

# INTERCONNECTION REQUIREMENTS - DISTRIBUTED ENERGY STORAGE SYSTEMS, SINGLE-PHASE

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## 2. Purpose

These electric service requirements include information for use by the Service Provider and customers for interconnection and parallel operation of small inverter-based, distributed energy storage system (ESS) sources with the Service Provider's distribution system. The document is an application of SR-701 "GENERAL REQUIREMENTS FOR CUSTOMER INSTALLATION AND OPERATION OF DISTRIBUTED GENERATION SOURCES" along with the "DISTRIBUTED GENERATION INTERCONNECTION REQUIREMENTS (DGIR)" as filed with and approved by the Arizona Corporation Commission (ACC). The requirements presented are to ensure the safety of both utility and customer personnel and property.

## 3. Applicability

This document applies to all single-phase, inverter-based, energy storage systems capable of parallel operation with the Service Provider's distribution system. It pertains only to interconnection with single-phase, 120/240V, 3-wire services.

## 4. Definitions

**AC Coupled:** An energy storage system that is connected to an AC point of coupling with the service provider.

## INTERCONNECTION REQUIREMENTS - DISTRIBUTED ENERGY STORAGE SYSTEMS, SINGLE-PHASE

### 4. Definitions (cont'd)

**Automatic Transfer Switch (ATS):** An open transition transfer switch, that will automatically disconnect a generating facility and/ or energy storage system, from the service provider in the event of the loss of distribution system voltage. ATS may be internal to Multimode inverters or an external device that is installed separately.

**Backed Up Loads:** The loads that an energy storage system with a multimode inverter will supply electricity to in the event of a service provider outage.

**Backed Up Loads Disconnect Switch:** A visible open disconnect device that the customer is required to install and maintain in accordance with the requirements herein. It will de-energize the Backed Up Loads meter and associated equipment.

**Backfeed:** To energize a section of the Service Provider's distribution system from a source of electric supply other than the Service Provider.

**DC Coupled:** An energy storage system that is connected to the DC point of coupling of the Distributed Generation.

**Distributed Energy Resource (DER):** Any resource on the distribution system that produces electricity, such as distributed energy storage and distributed generation.

**Distributed Energy Storage:** Any type of customer energy storage system interconnected with the distribution system that either (1) has the capability of being operated in electrical parallel with the distribution system or (2) can feed a customer load that can also be fed by the distribution system.

**Distributed Generation (DG):** Any type of customer electrical generator, static inverter, or generating facility interconnected with the distribution system that either (1) has the capability of being operated in electrical parallel with the distribution system or (2) can feed a customer load that can also be fed by the distribution system.

**Distributed Generation Interconnection Requirements (DGIR):** Document conformed to ACC Docket No. E-00000A-99-0431 Decision No. 69674, dated June 28, 2007, that describes, procedural, administrative, and technical requirements for the interconnection of DG to the Service Provider's distribution system for the purpose of parallel operation. DGIRs can be found at <https://www.tep.com/wp-content/uploads/2016/04/dgir.pdf>

**Distribution System:** The infrastructure constructed, maintained, and operated by the Service Provider to deliver electric service to retail customers at primary and secondary distribution voltages (13.8kV and less).

**Energy Storage System:** One or more components capable of storing energy, to later be used in parallel with, or independent of, the Service Provider. For the purposes of this document, only those energy storage systems utilizing Interactive or Multimode Inverters shall be acceptable for interconnection with the Service Provider.

**Generating Facility:** All or part of the customer's electrical generator(s) and/or inverter(s) together with all protective, safety, and associated equipment necessary to produce electric power at the customer's facility.

**Inverter:** A power electronic device that converts DC power to AC by means of electronic switching.

- (a) **Interactive Inverter:** An inverter for use in parallel with the Service Provider to supply common loads and may deliver power to the Service Provider. May also be referred to as a grid-tied inverter.
- (b) **Multimode Inverter:** Equipment having capabilities of both the interactive inverter and the stand-alone inverter.
- (c) **Stand-Alone Inverter:** An inverter that only supplies power independent of the service provider.



## INTERCONNECTION REQUIREMENTS - DISTRIBUTED ENERGY STORAGE SYSTEMS, SINGLE-PHASE

### 4. Definitions (cont'd)

**Island:** A condition in which a portion of the Service Provider's distribution system is energized solely by one or more customer DER through the associated point(s) of interconnection while that portion of the Service Provider distribution system is electrically separated from the rest of the Service Provider distribution system.

**Line Side (Supply Side) Interconnection:** Interconnection of the customer DER between the Service Provider revenue meter and the customer main service disconnect(s).

**Load Side Interconnection:** Interconnection of the customer energy storage input or output at an over-current protective device in the customer load center or sub-panel.

**Parallel System:** A customer's energy resource that is electrically interconnected to a bus common with the Service Provider distribution system, either on a momentary or continuous basis.

**Point of Coupling:** The physical location where the energy storage system is connected to the customer's DG.

**Point of Interconnection:** The physical location where the DER conductors are connected to the customer's service. See SR-702 for information regarding requirements of various methods of interconnection.

**Service Provider:** A regulated electric utility that furnishes electric power and associated metering services to retail electrical customers in its defined service area. For purposes of this document, Service Provider will connote either Tucson Electric Power Company or Unisource Energy Services.

