NEMSA Guidelines for Interconnecting Solar Mini-Grids to Distribution Networks 2026

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INTRODUCTION[1]

Nigeria's electricity sector has recorded significant growth in the deployment of solar mini-grids, particularly in unserved and underserved communities, where solar photovoltaic (PV) systems combined with battery storage have become a cost-effective means of expanding electricity access.

At the same time, Distribution Networks[2] are increasingly extending into areas previously served principally by isolated mini-grids. This convergence has created a growing need for arrangements that allow solar mini-grids to interconnect with the Distribution Network.

Such interconnection can enable solar mini-grids to supplement inadequate grid supply and, where permitted, export surplus electricity to the network. This can improve supply reliability, optimise the use of available generation capacity and strengthen the commercial sustainability of solar mini-grid projects through additional electricity sales.

Under the Mini-Grid Regulations 2026 (Mini-Grid Regulation), the Nigerian Electricity Regulatory Commission (NERC) may grant permits for the construction, ownership, operation and maintenance of isolated and interconnected solar mini-grids. The Mini-Grid Regulation also establish the regulatory framework for connecting mini-grids to distribution networks. In particular, section 9 sets out the principal approval, contractual and technical requirements applicable to interconnected mini-grids,3 including the execution of a (i) tripartite agreement amongst the interconnected mini-grid developer, distribution company and connected community, (ii) publication of hosting capacity information, (iii) technical assessment of proposed interconnections and (iv) compliance with applicable NERC technical codes. The Mini-Grid Regulations do not, however, comprehensively address the detailed engineering procedures and technical specifications required to implement such interconnections to the distribution networks. Accordingly, supplementary technical guidance was required to establish a consistent and predictable process for the assessment, design, approval, commissioning and operation of solar mini-grid interconnections.

The Mini-Grid Regulations establish the overarching regulatory framework for interconnected mini-grids and prescribe certain technical and operational requirements applicable to their interconnection with Distribution Networks. They do not, however, set out the full suite of detailed engineering procedures, technical specifications, testing protocols and implementation requirements required for solar mini-grid interconnections. Accordingly, more detailed technical guidance was required to provide a consistent framework for the design, assessment, approval, installation, inspection, testing, commissioning and operation of solar mini-grid interconnections.

The Guidelines for Interconnecting Solar Mini-Grids to Distribution Networks (Guidelines), issued by the Nigerian Electricity Management Services Agency (NEMSA) on 2 June 2026 addresses this gap.

1. *This newsletter is for general information purposes only and does not constitute legal advice. Specific projects require tailored analysis.*
2. *The Guidelines do not expressly define a "Distribution Network". However, read together with the definition of a "Distribution Licensee" and the other relevant provisions of the Guidelines, the term may reasonably be understood as the network operated by a Distribution Licensee for the distribution of electricity. This interpretation is consistent with the Mini-Grid Regulations 2026, which define a "Distribution Network" as any connection of cables, service lines, overhead lines and electrical apparatus or equipment, with a design voltage of 33 kV or below, used to transport electricity through a distribution system.*
3. *Interconnected mini-grids according to the Mini-Grid Regulations are defined as a mini-grid connected to, and operated in coordination with, a distribution licensee's network, with installed capacity up to 10 megawatt (MW) per site.*

The Guidelines set out five distinct interconnection models, prescribes a structured multi-stage interconnection process, and establish detailed technical and metering requirements intended to protect grid stability, power quality, and public safety while supporting continued investment in Nigeria's decentralised renewable energy sector.

MINI GRID INTERCONNECTION MODELS

The Guidelines provide for five models for interconnecting solar mini-grids with distribution networks:

i. the Small Power Producer (SPP) model;

ii. the Small Power Distributor (SPD) model;

iii. the Hybrid SPP and SPD model;

iv. the Compensation Buy-Out (CBO) model; and

v. the Time-Split Supply (TSS) model.

Small Power Producer

The Small Power Producer (SPP) model is an interconnection model, under which the solar mini-grid developer generates electricity and injects it into the Distribution Network while the Distribution Licensee (DisCo) assumes responsibility for retailing electricity to the mini-grid's customers. Under the Guidelines, the SPP Model corresponds to a limited export or managed export interconnected project under the Mini-Grid Regulations. A limited export interconnected project may export electricity to the distribution licensee's network up to a fixed approved maximum limit. By contrast, a managed export interconnected project may export electricity to the distribution licensee's network subject to variable or time-dependent limits, specified operating periods, communication requirements or control instructions approved by NERC to preserve network safety, reliability and stability. Importantly, both limited export and managed export interconnected projects may generate and sell electricity to the distribution licensee for delivery through its Distribution Network, subject to their respective approved export limits and operating conditions.

