



NECA 417-2019

AN AMERICAN NATIONAL STANDARD



Recommended Practice for

Designing, Installing, Operating, and Maintaining Microgrids

Published by
National Electrical
Contractors Association



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National Standard



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Revision History	
NECA 417-2019	10-2019

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(This foreword is not a part of the standard)

Foreword

National Electrical Installation Standards™ are designed to improve communication among specifiers, purchasers, and suppliers of electrical construction services. They define a minimum baseline of quality and workmanship for installing electrical products and systems. *NEIS*™ are intended to be referenced in contract documents for electrical construction projects. The following language is recommended:

Microgrids should be designed, installed, operated, and maintained in accordance with NECA 417, *Recommended Practice for Designing, Installing, Operating, and Maintaining Microgrids* (ANSI).

Use of *NEIS*™ is voluntary and the National Electrical Contractors Association assume any obligation or liability to users of this publication. Existence of a standard shall not preclude any member or non-member of either organization from specifying or using alternate construction methods permitted by applicable regulations.

This publication is intended to comply with the edition of the National Electrical Code (NEC) in effect at the time of publication. Because they are quality standards, *NEIS* may in some instances go beyond the minimum safety requirements of the NEC. It is the responsibility of users of this publication to comply with state and local electrical codes when installing electrical products and systems.

Suggestions for revisions and improvements to this standard are welcome. They should be addressed to:

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1. Scope

This Standard applies to microgrids and provides recommended practices for their design, installation, commissioning, operation, and maintenance.

1.1 Products and Applications Included

This Standard covers distributed energy resources, distributed generation and energy storage systems, and electrical power distribution system components and equipment associated with microgrids. This applies to:

- Microgrid Generation Systems
 - Solar Photovoltaic (PV) Power Systems (See NECA 412)
 - Wind Power Systems
 - Fuel Cells
 - Microturbines
 - Engine-Generators (See NECA 404)
- Energy Storage Systems (See NECA 416)

Additionally, this Standard covers electrical power distribution system components and equipment associated with microgrids and energy storage systems. This applies to:

- Conductors
- Disconnecting Means
- Overcurrent Protection
- Grounding and Bonding

1.2 Products and Applications Excluded

This standard does not apply to:

- Distributed generation application process
- Interconnection agreements with electric

utility providers

- Other sources of generation
- Sizing distributed energy resources or energy storage systems
- Remote power systems (microgrids that are not grid-connected due to physical isolation or other parameter without a connection to the electric utility grid)
- Electrical power distribution system planning and design (configuration)

1.3 Regulatory and Other Requirements

All information in this publication is intended to conform to the *National Electrical Code* (ANSI/NFPA 70). Installers shall follow the NEC, applicable state and local codes, manufacturer instructions, and contract documents when installing microgrids. Also, follow IEEE C2, National Electrical Safety Code (NESC)[®] for microgrid installations located on the utility side of the point of common coupling or where the electric utility provider is otherwise involved with microgrid installation, operation, or maintenance.

Only qualified persons as defined in the *National Electrical Code* familiar with the construction, installation, and operation of microgrids and distributed energy resources, distributed generation and energy storage systems, shall perform the technical work described in this publication. Administrative functions such as receiving, handling, and storing electrical power distribution system components and other tasks should be performed under the supervision of a qualified person. All work shall be performed in accordance with NFPA 70E, *Standard for Electrical Safety in the Workplace*.

General requirements for installing electrical products and systems are described in NECA 1, *Standard for Good Workmanship in Electrical Construction* (ANSI). Other NEIS provide additional guidance for installing particular types of electrical products and systems. A complete list of NEIS is provided in Annex A.

1.4 Mandatory Requirements, Permissive Requirements, Quality and Performance Recommendations, Explanatory Material, and Informative Annexes

Mandatory requirements in manufacturer instructions, Codes, or other mandatory Standards that may or may not be adopted into law, are those that identify actions that are specifically required or prohibited and are characterized by the use of the terms “must” or “must not,” “shall” or “shall not,” or “may not,” or “are not permitted,” or “are required,” or by the use of positive phrasing of mandatory requirements. Examples of mandatory requirements may equally take the form of, “equipment must be protected . . .,” “equipment shall be protected . . .,” or “protect equipment . . .,” with the latter interpreted (understood) as “(it is necessary to) protect equipment . . .”

Permissive requirements of manufacturer instructions, Codes, or other mandatory Standards that may or may not be adopted into law, are those that identify actions that are allowed but not required, or are normally used to describe options or alternative means and methods, and are characterized in this Recommended Practice by the use of the terms “may” or “are permitted,” or “are not required.”

Quality and performance recommendations identify actions that are recommended or not recommended to improve the overall quality or performance of the installation and are characterized in this Recommended Practice by the use of the terms “should” or “should not.”

Explanatory material, such as references to other Codes, Standards, documents, references to related sections of this Recommended Practice, information

related to another Code, Standard, or document, and supplemental application and design information and data, is included throughout this Recommended Practice to expand the understanding of mandatory requirements, permissive requirements, and quality and performance recommendations. Such explanatory material is included for information only, and is identified by the use of the term “NOTE,” or by the use of italicized text.

Non-mandatory information and other reference Standards or documents relative to the application and use of materials, equipment, and systems covered by this Recommended Practice are provided in informative annexes. Informative annexes are not part of the enforceable requirements of this Recommended Practice but are included for information purposes only.