**Utility Isolation Disconnect Switch:** A visible open disconnect device that the customer is required to install and maintain in accordance with the requirements herein. It will completely isolate the customer's distributed energy resources from the Service Provider grid.

### 5. Standards

All customer equipment shall conform to the nationally-recognized standards and recommended practices and latest revision. These include, but are not limited to the following:

- (a) NFPA 70 - National Electrical Code (NEC)
- (b) IEEE 1547 - Standard for Interconnecting Distributed Resources with Electric Power Systems
- (c) IEEE 1547.1 - Standard for Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems.
- (d) IEEE 519 - Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
- (e) ANSI C84.1 - Electric Power Systems and Equipment-Voltage Ratings (60Hz)
- (f) UL 1741 - Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources
- (g) UL 1642 - Standard for Lithium Batteries
- (h) UL 9540 - Standard for Energy Storage Systems and Equipment
- (i) UL 1973 - Standard for Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications

## INTERCONNECTION REQUIREMENTS - DISTRIBUTED ENERGY STORAGE SYSTEMS, SINGLE-PHASE

### 6. Service Provider Design Review and Approval

Prior to installation of customer interconnection facilities, customer shall submit an interconnection application to the Service Provider for review and written approval. Application forms may be found on the Service Provider's website. Documentation to be furnished with the application may include an electrical one-line diagram, an electrical three-line diagram, site plan, equipment elevation drawings and control specifications. Utility review and inspection may be required for approval. Following approval, customer shall not remove, alter, modify, or change the equipment specifications, including, without limitation, the plans, control and protective devices or settings, and the generating facility system design, type, size, or configuration. If the customer desires to make such changes or modifications, they must revise and resubmit plans describing the changes or modifications for approval. No such change or modification may be made without prior approval.

### 7. Technical Requirements

#### (a) Line Side Interconnections

For line side interconnections, as are permitted by the NEC, the following requirements apply:

- (1) A line side interconnection constitutes a new service and is subject to all applicable NEC requirements and/or requirements adopted by the local code-enforcement authority.
- (2) Customer is required to arrange a power-kill with Service Provider to de-energize customer equipment before performing line side interconnection work. The Service Provider will energize this service only after the facility has passed the inspection of the applicable government agency and notification has been received by the Service Provider as is described in the process for new services elsewhere in these Service Requirements.
- (3) Any line side interconnection shall be made without modifications to any factory installed and/or factory listed equipment or components. Please contact Service Provider Design Department for additional guidance regarding this matter.
- (4) For 200A Milbank meter sockets only, customer may install Milbank tap connectors, Catalog No. KA77-INT, to complete the line side interconnection inside the revenue meter base enclosure.

#### (b) Minimum Protective Requirements

- (1) Inverter shall be set to detect and trip for any abnormal operating condition on the Service Provider's system, unless isolated.
- (2) Circuit breakers, if backfed, shall be suitable for such operation.
- (3) Inverters shall be tested to UL 1741 by a Nationally Recognized Testing Laboratory (NRTL) certified by OSHA to perform the UL 1741 test standard.

#### (c) Distribution Transformer

- (1) Customer's single-phase DERs can only be connected to the Service Provider's single-phase distribution transformers.
- (2) Customer DG with a combined total rating of over 10kWAC, as measured at the service entrance, will be required to be isolated from other customers served from the same Service Provider transformer. This will be accomplished by installing a separate dedicated transformer to serve only the customer with DG in excess of 10kWAC. All work necessary to modify existing Service Provider facilities to accommodate customer-owned DG shall be done at the customer's expense.
- (3) Customer energy storage systems with a combined total rating of over 10kWAC, as measured at the service entrance, will be subject to engineering review.



## INTERCONNECTION REQUIREMENTS - DISTRIBUTED ENERGY STORAGE SYSTEMS, SINGLE-PHASE

### 8. Customer Operating Requirements

This section provides operating requirements that the customer must follow and responsibilities that the customer must assume to operate their energy storage system in parallel with the Service Provider system.

(a) Quality of service

The operation of the customer's energy storage system must not reduce the quality of service of the distribution system to other Service Provider customers. No abnormal voltages, currents, frequencies, or interruptions are permitted.

(b) De-energized Service Provider circuit

The customer will at no time energize a de-energized Service Provider circuit.

(c) Inhibited Parallel Operation

(1) If the Service Provider circuit is de-energized, the inverter shall not attempt to reconnect their system until power has been restored. The inverter shall delay reconnection for a parallel operation of its generating facilities for a minimum of five minutes after the Service Provider voltage and frequency are restored to normal. Service Provider is not responsible for damage caused to the customer's facilities as a result of automatic or manual reclosing of distribution feeder breakers or reclosers.

(2) The customer is not prohibited from isolating their system from the Service Provider and supplying their own premise wiring while the Service Provider's circuit is de-energized.

(d) Customer Responsibility for Damage Caused by Customer Energy Storage Systems

The customer is responsible for damage caused to other customers and to the Service Provider as a result of improper operation or malfunction of their energy storage system.

## INTERCONNECTION REQUIREMENTS - DISTRIBUTED ENERGY STORAGE SYSTEMS, SINGLE-PHASE

### 9. Metering Requirements for DC Coupled Configuration #1

#### (a) General

The customer shall provide and install a meter socket, in accordance with Service Provider requirements, to meter the generator output. This is referred to as the production or DG meter socket. Equipment should be selected from the approved material list in SR-452. (At present, for residential single-phase DG systems only, Service Provider will furnish a DG meter socket to the customer if they so request.) Service Provider will furnish and install the DG meter.