Small Power Distributor

Under the Small Power Distributor Model (SPD) model, the solar mini-grid developer decommissions the solar mini-grid, purchases bulk electricity from the Distribution Network, and retails the purchased electricity to the mini-grid customer.

The SPD model operates as a non-export interconnected project, with the transition governed by the Mini-Grid Regulations. The Mini-Grid Regulation[4] defines non-export interconnection project as an interconnected mini-grid permitted to import electricity from the distribution licensee but not permitted to export electricity to the distribution licensee's network during normal operation, except expressly approved by the NERC.

The SPD model is essentially a bulk-purchase and retail-distribution model, rather than a power-generation model. The mini-grid developer stops generating electricity and becomes a local electricity distributor or retailer. It purchases electricity in bulk from the distribution licensee at an agreed bulk-supply tariff and resells that electricity to customers within the former mini-grid service area. Its commercial return is derived principally from the difference between the bulk purchase price and the approved retail tariff, after accounting for network operation, maintenance, metering, billing, losses and other permitted costs.

SPP & SPD Hybrid

Under this model, the solar mini-grid developer generates electricity for injection into the distribution licensee's network and retails electricity to customers within the mini-grid service area. The electricity supplied to those customers may comprise both electricity generated by the mini-grid and electricity purchased from the Distribution Licensee through the grid. [5]

Under the hybrid SPP and SPD Model the solar mini-grid developer performs two functions simultaneously:

(x) Generation and export: The developer generates electricity from its solar PV and battery system. It supplies customers within the mini-grid service area and may inject surplus electricity into the Distribution Network, subject to the approved export limits and technical requirements.

(y) Bulk purchase and retail: When the mini-grid cannot generate enough electricity to meet customer demand, for example, at night or during periods of low solar generation, the developer purchases additional electricity from the distribution licensee. The developer then retails the combined electricity supply to customers within its service area.

4. *Section 3.2 of the Guidelines*
5. *.Section 3.3 of the Guidelines.*
6. *Section 3.4 of the Guidelines.*

Compensation Buy-Out

Under the Compensation Buy-Out (CBO) model, the DisCo purchases the solar mini-grid's assets from the developer, in accordance with the compensation provisions of the Mini-Grid Regulations, and assumes full responsibility for electricity supply within the affected area.[6] Section 21 of the Mini-Grid Regulations provides that, where a DisCo extends its distribution network to an area served by a permitted isolated mini-grid, the parties may agree to transfer all the mini-grid's distribution assets to the DisCo or another approved operator. The compensation payable must comprise the higher of:

i. the verified indexed historical cost of the prudent, efficiently incurred, used and useful assets, net of accumulated depreciation and excluded contributions; and

ii. the verified net depreciated replacement cost of those assets.

The compensation must also include approved preservation, handover, removal, reinstatement, decommissioning and other transition costs.

Depending on the age of the project, the developer may additionally be entitled to unrecovered development and construction costs and an amount equal to the revenue generated by the mini-grid during the 12 months preceding the transfer. The compensation must be calculated in accordance with Schedule 13 of the Mini Grid Regulation and approved by the NERC before the transfer is completed.

Time-Split Supply

The Time-Split Supply (TSS) model allows the solar mini-grid developer and the DisCo to supply electricity to the same group of customers at different times. The solar mini-grid developer remains the retailer responsible for supplying and billing the customers, but the electricity sold to them may come either from the DisCo's distribution network or from the solar mini-grid's generation and battery-storage system.[7]

The DisCo and the solar mini-grid developer agree in advance on the periods during which each source will supply the customers. For example, the solar mini-grid may supply customers during daylight hours, while the DisCo supplies them at night or whenever solar generation and stored energy are insufficient. The parties must also agree on how the customers will be switched safely between the two sources, how electricity received from the DisCo will be measured and paid for, and which party is responsible for operating and maintaining the relevant equipment.

The arrangement may operate as a non-export interconnected project unless parallel operation or export to the distribution licensee's network is expressly approved by the NERC. It means that, as the default position, electricity is permitted to flow from the DisCo's distribution network into the solar mini-grid, but electricity generated by the solar mini-grid is not permitted to flow back into the DisCo's network.

The appropriate interconnection model will depend on the technical characteristics, commercial viability and supply requirements of the relevant site. Accordingly, the Guidelines contemplate that the solar mini-grid developer and the DisCo will jointly evaluate and agree on the model most suitable for each project, particularly where an existing isolated mini-grid is required to transition following the extension of the Distribution Network into its service area. Any selected model must comply with the applicable regulatory, technical and safety requirements and, where required, receive the NERC's approval.

