Utility External Disconnect Switch

Practical, Legal, and Technical Reasons to Eliminate the Requirement

Prepared by

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Interstate Renewable Energy Council

Solar America Board for Codes and Standards

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Executive Summary

Some states and utilities require that a utility external disconnect switch (UEDS) be installed between a photovoltaic (PV) power system and the utility grid as a device necessary for safety. Adding the UEDS provides a utility worker with an additional means of disconnecting a customer's system.

However, thousands of PV systems in many jurisdictions have been connected to the utility grid both safely and effectively without a UEDS. Indeed, there is increasing evidence that UEDSs are seldom, if ever, used. The history of safety recorded from these jurisdictions demonstrates that when PV hardware meeting Underwriters Laboratories (UL) and Institute of Electrical and Electronic Engineers (IEEE) standards is installed in compliance with the *National Electrical Code® (NEC)* and operated according to procedures mandated by OSHA and in accordance with recognized Best Practices, the UEDS is not needed to ensure safe operation of a PV system. In fact, for properly designed and installed Code-compliant PV systems, the UEDS provides little, if any, additional safety, beyond what is already present. Indeed, utilities increase their risk of liability when they require the UEDS for safety during maintenance or emergency.

Currently, eight states—Arkansas, Delaware, Florida, Nevada, New Jersey, New Hampshire, North Carolina, and Utah—have incorporated provisions into their interconnection procedures that appear to waive the requirement for a UEDS for small, inverter-based systems. Although the precise application of these provisions may be subject to debate, it is clear that an increasing number of states have decided to do away with the requirement for a UEDS for small, inverter-based systems. In addition, many utilities around the country have also eliminated the requirement for the UEDS on systems less than 10 kW. This list of utilities includes Pacific Gas and Electric and Sacramento Municipal Utility District (SMUD) in California and National Grid USA in the northeast United States. Importantly, more than half of all small, inverter-based photovoltaic systems installed in 2007 were in these jurisdictions with no UEDS requirement.

This report documents the safe operation of PV systems without UEDSs in several large jurisdictions and explains why, increasingly, the Best Practice is to eliminate the UEDS requirement. As described in this report, the UEDS fails to provide the "fail safe" protection that is its justification, is functionally redundant to the traditional practice of "pulling the meter," and adds unnecessary cost to a PV system. This report recommends adherence to established Best Practices for PV system interconnection because they provide safety without the UEDS or its unfavorable impacts.

Author Biography

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Solar America Board for Codes and Standards

The Solar America Board for Codes and Standards (Solar ABCs) is a collaborative effort among experts to formally gather and prioritize input from the broad spectrum of solar photovoltaic stakeholders including policy makers, manufacturers, installers, and consumers resulting in coordinated recommendations to codes and standards making bodies for existing and new solar technologies. The U.S. Department of Energy funds Solar ABCs as part of its commitment to facilitate widespread adoption of safe, reliable, and cost-effective solar technologies.

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Introduction

What is a Utility External Disconnect Switch?

Photovoltaic (PV) systems are designed to operate as electric power generators, connected in parallel with the utility grid, and to meet stringent equipment and interconnection standards. A utility-interactive inverter serves as the interface for the PV system providing voltage and frequency synchronization and serving as the system controller. The inverter converts the DC power produced by the PV array into AC power in harmony with the voltage and power quality requirements of the utility grid. This harmonious voltage and frequency synchronization requires the existence of the utility AC power as a reference signal. The grid-interactive inverters are designed to shut down in the absence of utility power.

In the United States, the *National Electric Code® (NEC)* and authorities having jurisdiction (AHJ) require that grid-interactive PV inverters meet the safety and operational requirements of Underwriters Laboratories (UL) standard 1741[1] in addition to the interconnection requirements of Institute of Electrical and Electronic Engineers (IEEE) standard 1547-2003[2]. These standards describe the safety, system protection, and power quality requirements that the inverter must meet. As noted above, these standards also specify operational requirements for safe operation when the inverter is connected to the grid. UL 1741 test standard evaluates inverters for compliance with the IEEE 1547 interconnection requirements to automatically prevent the PV source from supplying power to the grid when the utility grid is not energized.

Figure 1: Typical location of Utility External Disconnect Switch, marked with a yellow caution label, below the production meter. The revenue meter is to left.