Under no circumstances shall any metering enclosure be used as a conduit or raceway for any conductors other than those phase conductors being metered and the associated grounded conductor (neutral) and grounding conductor (equipment ground). A neutral must be run from the customer service to the DG meter socket and terminated on the neutral bus for DG systems that may not require a neutral to operate.

Backed up loads must be served via customer's main service panel during normal grid operation, and must contain a transfer switch. See page 8 of this document for approved DC Coupled layout and SR-702 for DG metering requirements

No loads, technologies, or strategies not related to the customer's generating facility may divert, for any purpose, DG energy that would otherwise have been metered as DG production.

#### (b) Arrangement and Location

The DG meter shall be located within 10 feet of the revenue meter. Variances are not granted based on convenience or preference and must be submitted in the interconnection application and subsequently approved prior to construction. Meter sockets shall be accessible to Service Provider personnel at all times.

#### (c) Meter Socket Identification

The DG meter socket shall be labeled "Distributed Generation Meter" and shall employ signage as shown in page 8 of this SR. Service Provider will furnish the required warning placards to the customer, for approved projects, through their distributor, Border States Electric.

#### (d) Meter Socket Heights

Minimum and maximum meter socket heights shall be as specified in SR-405 page 2.

#### (e) Equipment Protection and Grounding

Meter sockets and all related metering enclosures and equipment shall be grounded in accordance with the NEC and any applicable local codes. In addition, Service Provider requires bonding at all box connectors by use of bonding bushings.

#### (f) Working Space

Working space requirements for all metering equipment shall be as specified in SR-405 page 10.

### 10. Disconnect Switches for DC Coupled Configuration #1

#### (a) General

For energy storage systems with Multimode Inverters, the utility isolation disconnect must be installed between the load side or line side Point of Interconnection and the Multimode Inverter.

As required by the DGIR, the customer shall install a Utility Isolation disconnect switch to isolate all ungrounded conductors of the DERs from the Service Provider System. The switch shall be a gang-operated, load-break device with a visible air-gap in the open position. It shall be rated for the current and voltage requirements of the energy storage system and shall be lockable in the open position.



## INTERCONNECTION REQUIREMENTS - DISTRIBUTED ENERGY STORAGE SYSTEMS, SINGLE-PHASE

### 10. Disconnect Switches for DC Coupled Configuration #1 (cont'd)

For residential single-phase DG systems requesting load side interconnection only, the Service Provider will furnish both DG disconnect switches to the customer, if they so request.

Under no circumstances shall any disconnect switch enclosure be used as a conduit or raceway for any conductors other than the phase conductors, associated grounded conductor (neutral) and associated grounding conductor (equipment ground) of the energy storage output circuit. All phase conductors shall be terminated on appropriate terminals inside the switch enclosure.

#### (b) Arrangement and Location

The Utility Isolation disconnect switch and all required meter switches shall be located within 10 feet of the customer's revenue meter, installed between the DERs and the point of interconnection.

Variances are not granted based on convenience or preference and must be requested in the interconnection application and subsequently approved prior to construction. Switch installations shall be accessible and operable to Service Provider personnel at all times.

See page 8 for layout details.

#### (c) Labeling

The disconnect switch shall be labeled "Utility Isolation Disconnect" and shall employ signage as shown in page 8 of this SR. Service Provider will furnish the required warning label to the customer through their distributor, Border States Electric.

