject a Direct Current greater than 0.25 % of the rated Alternating Current output per phase.

3.2 Limitation of Voltage Flicker induced by the SSDG

The DG installation shall not cause abnormal flicker beyond the limits defined by the "Maximum Borderline of Irritation Curve" specified in the IEEE 519-2014.

3.3 Harmonics

Based on IEEE 519, the Total Harmonic Distortion (THD) Voltage shall not exceed 5.0% of the fundamental on 400 V when measured at the Point of Common Coupling (PCC).

The total harmonic distortion will depend on the injected harmonic current and the system impedance seen from the PCC. However, in order to facilitate the fulfilment of the requirements by e.g. inverter manufacturers, the voltage distortion limits have been translated into a similar requirement on current distortion.

The DG output should have low current-distortion levels to ensure that no adverse effects are caused to other equipment connected to the utility system. The DG electrical output at the PCC should comply with Clause 10 of IEEE Std. 519-2014 and should be used to define the acceptable distortion levels for PV systems connected to a utility. The key requirements of this clause are summarised in the following:

(a) Total Harmonic Current Distortion (Total Demand Distortion, TDD) shall be less than 5% of the fundamental frequency current at rated current output.

(b) Each individual harmonic shall be limited to the percentages listed in Table 3. The limits in Table 3 are a percentage of the fundamental frequency current at rated current output.

(c) Even harmonics in these ranges shall be < 25% of the odd harmonic limits listed.

Table 3: Distortion Limits as recommended in IEEE Std. 519-2014 for six-pulse converters

Odd Harmonics	Maximum Harmonic Current Distortion
3^{rd} -9^{th}	4.0%
11^{th} -15^{th}	2.0%
17^{th} -21^{st}	1.5%
23^{rd} -33^{rd}	0.6%
Above the 33^{rd}	0.3%

3.4 Surge Withstand Capability

The interconnection system shall have a surge withstand capability, both oscillatory and fast transient, in accordance with IEC 62305-3, the test levels of 1.5 kV. The design of control systems shall meet or exceed the surge withstand capability requirements of IEEE C37.90.

3.5 Voltage and Current Unbalance

The connection of unbalanced loads and generation to the distribution network can result in unbalanced currents and voltages. DG that uses 3-phase generators or inverters which inject balanced currents into the distribution network do not increase levels of voltage imbalance in the network. In fact, embedded generators which use 3-phase induction generators can actually reduce voltage imbalance.

The total voltage unbalance in the grid should be smaller than 2%, where the unbalance, $U_{unbalance}$, is defined as the maximum deviation from the average of the three-phase voltages, U_a, U_b and U_c, divided by average of the three-phase voltages.

$$U_{unbalance} = \frac{Max\,(U_a, U_b, U_c) - U_{avg}(a,b,c)}{U_{avg}(a,b,c)} \times 100\%$$

The contribution from one installation may not cause an increase of the voltage unbalance of more than 1.3%.

When considering three phase units, the contribution to the voltage unbalance can be described as

$$U_{unbalance} = \frac{\sqrt{3} \times I_{neg\ seq\ load} \times U_{line}}{S_{sc}}$$

Or

$$I_{neg\ seq\ load} = \frac{\sqrt{3} \times U_{unbalance}(\%) \times U_{line}}{S_{sc}}$$

Where

- S_{SC} is the Three phase short circuit power
- $I_{neg\ seq\ load}$ is Negative sequence of component loads
- U_{line} is the line voltage
- $U_{unbalance}$ the voltage unbalance

If nothing else is stated the S_{SC} shall be 2.5 MVA. The demand on voltage unbalance on a three phase load can be translated into a demand on the maximum negative sequence current.

$$I_{\max neg\ seq\ load} = \frac{\sqrt{3} \times 1.3\% \times 400}{2.5} = 3.6\ A$$

3.6 Voltage Step Change

The process of starting a DG can cause step changes in voltage levels in the distribution network. These step changes are caused by inrush currents, which may occur when transformers or generators are energised from the network. Step voltage changes will also occur whenever a loaded generator is suddenly disconnected from the network due to faults or other occurrences.

