Informational Note: These systems operate independently from an electric utility and include isolated microgrid systems. Stand-alone systems often include a single or a compatible interconnection of sources such as engine generators, solar PV, wind, ESS, or batteries.

This article addresses the operating parameters for electric power production sources in stand-alone mode. If a stand-alone system is interconnected with the alternating-current (ac) system, the requirements of Article 705 apply. Power production sources such as a generator, photovoltaic (PV) system, fuel cell, and wind electric system supplying a sign, lights, irrigation system, or remote facilities such as a cabin are a few examples of stand-alone systems. These systems can include energy storage or backup power supplies.

Article 710, which covers stand-alone systems, and Article 702, which covers optional standby systems, are not mutually exclusive. In respect to how the two articles interact, a stand-alone system operating in island mode (such as a generator or a solar PV system) serves as the alternate electric power production source for the optional standby system loads covered by Article 702. The connection of the stand-alone system to the optional standby system loads can be done automatically or manually using transfer equipment or multimode inverters. The capacity of the stand-alone source is affected by whether the optional standby system loads are connected automatically or manually as specified in 702.4(A)(1) and (2).

Δ **710.6 Equipment Approval.** All power production equipment or systems shall be approved for use in island mode and comply with one of the following:

(1) Be listed
(2) Be evaluated for the application and have a field label applied

Δ **710.10 Identification of Power Sources.** A permanent plaque, label, or directory shall be installed at a building supplied by a stand-alone system at the power source disconnecting means location, or at an approved readily visible location. The plaque, label, or directory shall denote the location of each power source disconnecting means for the building or be grouped with other plaques or directories for other on-site sources. Where multiple sources supply the building, markings shall comply with 705.10.

710.12 Stand-Alone Inverter Input Circuit Current. The maximum current shall be the stand-alone continuous inverter input current rating when the inverter is producing rated power at the lowest input voltage.

710.15 General. Premises wiring systems shall be adequate to meet the requirements of this *Code* for similar installations supplied by a feeder or service. The wiring on the supply side of the building or structure disconnecting means shall comply with the requirements of this *Code*, except as modified by 710.15(A) through (G).

(A) Supply Output. Power supply to premises wiring systems fed by stand-alone or isolated microgrid power sources shall be permitted to have less capacity than the calculated load. The capacity of the sum of all sources of the stand-alone supply shall be equal to or greater than the load posed by the largest single utilization equipment connected to the system. Calculated general lighting loads shall not be considered as a single load.

Informational Note: For general-use loads the system capacity can be calculated using the sum of the capacity of the firm sources, such as generators and ESS inverters. For specialty loads intended to be powered directly from a variable source, the capacity can be calculated using the sum of the variable sources, such as PV or wind inverters, or the combined capacity of both firm and variable sources.

Even though a stand-alone installation may have disconnecting means rated at 100 or 200 amperes at 120/240 volts, the PV source is not required to provide either the full current rating or the dual voltages of the service equipment. A PV installation usually is designed so that the actual ac demands on the system are sized to the output rating of the PV system. The inverter output is required to have sufficient capacity to power the largest single piece of utilization equipment to be supplied by the PV system, but the inverter output does not have to be rated for potential multiple loads to be simultaneously connected to it.

(B) Sizing and Protection. The circuit conductors between a stand-alone source and a building or structure disconnecting means shall be sized based on the sum of the output ratings of the stand-alone source(s). For three-phase interconnections, the phase loads shall be controlled or balanced to be compatible with specifications of the sum of the power supply capacities.

Δ **(C) Single 120-Volt Supply.** Stand-alone and isolated microgrid systems shall be permitted to supply 120 volts to single-phase, 3-wire, 120/240-volt service equipment or distribution panels where there are no 240-volt outlets and where there are no multiwire branch circuits. In all installations, the sum of the ratings of the power sources shall be less than the rating of the neutral bus in the service equipment. This equipment shall be marked with the following words or equivalent:

WARNING:
SINGLE 120-VOLT SUPPLY.
DO NOT CONNECT MULTIWIRE
BRANCH CIRCUITS!

The warning sign(s) or label(s) shall comply with 110.21(B).

If multiwire branch circuits are connected to a normal 120/240-volt ac service, the currents in the neutral conductors subtract or are at most no larger than the rating of the branch-circuit overcurrent device. If the electrical system consists of a single 120-volt electrical system supplying the two buses in the panelboard, the currents in the grounded conductor for each multiwire branch circuit add rather than subtract. Because the two buses are in phase, there is no neutral conductor. The currents in these conductors can be as high as twice the rating of the branch-circuit overcurrent device, and overloading is possible.

(D) Three-phase Supply. Stand-alone and microgrid systems shall be permitted to supply three-phase, 3-wire or 4-wire systems.