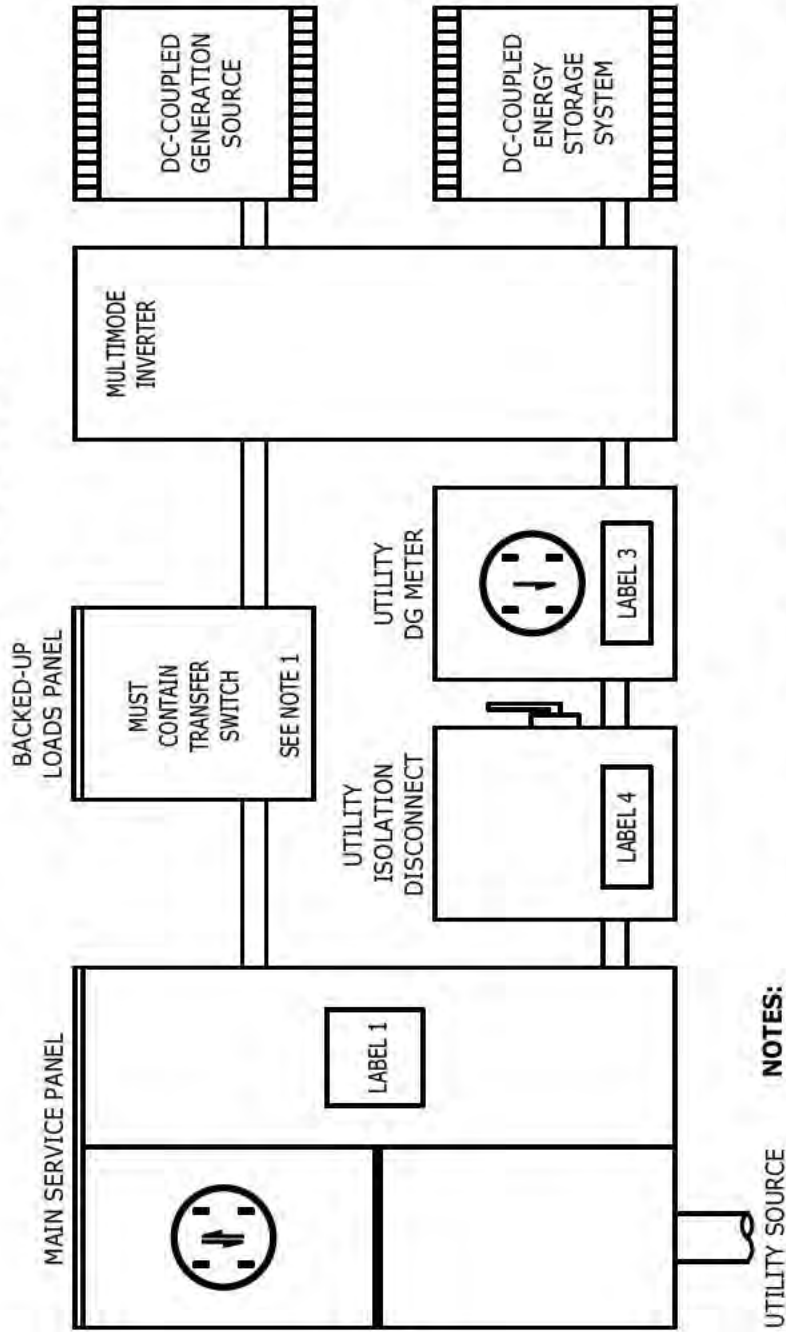
#### (d) Disconnect Switch Heights

Minimum and maximum disconnect heights shall match the requirements for meter socket heights as specified in SR-405 page 2.

#### (e) Equipment Protection and Grounding

Disconnect switch enclosures shall be grounded in accordance with the NEC, any applicable local codes. In addition, Service provider requires bonding at all box connectors by use of bonding bushings.

# DC-COUPLED CONFIGURATION #1 INTERCONNECTION LAYOUT SINGLE-PHASE SERVICE



## **NOTES:**

1. BACKED-UP LOADS PANEL MUST BE SERVED VIA CUSTOMER'S MAIN SERVICE PANEL DURING NORMAL GRID OPERATION.
2. MULTIMODE INVERTER MUST ISOLATE FROM SERVICE PROVIDER'S SYSTEM DURING BACK-UP MODE.
3. SEE SR-702 PAGE 6 FOR NOTES REGARDING UTILITY DG METER SOCKET AND ISOLATION DISCONNECT.



LABEL 1  
2-15-1912



LABEL 3  
2-15-1911



LABEL 4  
2-15-1902



## INTERCONNECTION REQUIREMENTS - DISTRIBUTED ENERGY STORAGE SYSTEMS, SINGLE-PHASE

### 11. Metering Requirements for DC Coupled Configuration #2

#### (a) General

If the multimode inverter is supplying backed-up loads while operating in parallel with the Service Provider, the customer shall install a meter socket, in accordance with Service Provider requirements, to meter the consumption of the backed-up loads. This meter is referred to as the Backed-Up Loads meter. See page 11 for general layout requirements. Service Provider will furnish and install the Backed-Up Loads meter.

The customer shall install a second meter socket as specified on page 11, in accordance with Service Provider requirements, to provide bidirectional metering of both energy delivered by the multimode inverter to the customer's main service and energy delivered by the Service Provider to the backed-up loads. This meter is referred to as the production or Utility DG meter. Service Provider will furnish and install the DG meter.

Equipment should be selected from the approved material list in SR-452. (At present, for residential single-phase DER systems only, Service Provider will furnish both meter sockets to the customer if they so request).

Under no circumstances shall any metering enclosure be used as a conduit or raceway for any conductors other than those phase conductors being metered and the associated grounded conductor (neutral) and grounding conductor (equipment ground). A neutral must be run from the customer service to the DG meter socket and terminated on the neutral bus for DG systems that may not require a neutral to operate. A neutral must also be run from the multimode inverter to the Backed-Up Loads meter and terminated on the neutral bus for DG systems and loads that may not require a neutral to operate.

No loads, technologies, or strategies not related to the customer's generating facility may divert, for any purpose, DG energy that would otherwise have been metered as DG production.

#### (b) Arrangement and Location

Both meters shall be located within 10 feet of the revenue meter. Variances are not granted based on convenience or preference and must be submitted in the interconnection application and subsequently approved prior to construction. Meter sockets shall be accessible to Service Provider personnel at all times.

#### (c) Meter Socket Identification

The Backed-Up Loads meter socket shall be labeled "Backed-Up Loads Meter" and the DG meter socket shall be labeled "Distributed Generation Meter". Both shall employ signage as shown in page 11 of this SR. Service Provider will furnish the required warning placards to the customer, for approved projects, through their distributor, Border States Electric.

#### (d) Meter Socket Heights

Minimum and maximum meter socket heights shall be as specified in SR-405 page 2.

#### (e) Equipment Protection and Grounding

Meter sockets and all related metering enclosures and equipment shall be grounded in accordance with the NEC any applicable local codes. In addition, Service Provider requires bonding at all box connectors by use of bonding bushings.

#### (f) Working Space

Working space requirements for all metering equipment shall be as specified in SR-405 page 10.