Step voltage changes caused by the connection and disconnection of generating plants at the distribution level, should not exceed ± 3% for infrequent planned switching events or outages and ± 6% for unplanned outages such as faults.

If the connection of the DG to the grid does not exceed the following values in Table 4 it is expected to stay within the above-mentioned voltage levels.

Table 4: Maximum Inrush Current

Connection	Inrush current
Single phase	19 A
Three phase	30 A

4 Power Factor

The power factor of the DG normal operating conditions across the statutory range of nominal voltage shall be between 0.95 leading and 0.95 lagging.

5 Network Maintenance

The Preventive and Corrective maintenance of the feeder where the DG is connected may interrupt the DG's generation. No compensation shall be applicable for the loss of generation.

6 Safety, Isolation and Switching

6.1 Rules for working on Low Voltage (LV) grid

According to the CEB Safety Rules based on Occupational Safety and Health Act 2005, the following rules, amongst others, must be respected before working on the grid:

a. The system must be Isolated from all possible sources of supply, all switches must be locked in visibly open positions, the system must be tested on the site of work, and

the system must be short-circuited and Earthed.

b. The DG shall have a local means of isolation that disconnects all live conductors including the neutral. The producer shall not energise a de-energised CEB's Power circuit.

c. Switch with visible contact lockable in off position shall be installed to disable the automatic or manual closing of the interconnecting switch or breaker. This switch shall be accessible to the CEB's personnel to obtain the necessary safety requirements when the CEB's personnel is working on associated equipment or lines. While the CEB's personnel are working on the grid, the operation of switches shall be restricted to CEB only. This can be assured by keeping the keys of lockable switches in safe custody. Alternatively, the CEB's personnel will remove and keep fuses while working on lines.

d. In all circumstances the switch, which must be manual, must be capable of being secured in the "OFF" isolating position. The switch must be located at an easily accessible position in the producer's installation.

e. The visible switch shall be visibly marked. Also, all transformers that carry DG installations on the LV side shall be visibly marked. Additionally, the CEB will maintain an updated register of all DGs with precise addresses, connecting points and relevant transformers.

f. The applicant shall ensure that the design provides suitable measuring points for the installation of these meters In all cases, the DG design shall be able to meet the requirements of the applicable RE scheme.

Isolation for a DG without Battery Energy Storage System (BESS) shall be as per Figure 1.

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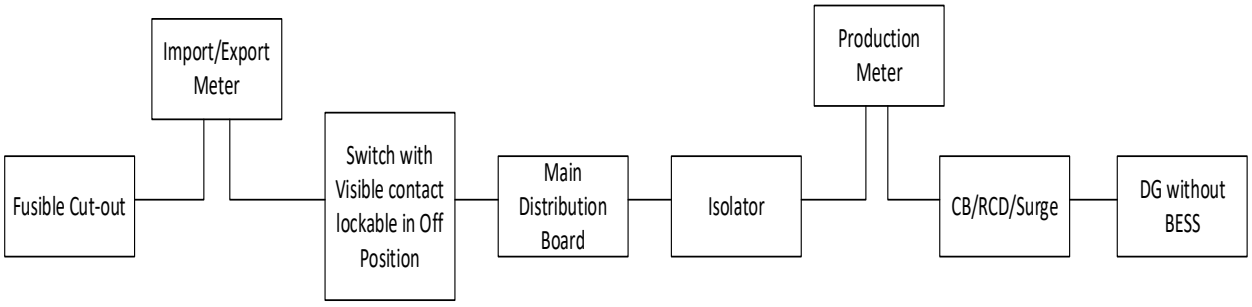

Figure 1: Indicative layout for a DG without BESS

For a DG with Battery Energy Storage System (BESS), indicative layout is shown in Figure 2

The system shall be designed to enable the CEB to install the required energy meters necessary to comply with the Renewable Energy (RE) scheme under which the application has been submitted.