Scope of Application

The Guidelines apply to all ranges of solar mini-grid capacity as provided in the Mini-Grid Regulations 2026[8] are enforced by NEMSA, with implementation carried out by the relevant DisCo in close collaboration with the solar mini-grid developer.[9]

It is to be read and applied together with the Electricity Act 2023, the NERC regulations and codes referenced therein, including the Nigerian Electricity Health and Safety Code 2014, the Nigerian Electricity Supply and Installation Standards (NESIS) Regulations 2015, the Grid Code 2018, the Distribution Code 2014, the Metering Code V02 2014, the Smart Metering Regulations 2015, and the Mini-Grid Regulations 2026, as well as other applicable NEMSA guidelines and the relevant IEC standards governing PV systems and battery installations.[10]

Where a conflict arises between the Guidelines and any other NEMSA guideline on a matter relating specifically to mini-grid interconnection, the Guidelines take precedence, provided they remain consistent with extant laws and regulations. The Guidelines are subject to review by NEMSA at least once every three years.[11]

7. *Section 3.5 of the Guidelines.*
8. *being interconnected mini-grids with an installed generated capacity of up to 10MW persite.*
9. *Definition of 'Interconnected Mini-Grid', Definitions section of the Guidelines.*
10. *Section 2.3(3) of the Guidelines.*
11. *Section 2.3(4)–(5) of the Guidelines.*

Hosting Capacity Information and Suitability Screening

A central feature of the Guidelines is the introduction of Hosting Capacity Information (HCI), which is a feeder-level or network-level technical information published or confirmed by a DisCo, in a form approved by the Commission, showing the indicative ability of a feeder or network segment to accommodate an interconnected solar mini-grid without material adverse effect on safety, stability, voltage, protection, or power quality. DisCos are required to update their HCI at least once every twelve months, within sixty days of any material feeder change, or as directed by the Commission.[12]

Before filing an application for interconnection, a solar mini-grid developer must review the relevant DisCo's published HCI to identify, among other things, the proposed Point of Common Coupling (PCC),[13] the available hosting capacity, and whether the project qualifies for a simplified interconnection pathway or requires a full System Impact Study.[14,15]

A DisCo is required to validate its suitability for interconnection with a mini-grid. These requirements include that the proposed PCC sits on a radial distribution network, that the mini-grid's Alternating Current (AC) capacity does not exceed available hosting capacity absent approved reinforcement, that the mini-grid's fault current remains between 1.25 and 1.5 times its normal operating current, and that existing protective equipment can safely accommodate the resulting maximum loads and fault currents. Where a proposed interconnection fails to satisfy these criteria, the DisCo must carry out a supplementary study to explore alternative interconnection options rather than reject the application outright.[16]

INTERCONNECTION PROCESS

Preliminary Stage

The interconnection process commences with the developer's review of HCI and site status, followed by the filing of a prescribed application form, the execution of a memorandum of understanding to facilitate information sharing, and the mutual exchange of technical information between the developer and the DisCo.[17]

Upon validating suitability, the DisCo must complete the prescribed feedback form and communicate its decision to the developer. The Guidelines note that the screening process may take up to seven business days, with the DisCo required to inform the developer of the outcome, including explanations for the decision, within ten business days of receiving the application.[18]

Permitting Stage

Where the preliminary screening is successful, the developer must submit a full Technical and Investment Plan (Annex E), accompanied by a draft tripartite agreement negotiated with the DisCo and host community using Schedule 10 of the Mini-Grid Regulations 2026 as a guide. Following the DisCo's review and approval, the tripartite agreement is executed by the parties, after which the developer applies to NERC for a Mini-Grid Permit, attaching the executed tripartite agreement and all other prescribed documentation.[19]

Completion and Inspection Stage

The developer shall install the solar mini-grid plant, notify NEMSA and the DisCo of completion, and apply for inspection and testing under the Guidelines. Any sanctions for non-compliance or disputes arising from the inspection process are resolved under that 2020 guideline.[20]

Commissioning Stage

Commissioning may proceed only after the developer has notified the DisCo of the proposed commissioning date and has obtained both the NERC mini-grid permit and the NEMSA inspection certificate, ensuring that the PCC is confirmed safe for connection before energisation.[21]

TECHNICAL GUIDELINES AND REQUIREMENTS

Requirements for Small Power Producers

A solar mini-grid operating as an SPP must demonstrate voltage and power factor regulation, Low or Fault Voltage Ride-Through[22] capability, operator-controllable ramp rates and curtailment functionality, and export control consistent with its approved export limit. A formerly isolated mini-grid converting to SPP status must replace its off-grid inverter with a grid-tie Inverter.[23]