## INTERCONNECTION REQUIREMENTS - DISTRIBUTED ENERGY STORAGE SYSTEMS, SINGLE-PHASE

### 12. Disconnect Switches for DC Coupled Configuration #2

#### (a) General

For energy storage systems with Multimode Inverters, the utility isolation disconnect must be installed between the load side or line side Point of Interconnection and the Multimode Inverter.

As required by the DGIR, the customer shall install a Utility Isolation disconnect switch to isolate all ungrounded conductors of the DERs from the Service Provider System. The switch shall be a gang-operated, load-break device with a visible air-gap in the open position. It shall be rated for the current and voltage requirements of the energy storage system and shall be lockable in the open position.

The customer shall install a Backed-Up Loads disconnect switch to isolate all ungrounded conductors of the DERs from the Backed-Up Loads meter. The switch shall be a gang-operated, load-break device with a visible air-gap in the open position. It shall be rated for the current and voltage requirements of the energy storage system and shall be lockable in the open position.

For residential single-phase DER systems requesting load side interconnection only, the Service Provider will furnish both DG and Backed-Up Loads disconnect switches to the customer, if they so request.

Under no circumstances shall any disconnect switch enclosure be used as a conduit or raceway for any conductors other than the phase conductors, associated grounded conductor (neutral) and associated grounding conductor (equipment ground) of the energy storage output circuit. All phase conductors shall be terminated on appropriate terminals inside the switch enclosure.

#### (b) Arrangement and Location

The Utility Isolation and Backed-Up Loads disconnect switches and all required meter switches shall be located within 10 feet of the customer's revenue meter. Variances are not granted based on convenience or preference and must be requested in the interconnection application and subsequently approved prior to construction. Switch installations shall be accessible and operable to Service Provider personnel at all times.

The Utility Isolation disconnect switch must be installed between the DERs and the point of interconnection.

The Backed-Up Loads disconnect switch must be installed between the Backed-Up Loads meter and the multimode inverter.

See page 11 for layout details.

#### (c) Labeling

The Utility Isolation disconnect switch shall be labeled "Utility Isolation Disconnect". The Backed-Up Loads Disconnect shall be labeled "Backed-Up Loads Disconnect". Both shall employ signage as shown in page 11 of this SR. Service Provider will furnish the required warning labels to the customer through their distributor, Border States Electric.

#### (d) Disconnect Switch Heights

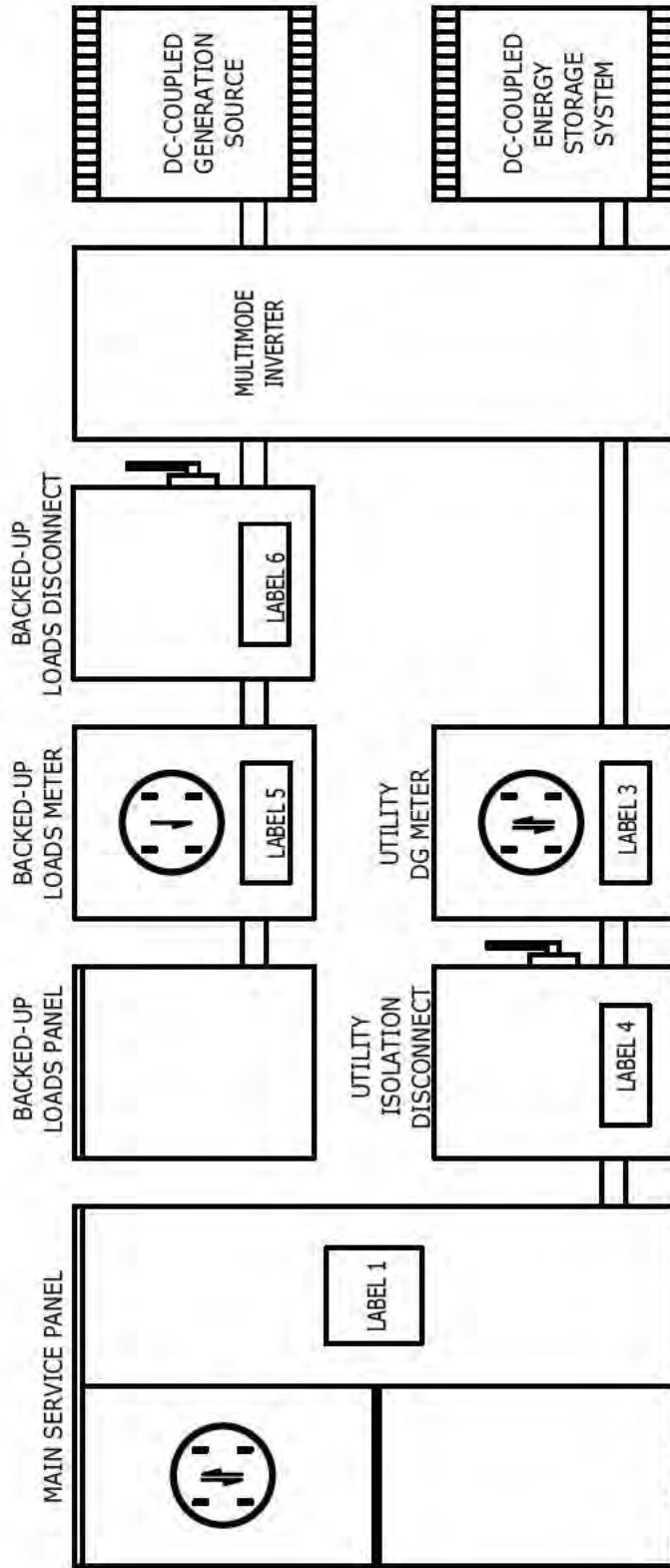
Minimum and maximum disconnect heights shall match the requirements for meter socket heights as specified in SR-405 page 2.