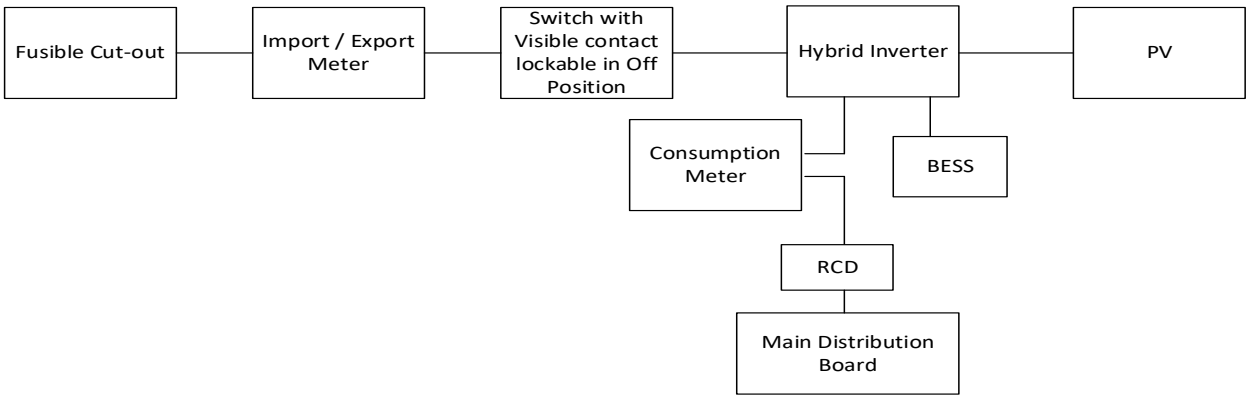

Figure 2: Indicative layout for a DG with BESS

6.2 Safety Concerns

The DG owner shall observe the following safety concerns:

(a) Persons must be warned that the installation includes a DG so that safety precautions should be taken to avoid the risk of electric shock/electrocution. Both the mains supply and the DG must be securely isolated before electrical work is performed on any part of the installation. Adequate labelling must be placed to warn that the installation is connected to another source of energy.

(b) Photovoltaic (PV) cells will produce an output whenever they are exposed to light. Additional precautions such as covering the PV cells will be necessary when working on those parts of the circuit close to the source of energy and upstream of the means of isolation. To guarantee this isolation, the generator operator shall follow the supplier instructions or propose any other means to guarantee it.

(c) The manufacturer or supplier of the DG is required to certify compliance with the Electrical Equipment Safety Regulations and the Electromagnetic Compatibility Regulations. This should ensure that the DG is satisfactory in a domestic installation in terms of the power factor, generation of harmonics and voltage disturbances arising from starting current and synchronization.

(d) The Battery Energy Storage System (BESS) shall be installed, in full compliance with the manufacturer's recommendations. The installation site shall be selected and designed to ensure accessibility, safe operation, prevention of overheating with proper cooling or ventilation system, and maintain environmental conditions suitable for the long-term reliability of the BESS. A fire detection system is also recommended.

6.3 Electromagnetic Emission / Immunity

The DG shall comply with the requirements of the EMC Directive and in particular the product family emission standards.

6.4 Labels

To indicate the presence of the DG within the premises, the CEB shall fix label at: at:

(a) the supply terminals (fused cut-out)

(b) the meters position

(c) the consumer unit

(d) all the points of isolation

For DG with or without Battery Energy Storage System, a label as per Figure 3 will be used:

Figure 3: SSDG Label

The installation operating instructions must contain the manufacturer's contact details e.g. name, telephone number and web address.