13. *According to the Guidelines the Point of Common Coupling is the physical connection point where a solar mini-grid links to the distribution licensee's network. In practical terms, the handover point at which the electricity supply passes between the mini-grid and the grid, and where metering, protection, and commercial responsibilities are defined.*
14. *According to the guidelines a System Impact Study (SIS) is a detailed technical assessment carried out to determine the effect that connecting a mini-grid will have on the Distribution Licensee's existing network, covering safety, voltage levels, protection settings, and overall network stability.*
15. *Section 4.1.1(1) of the Guidelines.*
16. *Section 4.1.1(5) of the Guidelines.*
17. *Section 4.1.1(2)–(4) of the Guidelines.*
18. *Annex D of the Guidelines.*
19. *Section 4.1.2 of the Guidelines.*
20. *Section 4.1.3 of the Guidelines.*
21. *Section 4.1.4 of the Guidelines.*
22. *Low Voltage Ride-Through (LVRT) and Fault Ride-Through (FRT) refer to the capability of a solar mini-grid to remain connected and operational during brief dips in grid voltage or short-term disruptions to grid frequency, rather than automatically disconnecting at the first sign of instability. This capability is essential for maintaining grid stability during fault events. See the Definitions section and section 5.1.1(b) of the Guidelines.*
23. *Section 5.1.1 of the Guidelines.*

The SPP must track the Distribution Network's voltage and frequency at the PCC and disconnect where power quality deviates beyond prescribed tolerances, namely a voltage variation of ±6% of nominal, a frequency variation of ±2.5% of the nominal 50Hz, and Total Harmonic Distortion of ±5%.[24]

Anti-islanding protection in accordance with IEC 61727 is mandatory for all SPP generators, and the SPP must retain the functionality to curtail power output on the instruction of the DisCo, reflecting the Guidelines' emphasis on dispatchability as a condition of grid integration.[25]

Requirements for Small Power Distributors and Hybrid Arrangements

A mini-grid converting to SPD status must install a step-down transformer where it operates at low voltage while the Distribution Network is supplied at medium voltage, with the mini-grid's low-voltage assets, including conductors, protection corridors, circuit breakers, lightning protection, earthing, switching equipment, droplines, and energy meters, brought into conformity with the distribution code 2015 and 2018 and the NESIS Regulations 2015 .[26,27]

Where a developer adopts the SPP and SPD hybrid model, the technical requirements applicable to both the SPP and SPD models apply concurrently, reflecting the dual generation and retail functions performed under that arrangement.[28]

Time-Split Supply, Metering and Inverter Standards

A mini-grid operating under the TSS model must install switching equipment capable of safely transferring supply between the mini-grid generator and the Distribution Network without compromising system stability, with the switching scheme designed to prevent parallel operation except where expressly agreed with the DisCo, and all switching coordinated under a jointly approved supply schedule.[29]

Protection settings and anti-islanding measures under the TSS model must be coordinated with the DisCo to prevent back-feeding and to ensure correct isolation during supply transitions, grid outages, or fault conditions, while metering at the interconnection point must separately measure energy imported and exported using smart meters with time-of-use or interval measurement capability.[30]

Across all interconnection models, inverters used at the PCC must be grid-tie inverters with evidenced product certification, capable of maintaining system stability through protection against over- and under-voltage, over- and under-frequency, and bidirectional overcurrent conditions.[31]

NEMSA retains responsibility for conducting prescribed onsite tests, including short-circuit current, insulation resistance, and transformer ratio tests, as well as type and routine tests of system components, while metering units at the interconnection point must be smart meters compliant with the Metering Code 2014 and the Smart Metering Regulations 2015.[32]

Developers converting from isolated to interconnected operation are expected to budget for the capital expenditure associated with inverter replacement, transformer installation (where applicable), and protection system upgrades, and factor the NEMSA inspection and NERC permitting timelines into their project schedules. Early engagement with the relevant DisCo on hosting capacity and switching arrangements is advised to avoid delays at the commissioning stage.

MARKET OUTLOOK

For solar mini-grid developers, the Guidelines provide a clearer and more predictable pathway for developing interconnected mini-grids by standardising the applicable interconnection models, technical requirements and approval processes. This reduces project-development uncertainty, facilitates technical due diligence and enables developers to assess interconnection requirements and costs more effectively at the project-development stage.