#### (e) Equipment Protection and Grounding

Disconnect switch enclosures shall be grounded in accordance with the NEC and any applicable local codes. In addition, Service Provider requires bonding at all box connectors by use of bonding bushings.



## DC-COUPLED CONFIGURATION #2 INTERCONNECTION LAYOUT SINGLE-PHASE SERVICE



### NOTES:

1. BACKED-UP LOADS PANEL MUST BE SERVED VIA CUSTOMER'S MULTIMODE INVERTER DURING NORMAL GRID OPERATION.
2. MULTIMODE INVERTER MUST ISOLATE FROM SERVICE PROVIDER'S SYSTEM DURING BACK-UP MODE.
3. SEE SR-702 PAGE 6 FOR NOTES REGARDING UTILITY DG METER SOCKET AND ISOLATION DISCONNECT.



LABEL 6  
2-15-1900



LABEL 4  
2-15-1902



LABEL 5  
2-15-1904



LABEL 3  
2-15-1911



LABEL 1  
2-15-1912

## INTERCONNECTION REQUIREMENTS - DISTRIBUTED ENERGY STORAGE SYSTEMS, SINGLE-PHASE

### 13. Metering Requirements for AC Coupled Configuration

#### (a) General

The customer shall provide and install a meter socket, in accordance with Service Provider requirements, to meter the generator output. This is referred to as the production or DG meter socket. Equipment should be selected from the approved material list in SR-452. (At present, for residential single-phase DG systems only, Service Provider will furnish a DG meter socket to the customer if they so request.) Service Provider will furnish and install the DG meter.

Under no circumstances shall any metering enclosure be used as a conduit or raceway for any conductors other than those phase conductors being metered and the associated grounded conductor (neutral) and grounding conductor (equipment ground). A neutral must be run from the customer service to the DG meter socket and terminated on the neutral bus for DG systems that may not require a neutral to operate.

Energy storage systems connected to a service with a DG system must not divert any energy that would be recorded by the DG Meter. See page 14 of this document for approved AC Coupled layout and SR-702 for DG metering requirements.

No loads, technologies, or strategies not related to the customer's generating facility may divert, for any purpose, DG energy that would otherwise have been metered as DG production.

#### (b) Arrangement and Location

The DG meter shall be located within 10 feet of the revenue meter. Variances are not granted based on convenience or preference and must be submitted in the DG application and subsequently approved prior to construction. Meter sockets shall be accessible to Service Provider personnel at all times.

#### (c) Meter Socket Identification

The DG meter socket shall be labeled "Distributed Generation Meter" and shall employ signage as shown in pages 14 of this SR. Service Provider will furnish the required warning placards to the customer, for approved projects, through their distributor, Border States Electric.

#### (d) Meter Socket Heights

Minimum and maximum meter socket heights shall be as specified in SR-405 page 2.

#### (e) Equipment Protection and Grounding

Meter sockets and all related metering enclosures and equipment shall be grounded in accordance with the NEC any applicable local codes. In addition, Service Provider requires bonding at all box connectors by use of bonding bushings.

#### (f) Working Space

Working space requirements for all metering equipment shall be as specified in SR-405 page 10.

### 14. Disconnect Switches for AC Coupled Configuration

#### (a) General

For energy storage systems with Multimode Inverters, the utility isolation disconnect must be installed between the load side or line side Point of Interconnection and the grid-coupling device with automatic transfer switching capabilities.

Various system configurations are acceptable for utility isolation. For safety of Utility personnel, system shall automatically disconnect and isolate from Service Provider's system upon loss of utility service per UL-1741.



## INTERCONNECTION REQUIREMENTS - DISTRIBUTED ENERGY STORAGE SYSTEMS, SINGLE-PHASE

### 14. Disconnect Switches for AC Coupled Configuration (cont'd)

As required by the DGIR, the customer shall install a Utility Isolation disconnect switch to isolate all ungrounded conductors of the DERs from the Service Provider System. The switch shall be a gang-operated, load-break device with a visible air-gap in the open position. It shall be rated for the current and voltage requirements of the DER system and shall be lockable in the open position.

The customer shall install an additional Utility DG disconnect switch to isolate all ungrounded conductors of the grid-coupling device from the Utility DG meter. The switch shall be a gang-operated, load-break device with a visible air-gap in the open position. It shall be rated for the current and voltage requirements of the DG system and shall be lockable in the open position. See page 14 for layout details.

For residential single-phase DG systems requesting load side interconnection only, the Service Provider will furnish both DG disconnect switches to the customer, if they so request.

Under no circumstances shall any disconnect switch enclosure be used as a conduit or raceway for any conductors other than the phase conductors, associated grounded conductor (neutral) and associated grounding conductor (equipment ground) of the energy storage output circuit. All phase conductors shall be terminated on appropriate terminals inside the switch enclosure.

#### (b) Arrangement and Location

The Utility Isolation and Utility DG disconnect switches and all required meter switches shall be located within 10 feet of the customer's revenue meter. Variances are not granted based on convenience or preference and must be requested in the DG application and subsequently approved prior to construction. Switch installations shall be accessible and operable to Service Provider personnel at all times.