A Utility External Disconnect Switch (UEDS) is a disconnect device that the utility uses to isolate a PV system to prevent it from accidentally sending power to the utility grid during routine or emergency maintenance. The UEDS is installed in an accessible location for operation by utility personnel. Figure 1 shows the UEDS in a typical installation. However, meter locations on buildings vary, depending upon local zoning law and utility practices, and line workers seeking to disconnect PV systems in an emergency, may find it difficult to locate the meter and the UEDS. For example, they could be mounted on a wall behind bushes or other obstructions. Also, emergencies often occur during inclement weather or at night.

Historical Background on Distributed Generation

Utilities have historically treated customer-sited generation equipment connected to the grid with similar scrutiny as their large central power plants. Since there is a wide variety of generator types and installations, this common approach may cause excessive interconnection requirements for small, inverter-based generating systems. Central power plants are synchronous generators that export large amounts of power on high-voltage transmission lines. In contrast, small renewable energy systems are inverter-based sources that connect relatively small generators of power to the low-voltage side of the distribution transformer. Some utilities require distributed resources to provide direct-transfer trip, Supervisory Control And Data Acquisition (SCADA), and redundant relay protection devices such as those used by central power plants. Over the past decade, standards and codes have been updated to facilitate the safe operation of small distributed energy systems. Inverters and other equipment meet these newer standards. Many utilities now have different rules and procedures for small distributed systems than they have for central power plants.

1 UL 1741(2005) Inverters, Controllers, and Interconnection System Equipment for Use with Distributed Energy Resources

2 IEEE 1547 (2003), IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems

Current Status of the Utility External Disconnect Switch Requirements

Several utilities (such as National Grid[3], Pacific Gas and Electric[4] (PG&E) and Sacramento Municipal Utility District[5] (SMUD)) and eight states (Arkansas, Delaware, Florida, Nevada, New Jersey, New Hampshire, North Carolina, and Utah)[6] have waived the requirement for a UEDS for small, inverter-based systems. Increasingly, utilities such as PG&E and SMUD are taking advantage of self-contained meters as the means for facilitating the desired accessible/visible break/lockable functions without requiring a UEDS. As a result, more than half of all photovoltaic installations in the US in 2007 were installed without a UEDS[7].

Utility testimony indicates that, for properly designed and installed Code-compliant PV systems, the UEDS provides little, if any, additional safety, when a self-contained meter is already present[8]. There remain state and utility interconnection rules and guidelines that still require an accessible, lockable, visible-break safety-disconnect switch (for example[9,10]). Some utility companies are reluctant to accept the growing body of evidence that this additional safety device is unnecessary.

Review of Literature, Standards, and Operations

Safety, OSHA, and ANSI

Safety, in all aspects of PV system installation, interconnection, and operation, is of paramount concern to the Solar ABCs and the continued growth of connecting renewable energy sources to the grid. The Occupation Safety and Health Administration (OSHA) provides the law of the land for electrical safety regulations although utilities may interpret this law in various ways. The OSHA Act of 1970 requires employers to provide employees with a workplace free from recognized hazards known to cause serious physical harm. Sub part S of OSHA 29CFR part 1910, "Standards for General Industry," contains requirements that deal with protection from electrical hazards. Switching and tagging, and lockout/tagout are the primary methods of hazardous energy control. OSHA rules direct utilities to follow three general steps in switching and tagging procedures: first, check to be sure the circuit is dead; second, ground the circuit conductors; and third, work with gloves.

OSHA 1910.269 and provisions of 1910.331 through 1910.335 cover electrical safety work practices. As part of the three-step process to lockout/tagout a line section, OSHA Section 1910.333(b)(2)(iv)(B) states that:

A qualified person shall use test equipment to test the circuit elements and electrical parts of equipment to which employees will be exposed and shall verify that the circuit elements and equipment parts are de-energized. The test shall also determine if any energized condition exists as a result of inadvertently induced voltage or unrelated voltage backfeed, even though specific parts of the circuit have been de-energized and presumed to be safe. If the circuit to be tested is over 600 volts, nominal, the test equipment shall be checked for proper operation immediately after this test.

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3 John J. Bzura PhD. email correspondence. *M.D.T.E. No. 1116-A Canceling M.D.T.E. No. 1088 Effective: April 2, 2007*. February 2008.