DisCo will need to invest in the institutional capacity required to publish and maintain accurate, feeder-level HCI,[33] process interconnection applications and technical and investment plans within the screening and feedback timelines anticipated by the Guidelines, and to negotiate and administer tripartite agreements alongside developers and host communities.

24. *Section 5.1.2 of the Guidelines.*
25. *Sections 5.1.3–5.1.4 of the Guidelines.*
26. *Section 5.2 of the Guidelines.*
27. *It is noted that the Guidelines internally refer to both the "Distribution Code, 2014" (section 2.3(3)(c)(iv)) and the "Distribution Code, 2018" (section 5.2(3)). Practitioners should confirm the applicable version with the relevant DisCo or NERC.*
28. *Section 5.3 of the Guidelines.*
29. *Section 5.4.1 of the Guidelines.*
30. *Sections 5.4.2–5.4.3 of the Guidelines.*
31. *Section 5.5 of the Guidelines.*
32. *Sections 5.6–5.7 of the Guidelines.*
33. *Hosting Capacity Information (HCI) is data published by a DisCo at feeder or network-segment level, showing the maximum additional generation capacity that the network can absorb without adversely affecting safety, voltage stability, or power quality. DisCos are required to update their HCI at least once every twelve months. See the Definitions section and section 4.1.1(1) of the Guidelines.*

The ability of DisCos to perform these functions efficiently will materially affect the speed at which solar mini-grid interconnections can be implemented across their networks. For investors and financiers, the Guidelines provide greater visibility on the technical and procedural requirements for interconnection, thereby reducing a material area of project development risk. This should support the bankability of interconnected mini-grid projects, particularly where financing is dependent on demonstrating a clear interconnection pathway, defined technical requirements and credible arrangements for the import, export and sale of electricity.

Compliance with the applicable technical requirements may require additional capital expenditure, particularly where an existing isolated mini-grid must undertake inverter replacement, protection system upgrades or other modifications to achieve interconnection.

For host communities, the interconnection framework preserves a formal role for the community through the tripartite agreement, which requires the participation and consent of the connected community in determining key aspects of the interconnection arrangement. At a broader sector level, the Guidelines support the integration of decentralised renewable generation into Distribution Networks, enabling mini-grids to supplement inadequate grid supply while reducing pressure on existing distribution infrastructure.

RECOMMENDATIONS

The effective implementation of the Guidelines will depend significantly on the technical and institutional capacity of DisCos to provide the network information required to support the interconnection process. In particular, the Guidelines contemplate that developers will rely on feeder-level HCI at the preliminary assessment stage and that DisCos will undertake screening, determine the appropriate system impact study pathway, and provide relevant network, protection and capacity data within prescribed timelines. In practice, however, the quality, completeness and frequency of network data maintained by DisCos may vary considerably, and some DisCos may not presently maintain sufficiently granular or routinely updated feeder-level information. This could delay preliminary screening, increase reliance on project-specific system studies and undermine the objective of creating a predictable and expedited interconnection process. Similar implementation constraints may arise in relation to protection coordination, communications infrastructure, metering integration and the technical personnel required to evaluate increasingly complex embedded generation projects..

Although the Guidelines identify the SPP and SPP and SDP hybrid models as arrangements under which a mini-grid may export electricity to the Distribution Network, the commercial framework is supplemented by the Mini-Grid Regulations 2026, under which the parties may agree an export tariff or settlement methodology, subject to the applicable regulatory and contractual arrangements. Where no agreement is reached within 30 business days following technical approval of export capability, the default export pricing and settlement methodology prescribed in Schedule 8 of the Mini-Grid Regulations applies. Accordingly, effective implementation will require developers and DisCos to understand and consistently apply the Guidelines together with the commercial framework under the Mini-Grid Regulations to avoid uncertainty or delay in negotiating export arrangements.

CONCLUSION

The Guidelines for Interconnecting Solar Mini-Grids to Distribution Networks 2026 represent an important development in the regulatory and technical framework for interconnected solar mini-grids in Nigeria. By establishing defined interconnection models, a structured process for assessing and implementing interconnection, and detailed technical, testing and commissioning requirements, the Guidelines provide developers and DisCos with a more standardised and predictable framework for integrating solar mini-grids with distribution networks. The effectiveness of the Guidelines will however depend on the availability of reliable network information, and effective coordination among developers, DisCos, host communities, NEMSA and other relevant sector institutions throughout the interconnection process.

33. *The Net Billing Regulations 2026 (NERC–R–002–2026) were issued by NERC pursuant to section 226 of the Electricity Act 2023 and establish the framework for net billing of distributed renewable energy systems. The HCI publication approach anticipated under those Regulations is a useful comparator for the feeder-level data requirements under the Guidelines.*

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