The Utility Isolation disconnect switch must be installed between the DERs and the point of interconnection.

The Utility DG disconnect switch must be installed between the Utility DG meter and the grid-coupling device.

See page 14 for layout details.

#### (c) Labeling

The disconnect switch shall be labeled "Utility Isolation Disconnect". The Utility DG Disconnect shall be labeled "Utility DG Disconnect". Both shall employ signage as shown in page 14 of this SR. Service Provider will furnish the required warning label through their distributor, Border States Electric.

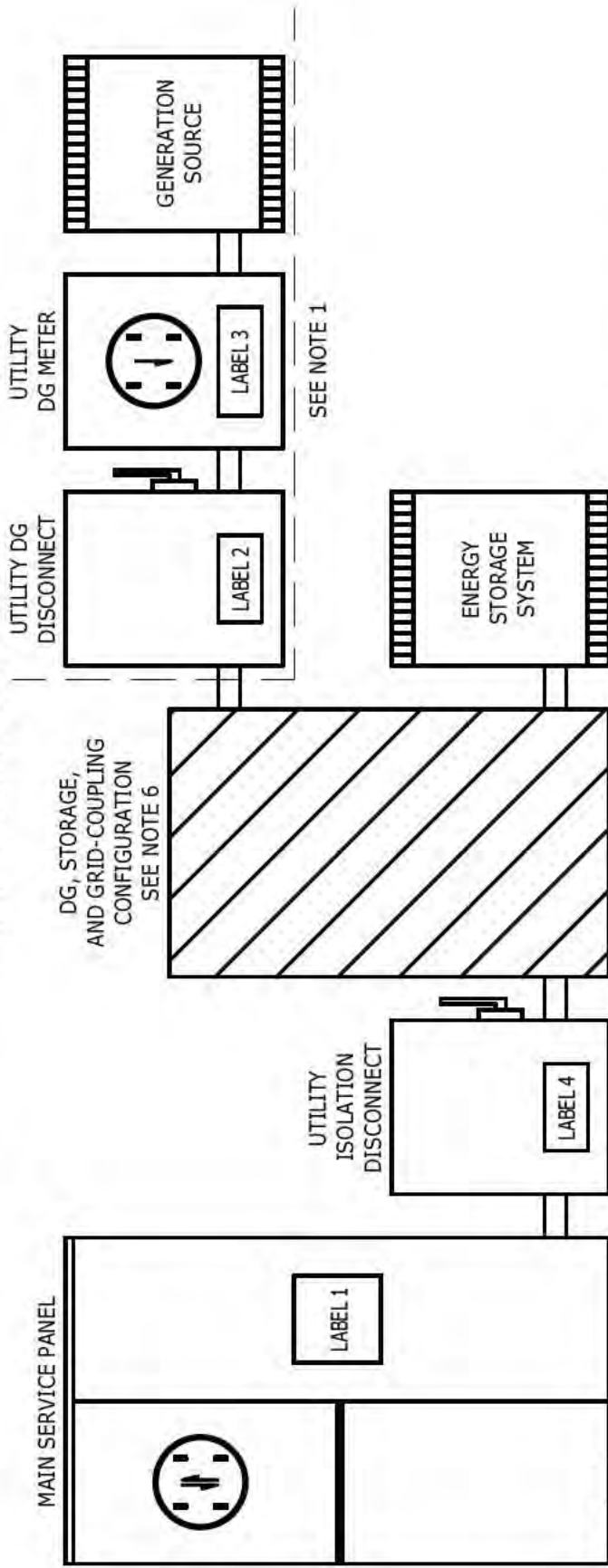
#### (d) Disconnect Switch Heights

Minimum and maximum disconnect heights shall match the requirements for meter socket heights as specified in SR-405 page 2.

#### (e) Equipment Protection and Grounding

Disconnect switch enclosures shall be grounded in accordance with the NEC and any applicable local codes. In addition, Service Provider requires bonding at all box connectors by use of bonding bushings.

# AC-COUPLED CONFIGURATION INTERCONNECTION LAYOUT SINGLE-PHASE SERVICE



## NOTES:

1. CUSTOMER IS REQUIRED TO FURNISH AND INSTALL DG DISCONNECT SWITCH, METER SOCKET (SEE SR-702), LABELS 1-4, AND RELATED DG EQUIPMENT.
2. SERVICE PROVIDER WILL PROVIDE DG DISCONNECT SWITCH, METER SOCKET AND LABELS ONLY FOR APPROVED SINGLE-PHASE RESIDENTIAL APPLICANTS.
3. REVENUE AND DG METER ARE PROVIDED BY AND INSTALLED BY SERVICE PROVIDER.
4. A GOVERNMENTAL AGENCY CLEARANCE IS REQUIRED FOR ALL DG AND ENERGY STORAGE INSTALLATIONS.
5. LABELS ARE AVAILABLE FOR PURCHASE AT BORDER STATES ELECTRIC, 763 E MACARTHUR CIRCLE, TUCSON, AZ 85714.
6. VARIOUS SYSTEM CONFIGURATIONS ARE ACCEPTABLE FOR UTILITY ISOLATION. FOR SAFETY OF UTILITY PERSONNEL, SYSTEM SHALL AUTOMATICALLY DISCONNECT/ISOLATE FROM UTILITY UPON LOSS OF UTILITY SERVICE PER UL-1741.