4 Pacific Gas and Electric Company. (Nov 2006). AC disconnect switches for inverter-based generation. Retrieved June 12, 2008 from http://www.pge.com/b2b/newgenerator/solarwindgenerators/disconnectswitches

5 "SMUD Waives Switch Requirement for Solar Systems: Move Makes Solar Installations Easier." SMUD, Feb. 21, 2007. http://www.smud.org/news/releases/07archive/02_21solar.pdf

6 Coddington, M.H., Margolis, R.M., & Aabakken, J. (2008). *Utility-interconnected photovoltaic systems: Evaluating the rationale for the utility-accessible external disconnect switch* page 23

7 Larry Sherwood, IREC personal communication July 6, 2008.

8 Public Service of Colorado testimony in Docket 07R-166E that its policy provides field personnel of either pulling the meter or utilizing the EUDS if they choose to disconnect a customer's system page 88

9 Ohio PUCo. Technical Requirement and Parallel Operation of Distributed Generation. page 1.4.2.

10 Exelon Energy Delivery Interonnection Guideslines for Generators 2 MVA or Less.Original: October 31, 2006. Page 8.

In contrast, utility standards for lockout/tagout usually reference the older, less rigorous American National Standards Institute (ANSI) standard Z244.1-2003 procedures. Where OSHA requires that a circuit be measured and verified as de-energized from all sources before servicing, the ANSI standard does not require this. The lack of a requirement to manually check for safe conditions has often been cited as the necessity for an accessible, lockable UEDS. However, OSHA procedures explicitly require the line section to be verified as de-energized prior to all service actions[11].

It is important to note that all grid interactive inverters installed in the U. S. have been tested to the UL 1741 and IEEE 1547 standards (explained below) that include passing the Unintentional Islanding Test, which verifies that the inverter does not operate independent of the utility. This evaluation also tests that these inverters cease to export power when the utility is de-energized.

Since the OSHA procedure must be performed *before* starting any maintenance or emergency work, a line determined to be de-energized and made safe via the OSHA safety procedures by a worker can not become energized by a grid-interactive inverter under any circumstances without reapplication of line voltage from the utility. Hence, since workers must determine that a line is de-energized and attach equipotential grounding before servicing, presence of the UEDS provides little additional protection for line workers.

National Electrical Code Requirements

The *National Electrical Code® (NEC)* requires all buildings or structures to have switches or breakers capable of disconnecting them from all sources of power[12]. The switches must be manually operable without exposing the operator to contact with live parts and must be readily accessible[13]. *NEC* 690.13 states: "Means shall be provided to disconnect all current-carrying conductors of a photovoltaic power source from all other conductors in a building or other structure." In addition, the switches must be permanently marked to identify them as PV system disconnects. In the case of solar generators, the *NEC* requires at least two manual disconnects on the inverter (one AC disconnect switch and one DC disconnect switch). In section 690.64, the *NEC* specifies that PV system inverters must have means for disconnecting AC, either with breakers in distribution panels or fusible switches. The *NEC* does not require that these disconnects be lockable or that they provide a visible-break separation, conditions placed on the UEDS.

More significant is the difference between the *NEC* and the utility in their working definition of the term "readily accessible." From the *NEC* perspective, a circuit breaker panel in the laundry room in a residence is readily accessible to the electrician who would come to repair a PV system (or general house wiring, electric range, etc.). So is the disconnect switch next to the inverter inside of the garage. If the house is locked and no one is home, then the electrician can't get to the breaker or the disconnect—or the inverter—and therefore can't work on the PV system, wiring, range, etc.

Utilities have a different perspective on *readily accessible*—their stated use of the utility disconnect would potentially require emergency access 24 hours a day, 7 days a week. It cannot be locked in a garage or laundry room. Since the utility usually has access to the customer's revenue meter, they typically want or require the PV utility disconnect switch to be located near the meter. Even though the meter may be located inside the house or building (in an area where the utility has 24-hour access), utility accessible locations are usually (though not always) on the building exterior, leading to the PV industry misnomer, *External* Disconnect Switch, rather than the more correct, Utility Accessible Switch designation.

11 OSHA standard interpretations: Recognition of ANSI ASSE Z244.1-2003 "Control of hazardous energy-lockout tag-out and alternative methods" consensus standard. Washington, D.C.: Occupational Safety & Health Administration.