6.5 Documentation

Up-to-date information must be displayed at the DG as follows:

a) A single line diagram showing the configuration between the DG and the CEB's fused cut-out. This diagram is also required to show by whom the DG is owned and maintained.

b) A summary of the protection's separate settings incorporated within the equipment. A fully descriptive electrical schematic diagram shall be framed and properly fixed on a wall, within the DG setup, visible to CEB officers.

c) In addition, the maintenance requirements and maintenance services available shall be documented.

d) The applicant shall keep a certificate signed by the maintenance contractor containing at least the following:

- A statement confirming that the solar PV system and Battery Energy Storage System, where applicable, meets the requirements of this standard.
- Client's name and address.
- Site address (if different).
- Contractors name, address etc.
- List of key components installed.
- Estimation of system performance

6.6 Information Plate

The following information shall appear on the information plate for PV system:

(a) Manufacturer's Name or Trade Mark;

(b) Type designation or identification number, or any other means of identification making it possible to obtain relevant information from the manufacturer;

(c) Rated Power;

(d) Nominal Voltage

(e) Nominal Frequency;

(f) Phases;

(g) Power Factor.

For Battery Energy Storage System (BESS) the following information shall appear on the information plate:

(a) Manufacturer name and model number

(b) Battery chemistry

(c) Nominal voltage

(d) Capacity (Ah or Wh/kWh rating)

(e) Cycle life (number of charge/discharge cycles) (Recommended greater than 6000 cycles)

(f) Operating temperature range

(g) Safety certifications

(h) Warning labels (fire hazard, recycling instructions)

(i) Date of manufacture and batch/serial number

6.7 Electrical Contractor / Installer

The DG shall be installed in accordance with the instructions issued by the manufacturer.

In designing a connection for a DG, the electrical contractor /installer must consider all the issues that would need to be covered for a conventional final circuit, including:

(1) the maximum demand (and the generator output);

(2) the type of earthing arrangement;

(3) the nature of the supply;

(4) external influences;

(5) compatibility, maintainability and accessibility;

(6) protection against electric shock;

(7) protection against thermal effects;

(8) protection against overcurrent;

(9) isolation and switching;

(10) selection and installation issues.

The installer must affix a label clearly indicating the next scheduled maintenance of the installations and inform the CEB, who will add the information to the SSDG-register.

The installer must be skilled in the field of DG including Battery Energy Storage System and possess a relevant and approved certificate.

7 Metering

In order to calculate the export or import of the applicant, a bidirectional meter (*Import/Export Meter*) measuring both the imported and exported energy shall be installed.

A second meter measuring the gross energy production or consumption of the DG shall be installed.

The Import/Export Meter and the Production Meter shall be installed next to each other and be easily accessible to CEB personnel, unless otherwise agreed with CEB

For Distributed Generation (DG) incorporating Battery Energy Storage Systems (BESS), the applicant shall ensure that the system design allows for the installation of all required metering devices necessary to achieve the objectives of the Renewable Energy (RE) scheme under which the application has been submitted.
Where additional meters are required to record internal consumption or auxiliary loads, the applicant shall provide suitable measuring points to enable the installation of the CEB's meters. These provisions shall be incorporated into the system design to ensure accurate measurement, monitoring, and compliance with the RE scheme requirements.

8 Testing, Commissioning and Maintenance

Testing and commissioning of DG will be done in the presence of the CEB. The CEB shall notify the applicant in advance with a testing and commissioning plan. The applicant shall keep written records of test results and protection settings. The applicant shall regularly maintain their protection systems in accordance with good electrical industry practice.

9 Standards and Regulations

All electrical apparatus, materials and wiring supplied shall comply with the Electricity Act, the Central Electricity Board Act, Electricity Regulations, this code and the following standards amongst others. Responsibility to comply to relevant standards shall be on the Installer and Applicant.