LABEL 1  
2-15-1912



LABEL 2  
2-15-1913



LABEL 3  
2-15-1911



LABEL 4  
2-15-1902



## INTERCONNECTION REQUIREMENTS - DISTRIBUTED ENERGY STORAGE SYSTEMS, SINGLE-PHASE

### 15. Stand Alone Energy Storage Systems

The installation of an additional meter socket is not required if the energy storage system will be connected to a service without a DG system.

### 16. Disconnect Switches- Stand Alone Energy Storage Systems

#### (a) General

The customer shall install a Utility Isolation disconnect switch(s) to isolate all ungrounded conductors of the DERs from the Service Provider System. The switch shall be a gang-operated, load-break device with a visible air-gap in the open position. It shall be rated for the current and voltage requirements of the energy storage system and shall be lockable in the open position.

For residential single-phase energy storage systems requesting load side interconnection only, the Service Provider will furnish both Utility Isolation disconnect switch and label to the customer, if they so request.

Under no circumstances shall any disconnect switch enclosure be used as a conduit or raceway for any conductors other than the phase conductors, associated grounded conductor (neutral) and associated grounding conductor (equipment ground) of the energy storage output circuit. All phase conductors shall be terminated on appropriate terminals inside the switch enclosure.

#### (b) Arrangement and Location

The Utility Isolation disconnect switch and all required meter switches shall be located within 10 feet of the customer's revenue meter. Variances are not granted based on convenience or preference and must be requested in the DG application and subsequently approved prior to construction. Switch installations shall be accessible and operable to Service Provider personnel at all times.

The Utility Isolation disconnect switch must be installed between the DERs and the point of interconnection.

See page 16 for layout details.

#### (c) Labeling

The disconnect switch shall be labeled "Utility Isolation Disconnect" and shall employ signage as shown in page 16 of this SR. Service Provider will furnish the required warning label through their distributor, Border States Electric.

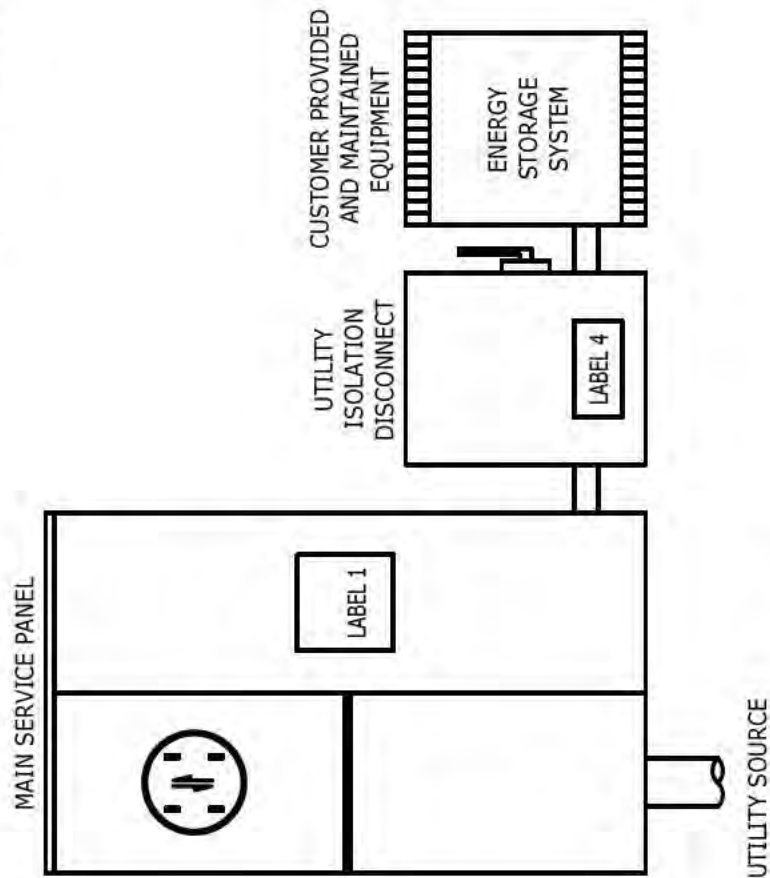
#### (d) Disconnect Switch Heights

Minimum and maximum disconnect heights shall match the requirements for meter socket heights as specified in SR-405 page 2.

#### (e) Equipment Protection and Grounding

Disconnect switch enclosures shall be grounded in accordance with the NEC, any applicable local codes. In addition, Service Provider requires bonding at all box connectors by use of bonding bushings.

# STAND-ALONE ENERGY STORAGE INTERCONNECTION LAYOUT SINGLE-PHASE SERVICE



## NOTES:

1. ENERGY STORAGE SYSTEM MUST ISOLATE FROM SERVICE PROVIDER'S SYSTEM DURING BACK-UP MODE.
2. SEE SR-702 PAGE 6 FOR NOTES REGARDING UTILITY ISOLATION DISCONNECT.

**WARNING**  
 ELECTRICAL SHOCK HAZARD  
 DISTRIBUTED GENERATION  
 PRESENT  
 TERMINALS ON LINE AND  
 LOAD SIDE MAY BE  
 ENERGIZED

LABEL 1  
2-15-1912

**WARNING**  
 UTILITY ISOLATION DISCONNECT  
 PANEL MAY BE ENERGIZED BY  
 UTILITY SERVICE OR DG SOURCE

LABEL 4  
2-15-1902