12 National Fire Protection Association, *National Electrical Code (NEC)* 2008 section 690.13

13 ibid section 690.17 (1)

While in some cases the meter location may be a convenient point to connect the PV system—and thus a single switch could serve *NEC* and utility needs—in many cases it can be complicated and expensive to route. At times, it can be difficult to route PV output wires from a location that is both convenient and acceptable under *NEC* requirements (such as inside a garage) to a point acceptable to utilities. Meter locations on buildings vary depending upon local zoning law and utility practices, and line workers seeking to disconnect PV systems in an emergency may find it difficult to locate the meter and the UEDS. For example, they could be mounted on a wall behind bushes or other obstructions. Also emergencies often occur during inclement weather or at night. In those many cases where the *NEC* disconnect located near the inverter does not meet the utility's needs for readily accessible, the UEDS represents a redundant means to disconnect the system from the grid. In addition, this additional wire and equipment also contributes to system losses and potential maintenance concerns.

UL 1741 and Product Safety Evaluations

Safety of Inverter based system Subject to UL Testing under IEEE Standards 1547

The UL 1741 standard covers inverters, multi-mode inverters, converters, controllers, and interconnection systems for use with Distributed Energy Resources (DER). UL 1741 combines product safety requirements with the interconnection system test requirements developed in the IEEE 1547 standard to delineate the specific procedures and criteria for evaluating and certifying distributed generation products. UL 1741 goes beyond IEEE 1547 requirements to include product safety aspects. Rigorous tests must be passed for any inverter to obtain UL 1741 listing.

IEEE 1547 and IEEE 1547.1 were written to become the basis for DER interconnection of 60 Hz systems (i.e., North America voltage and frequency) and were based upon existing criteria for evaluating utility interconnection relays, and upon utility interconnection certification requirements from individual state and local public utility commissions (PUCs). Relays perform the protective functions that are integrated into an inverter. UL 1741 was revised in 2005 to directly reference the IEEE 1547 requirements and IEEE 1547.1 test procedures. IEEE 1547 references IEEE C37.90 and IEEE C62.41, standards that are normally applied to "utility grade" protection relays.

The combination of the UL 1741 and IEEE 1547 standards help to harmonize the utility interconnection requirements and equipment conformance validation across the United States. The IEEE 1547-compliant UL 1741 requirements became effective on May 5, 2007. Underwriters Laboratories Inc. and other Nationally Recognized Testing Laboratories (NRTLs) perform quarterly unannounced manufacturing inspections on the UL 1741 Listed equipment to verify that products continue to be produced in the same manner as when they were originally evaluated and tested. This process is intended to prevent variations in the critical components (hardware and software) that could affect the critical utility interconnection performance of the product.

Traditional Utility Protection Practices Not Evaluated as Rigorously as Inverter Based Interconnection

Unfortunately, utilities have not required that interconnection protection relays be Listed to UL 1741. Utility protection equipment is only required to meet the IEEE 1547.1 testing requirements and lacks the additional safety afforded by product testing and oversight of critical hardware and software that a NRTL listing provides.

PV system inverters today are UL 1741 Listed with anti-islanding feature. Islanding is a situation in which a portion of the electrical grid that contains loads and generation source remains energized even after it is isolated from the remainder of the electrical grid. The traditional utility concern is that the islanded system will suddenly and unexpectedly connect to the grid and re-energize it—or remain energized when the utility believes the portion of the grid in question to be completely de-energized. To be UL 1741 Listed, inverters must pass tests to "successfully demonstrate that their anti-islanding protection methods operate in less than two seconds under a range of conditions expected on the feeder[14]."

There are distributed generation systems designed to operate site loads during utility outages. However, these are for service institutions such as hospitals and other sites that have stand-by generation that is energized during a utility outage. All of these systems have specially designed power transfer systems that prevent the system from energizing the utility grid during an outage.

IEEE Standard Isolation Device Requirement

Some utilities cite the IEEE Standard 1547 Isolation Device clause 4.1.7 as justification for the UEDS[15]. Clause 4.1.7 in IEEE-2003 states: "When required by the Area Electric Power System (EPS) operating practices, a readily accessible, lockable, visible-break isolation device shall be located between the Area EPS and the DER unit." In other words, under IEEE 1547, an isolation device is not a universal requirement, but IEEE 1547 recognizes that utilities could require a redundant disconnect that could be on the utility side of the meter in addition to the many utility methods already available to isolate a circuit. Unless the local jurisdiction rules otherwise, this isolation device clause in IEEE 1547 is not a mandatory equipment requirement.