PV Modules	
IEC 61215	Crystalline silicon terrestrial photovoltaic (PV) modules - Design qualification and type approval
IEC 61646	Thin-film terrestrial photovoltaic (PV) modules - Design qualification and type approval
IEC 61730 - Part 1	Photovoltaic (PV) module safety qualification - Part 1: Requirements for construction
IEC 61730– Part 2	Photovoltaic (PV) module safety qualification - Part 2: Requirements for testing
IEC 61701	Salt mist corrosion testing of photovoltaic (PV) modules
IEC 628041	System voltage durability test for crystalline silicon modules – design qualification and type approval

PV Inverters	
IEC 62109-1	Safety of power converters for use in photovoltaic power systems - Part 1: General requirements
IEC 62109-2	Safety of power converters for use in photovoltaic power systems - Part 2: Particular requirements for inverters
IEC 62116	Test Procedure for islanding prevention measures for Utility connected photovoltaic inverters
IEC 61683	Photovoltaic Systems – Power conditioners – Procedure for measuring efficiency

Grid-Connected System	
IEC 61727	Photovoltaic (PV) systems - Characteristics of the utility interface
EN 50438	Requirements for the connection of micro-generators in parallel with public low voltage distribution networks
IEC 60364-7-712	Electrical installations of buildings - Part 7-712: Requirements for special installations or locations - Solar photovoltaic (PV) power supply systems
IEC 62446	Grid connected photovoltaic systems - Minimum requirements for system documentation, commissioning tests and inspection
IEC 61724	Photovoltaic system performance monitoring - Guidelines for measurement, data exchange and analysis
IEC: 60904-1	Photovoltaic devices - Part 1: Measurement of photovoltaic current-voltage characteristics
IEEE P1547	Series of Standards for Interconnection, May, 2003, NREL/CP-560-34003

GENERAL ENGINEERING STANDARDS	
IEC 60364-5-55	Electrical installations of buildings
IEC 60664-1	Insulation coordination for equipment within low-voltage systems –Part 1: Principles, requirements and tests
IEC 60909-1	Short circuit calculation in three-phase ac systems.
IEC 62305-3	Protection against lightning - Part 3 physical damage and life hazards in structures
IEC 60364-1	Electrical installations of buildings - Part 1: Scope, object and fundamental principles
IEC 60364-5-54	Electrical installations of buildings. Part 5: Selection and erection of electrical equipment. Chapter 54: Earthing arrangements and protective conductors
IEEE C37.90	IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus

Power Quality	
IEC 61000-3-2	Limits - Limits for harmonic current emissions (equipment input current up to and including 16 A per phase)
IEC 61000-3-3	Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection
IEC 61000-6-1	Generic standard -EMC - Susceptibility - Residential, Commercial and Light industry
IEC 61000-6-3	Generic standard - EMC - Emissions - Residential, Commercial and Light industry
IEEE 519	IEEE Recommended practice and requirements for harmonic control of electric power systems, Institute of Electrical and Electronic Engineers, Piscataway, NJ. April 1992

Battery Energy Storage System (BESS)	
IEC 61427	Secondary Cells and Batteries
IEC 62485-2	Safety requirements for secondary batteries and battery installations
IEC62933 Series***	Electrical Energy Storage (ESS) Systems Family of Standards
IEC 62619	Safety Requirements for large scale industrial applications (for lithium cells)

Battery Energy Storage System (BESS)	
IEC 63056	Safety requirements for lithium battery packs and systems for stationary applications
IEC 62281 (for Lithium Ion Battery)	Safety of primary and secondary lithium cells and batteries during transport
IEC 62351 series	Power system security
IEC 62620	Secondary cells and batteries containing alkaline or other non-acid electrolytes
IEC 60664-1	Insulation Co-ordination for equipment within low-voltage systems
IEC 60695-1-11	Fire and Hazard Assessment
IEC 62103	Electronic equipment for use in power installations
IEC 61140	Protection against electric shock
IEC 60364	Electrical installations for buildings
IEC 62281	Safety of primary and secondary lithium cells and batteries during transport
UL 1973 and UL 9540 Certification	For battery safety testing or field evaluation to ensure compliance with IEC 62485-2, 61508, 60812 (if applicable)
UL 1642	Standard for safety for lithium-ion batteries
IEC 62477-1	Safety requirements for power electronic converter systems
IEC 60068-2-1:2007	Environmental testing - Part 2-1: Tests - Test A: Cold
IEC 60068-2-2:2007	Environmental testing - Part 2-2: Tests - Test B: Dry heat
IEC 60068-2-14:2009	Environmental testing - Part 2-14: Tests - Test N: Change of temperature
IEC 60068-2-30:2005	Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)
IEC 62109-1 / IEC 62109-2	Safety of power converters for use in power systems
IEC 61000 series	Electromagnetic compatibility (EMC)