Operational Issues

Non-Use of the UEDS

Where the UEDS is required for renewable energy systems, discussions with utility personnel show that few utilities have used the switch during maintenance or emergency situations. One research project found that none of the external disconnect switches studied had been used by utility maintenance staff[16].

We will review some of the reasons why utility workers have not operated the UEDS for safety during either maintenance or emergency conditions. First, most residential PV systems are less than 10 kW. Residential customers have a potential connected load above 20 kW. Motor loads in particular tend to trip off isolated PV systems because motors have an in-rush current in the range of 5-12[17] times normal load. Typical motor loads are air conditioning units, washing machines, and refrigerators. If the grid is de-energized, then the PV alone cannot supply the motor load for the residence, and the inverter will shut off.

Second, according to Coddington et al.[18], on the UEDS a line worker can only be injured by a PV system if several failures occur at the same time. Similarly, the California Rule 21 Supplemental Review Guideline[19] states that a number of specific conditions must exist for unintentional islanding to take place. Public Service of Colorado's expert witness on this subject[20] has confirmed that a very unlikely series of events must occur to place a line worker at risk from a PV system installed without a UEDS.

14 Email and conference call with Tim Zgonena, Principal Engineer, Underwriters Laboratories, Inc.

15 Potomac Electric Power Company's Reply Comments Case No 1050,41 May 2,2008 Response to MD-DC-VA Solar Energy Industry Association page 6

16 U.S. Department of Energy, *Million Solar Roofs Case Study: Overcoming Net Metering and Interconnection Objections,* September 2005

17 How to Make Accurate Inrush Current Measurements Mar 1, 2003 , By Bob Greenberg, Fluke Corp

18 ibid Coddington page 11

19 www.energy.ca.gov/distgen/interconnection/SUP_REV_GUIDELINE_20050831.PDF Section 7.1 5a-c

20 Public Utilities Commission State of Colorado Docket 07A-462E Volume 4 page 102

Third, operation of multiple UEDSs is onerous for the utility. Utility companies may be reluctant to follow the number of steps necessary to document the required information necessary to properly switch and tag each PV system. This includes recording the location and size of each PV system on the utility's circuit maps and making this information available to system operators, engineers, line workers, and all non-utility employee crews working on the utility facilities. This is simply not practical in utility operations. In order to do this, information with details of the interconnect agreement must be communicated from the commercial side to the operational side of the utility. In addition, if the UEDS is to be operated for safety during maintenance and emergency situations, then the appropriate switching orders need to be generated for each work group, and all switching and tagging orders for small PV systems need to be posted and incorporated into existing switching and tag-out orders. Finally, although the utility must ensure access to the UEDS just as it does for all metering, utility metering personnel and service personnel are not the same. Service outages on the distribution system come at night or in bad weather conditions when metering personnel are not available to help with locating a UEDS. Thus, some utilities allow the practice of "pulling the meter" to isolate the system[21,22] if the need for isolation is found to be necessary.

Cost

Several PV installers have estimated the typical incremental cost of installing a UEDS to be in the range of $200 to $400. In response to a question from the Florida Public Utilities Commission, Progress Energy estimated the cost of the UEDS to be $1,253.13 per customer[23]. Whether the lesser or the higher estimate, on small systems, the UEDS is a burden that will have long-term impacts with no clear benefits. The national interest requires that our renewable energy installations be completed in as cost effective a manner as possible, consistent with Best Practices including safety concerns.

Legal and Jurisdictional Issues

There are two legal issues that arise from the utilities' claim that the UEDS is necessary for safety. The first issue is the exposure that utilities accept when they "require" the UEDS and then fail to operate it during maintenance or emergency situations. A utility that fails to incorporate the use of the UEDS into its standard operating procedures could as a result be faced with the prospect of additional source of liability or even punitive damages in case of injury[24].

The second issue arises from the fact that the utility requires the line worker to operate the UEDS even though it is located outside the utility's jurisdiction, i.e., it is not utility property and is located on the customer side of the meter. The legal concern arises because utility line workers are considered not "qualified"[25] under *NEC* requirements to work outside the utility's jurisdiction. The utility is exposed to liability if the line worker becomes injured attempting to operate the UEDS.

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21 Pacific Gas and Electric Company. (Nov 2006). AC disconnect switches for inverter-based generation. Retrieved June 12, 2008 from http://www.pge.com/b2b/newgenerator/solarwindgenerators/disconnectswitches/

22 Transcript of cross examination of Public Service of Colorado expert witness on this subject in 2008 Public Utility Commission of Colorado Docket 07R-166E page 88

23 Florida Public Utilities Commission (2007). Docket 070674-EI. Tallahassee, FL.

24 ibid Cook

25 National Fire Protection Association. (2007). Report on proposals A2007 NFPA 70. Quincy, MA:

Conclusions

This report highlights how a number of progressive state regulatory commissions and utilities with jurisdiction over a large portion of the country's inverter-based renewable energy systems have eliminated the UEDS requirement traditionally required for interconnection of Distributed Energy Resource generation and how the growing evidence indicates that the UEDS requirement can be eliminated from state and utility requirements for PV systems without compromising the safety of these systems or of personnel working near them.

The disadvantages of the UEDS requirement are:

- The lack of any measurable benefit to safety
- The additional cost of UEDS
- The potentially detrimental impact on PV system losses and reliability
- The possible liability incurred to federal sanctions and penalties as well as to punitive damages.

Furthermore,

- Utilities rarely, if ever, use the installed UEDS
- PV systems installed without a UEDS have had a clean safety record
- More than half of the small PV systems installed in 2007 did not have a UEDS
- A growing number of utility and regulatory commissions have decided to eliminate the UEDS requirement.

Recommendation

The recommendation is to eliminate the requirement for UEDS for all small, inverter-based systems in all jurisdictions. With the inherent safety features built into all UL-listed PV inverters, the UEDS is functionally unnecessary and provides little, if any, additional safety.

For customers with self-contained meters (including almost all residential and small commercial customers), the meter itself is already fully capable of providing the functions required of the switch (i.e., a visible, physical, lockable separation of the system from the utility). At the very minimum, these customers should be excluded from any UEDS requirement.

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www.energy.ca.gov/distgen/interconnection/SUP_REV_GUIDELINE_20050831.PDF Section 7.1 5a-c

Acronyms

AC	Alternating current
ANSI	American National Standard Institute
AHJ	Authorities Having Jurisdiction
DC	Direct current
DOE	Department of Energy
DER	Distributed Energy Resource
EPS	Electric Power Systems
FERC	Federal Energy Regulatory Commission
IEEE	The Institute of Electrical and Electronic Engineers
IREC	Interstate Renewable Energy Council
NEC	*National Electrical Code®*
NFPA	National Fire Protection Association
NREL	National Renewable Energy Laboratory
NRTLs	Nationally Recognized Testing Laboratories
OSHA	Occupational Safety Health Administration
PG&E	Pacific Gas & Electric
PV	Photovoltaic
SMUD	Sacramento Municipal Utility District
Solar ABCs	Solar America Board for Codes and Standards
UL	Underwriters Laboratories
UEDS	Utility External Disconnect Switch

Glossary of Terms

Best Practice: A technique or methodology that, through experience and research, has proven to reliably lead to a desired result. A commitment to using the Best Practices in any field is a commitment to using all of the knowledge and technology at one's disposal to ensure success.

De-energized: Free from any electrical connection to a source of potential difference and from electrical charge; not having a potential different from that of the Earth.

Intentional Islanding: Intentional islanding is the purposeful sectionalization of the utility system during widespread disturbances to create power "islands." These islands are designed to maintain a continuous supply of power during disturbances of the main distribution system.

Self-Contained Meter: A utility revenue meter that contains all sensing elements within the casing and meter base connections. All power to the facility must pass directly through the meter in order for the facility to receive service. Should the meter be removed, a physical separation will occur between the meter-base blade sockets, and the facility will be isolated from the utility. Nearly all residential customers are served by self-contained meters.

Unintentional Islanding: An unplanned condition where one or more DERs and a portion of the electric utility grid accidentally remain energized through the point of interconnection.

Utility External Disconnect Switch: An isolation device, accessible to utility personnel, used to provide a physical separation between a customer-generator and the utility system. This device must have a visibly-verifiable separation, be lockable in the open position, but does not need to be load-break rated or even be a switch.

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