Note:

1. **All specifications shall be according to the latest edition of the standards mentioned above.**
2. **In addition, the DG owner shall ensure that his proposed installations comply with all prevailing regulations pertaining to environment, health and safety, etc.**

CHAPTER 3 - GRID CODE MODIFICATIONS

CEB will propose a new version of this Grid Code in case that:

(i) some of the values included in it needs to be modified due to the evolution of the system.

(ii) the amount of generation in one or more of the segments considered requires a more severe control.

(iii) a better adequacy to operating conditions is required.

(iv) Further amendments to grid code to be prepared as addendum

CHAPTER 4 - NON-COMPLIANCE WITH THE CODE

In case of non-compliance with any of the technical provisions in this Grid Code, CEB shall inform the owner in writing of the discrepancies. The DG owner shall have 30 days to rectify the discrepancies.

Failing to do that, CEB shall be entitled to disconnect the DG.

CEB shall be entitled to disconnect the DG without prior notification if the installation conditions are harmful or creates unavoidable risks for the safety.

CEB shall not be responsible for any damage if such disconnection requires the disconnection of other loads associated or connected to the same connection as the SSDG.

Reconnection of the DG shall require that CEB certifies that the installation complies with this Grid Code. Fees applicable shall be the same as for reconnection fee.

ANNEX 1: Abbreviations and Definitions

“AC” means Alternating Current;

“Applicant” means a producer of electricity through a SSDG installation;

“BESS” means Battery Energy Storage System;

“CEB” means the Central Electricity Board;

“ Circuit breaker ” means a switching device capable of making, carrying, and breaking currents under normal circuit conditions and also making, carrying for a specified time, and breaking currents under specified abnormal conditions such as those of short circuit;

“DC” means Direct Current;

“Dedicated transformer” means a transformer installed between the CEB’s network and SSDG network that serves only the SSDG and attached loads, if any**;**

“DG” means Distributed Generation;

“Distributed generation” means electric generation facilities connected to the Utility network at the PCC;

“Directional-power relay” means a relay that operates on a predetermined value of power flow in a given direction, or upon reverse power so that, when used with SSDG in a non-export configuration, it will prevent power flow into the CEB´s Network;

“Flicker” means a variation of input voltage sufficient in duration to allow visual observation of a change in electric light source intensity;

“Fault” means a physical condition that causes a device, a component, or an element to fail to perform in a required manner, for example a short-circuit, a broken wire, an intermittent connection;

“Frequency” means the number of complete cycles of sinusoidal variations per unit time;

“Greenfield” means an installation of SSDG at a location without existing connection point;

“Grid” means CEB’s network that brings electricity from power stations to consumers;

“THD” means Total Harmonic Distortion;

"Harmonic distortion" means continuous distortion of the normal sine wave; typically caused by nonlinear loads or by inverters, measured in Total Harmonic Distortion (THD);

"IGBT" means Insulated-gate bipolar transistor;

"Installer" means a person who has been certified by the supplier or has followed a course on Certified SSDG installation;

"IPP" means an Independent Power Producer;

"Islanding" means a condition in which a portion of the CEB's network is energised by one or more SSDGs through their PCC(s) while electrically separated from the rest of the system;

"Isolated Generation" means a condition where the electrical path at the PCC is open and the SSDG continues to energise local loads;

"kV" means kilovolt;

"kVA" means Kilovolt Ampere

"kW" means Kilo Watt (1,000 W = 1,000 J/s); "kWh" means Kilowatt hour (1,000 watt hours);

"LV" means Low Voltage (Voltage below 1,000 V);

"MW" means megawatt (1,000,000 W = 1,000,000 J/s);

"Parallel operation" means a condition where the SSDG is operating while connected to CEB's network;

"PCC" means point of common coupling;

"Point of Common Coupling (PCC)" means the point at which a SSDG is connected to the CEB's network;

"Power factor Ratio" means ratio of real to total apparent power (kW/kVA) expressed as a decimal or percentage;

"Producer" means a producer of electricity through a SSDG installation or the owner thereof;

"PV" means photovoltaic;

"PWM" means Pulse width modulation;

"RE" means renewable energy;

"SSDG" means Small Scale Distributed Generation up to 50 kW as categorised in Schedule 2

" Supply Terminals" has the same definition as that in Electricity Act.

"SWC" means Surge Withstand Capability, the immunity of this equipment to fast and repetitive electrical transients;

"TT system" means in a TT earthing system, the protective earth connection of the consumer is provided by a local connection to earth;

"Voltage-restrained over-current relay" means a protective relay in which the pickup and over-current tripping times are affected by the voltage.

ANNEX 2: Certificate of Installation

After completing the DG installation, the Applicant shall submit the following duly filled and signed "Certificate of Installation" to the CEB (available on the CEB website):

CERTIFICATE OF INSTALLATION

I hereby certify that the installation of the SSDG of Capacity [.....] kW, with BESS of [.....]kW, [.....]kWh situated at address [.....] for Applicant [.....] has been done as per the requirements of the SSDG Grid Code (Ver. 3.0) and as per attached detailed schematic diagram.

The **inverter trip settings and power limitation parameters** have been configured in accordance with the approved settings, as detailed below. Furthermore, the battery system & overall installation is certified as **safe for operation** at the location where it has been installed on the customer's premises.

1. The details of the equipment installed are as follows:

Equipment	Make/Model	Rating (W)&(kWh)	Quantity
Photovoltaic Modules			
Inverter			
Battery Energy Storage System			

2. The inverter has been set as per the following settings:

Protection Parameters Settings	Trip Setting	Clearance Time	Trip Indication Provided
Over Voltage (230 V + 10 %)			
Over Voltage (230 V + 6 %)			
Under Voltage (230 V – 6 %)			
Over Frequency (50 Hz + 2 %)			
Under Frequency (50 Hz - 6 %)			
Loss of Mains (df/dt - Vector shift)			
Reconnection Time			
Power limitation on Power Exported to Grid (W)			
Line impedance (ohm)			

3. Mode of Operation

Describe in detail the mode of operation of the DG as configured

Name of Certified Installer:……(company seal)

Signature of Certified Installer: ……..Date:……

Name of Applicant: …….

Signature of Applicant:……..Date: …….

ANNEX 3: Certificate for Commercial Operation

SSDG Serial No.:		Contract Ac. No.:	
Name of SSDG owner:			
Site Address:			
Type of DG:	PV ☐	Hybrid (PV + BESS) ☐	
Capacity of DG:	**KW** Single phase ☐	Three phase ☐	
Capacity of BESS	**kW**	**kWh**	
Tariff		Date	

CEB Meter Details & Readings

Meter	**Make / Model & Serial No.**	**Export Readings**	**Import Readings**	**Seal No.**	**Phase Rotation**
Import/ Export		2.8. : …… 2.8.2: …… 2.8.3 :……	1.8. : …… 1.8.2: …… 1.8.3: ……		
Production		2.8. : …… 2.8.2: …… 2.8.3: ……			
Consumption		1.8. : …… 1.8.2: …… 1.8.3: ……			

Name of SSDG Officer: ……Signature: …… Date……

Name of District Officer: ……..Signature: ……Date……..

Statement of DG Owner

I certify that the meter details and readings, as described in table above, have been taken in my presence and are correct.

Name of DG owner/representative: ……..Signature: ……

Date: ……..