

# Engineering Requirements

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## 2. Purpose

The purpose of this document is to present the Utility’s design requirements for Net Metering systems to operate in parallel with the Utility’s electric system to ensure the safety of people and property and the integrity of the electrical system. Energy Storage Devices (ESD) that are paired with a Net Metering system are also covered by this standard. For Energy Storage Devices not paired with a Net Metering System, please refer to the generation interconnection standards RE-1 and RE-2 for Southern Nevada, or ENG01U and ENG02U for Northern Nevada.

## 3. General

- 3.1 As defined in NRS 704.771: “Net metering system” means facility or energy system for the generation of electricity that:
  - 3.1.1 Uses renewable energy as its primary source of energy to generate electricity;
  - 3.1.2 Has a generating capacity of not more than 1,000 kilowatts
  - 3.1.3 Is isolated on the Customer-Generator’s premises;
  - 3.1.4 Operates in parallel with the Utility’s transmission and/or distribution facilities; and
  - 3.1.5 Is intended primarily to offset part or all of the Customer-Generator’s requirements for electricity.
  
- 3.2 As defined in NRS 704.7811, “Renewable energy” means:
  - 3.2.1 Biomass
  - 3.2.2 Geothermal energy
  - 3.2.3 Solar energy
  - 3.2.4 Waterpower
  - 3.2.5 Wind

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## 4. Applicable Standards

Customer Generator Net Metering systems and Energy Storage Devices must meet all applicable safety and power quality standards established by the most recent versions of the following at the time of the interconnection:

- 4.1 All articles of the National Electric Code that apply, including but not limited to Articles 480, 685, 690, 694, 702, 705, and 706.
- 4.2 All applicable State and Local codes.
- 4.3 Underwriters Laboratories Inc.
- 4.4 Institute of Electrical and Electronic Engineers, (IEEE) Standards 929 and 1547. The readily accessible visible break and lockable disconnect switch of IEEE 1547 is required. A pull-out disconnect is NOT acceptable.
- 4.5 NV Energy's parallel operating interconnection requirements in its Rule 15 tariff.
- 4.6 All other applicable NV Energy standards.

## 5. Definitions

- 5.1 Backup Equipment: The hardware and control system that interrupts a Net Metering System's and Energy Storage Device's Parallel Operating functions, disconnects a power source from the Utility grid, and changes over to a Backup Operation mode.
- 5.2 Backup Operation: The disconnection from the Utility grid and continuing operation of a power source in the event of the loss of Utility power service. Also called a "Microgrid". All devices must be effectively isolated from the Utility grid while in a Backup Operation mode.
- 5.3 Customer-Generator: A user of a Net Metering system or Energy Storage Device.
- 5.4 Energy Storage Device: A device that captures energy produced at one time, stores that energy for a period of time, and delivers that energy as electricity for use at a future time.
- 5.5 Net Metering: Measuring and billing only the difference between electricity supplied by the Utility and the electricity generated by the Customer-Generator that is fed back to the Utility over the applicable billing period.
- 5.6 Renewable Energy Credit (REC) Meter: A Utility meter that is installed at the output terminals of a renewable generator's inverter. It measures the total production as soon as it is produced by the generator that the Utility claims towards its renewable energy portfolio goals in Nevada.
- 5.7 The Utility: NV Energy (NVE).


## 6. Studies

- 6.1 Technical review of the impact of the Net Metering system's or Energy Storage Device's interconnection on NV Energy's electric distribution system will be conducted per the requirements set forth in NV Energy's Rule 15. Normally, an Interconnection Study will not be required, but may be if deemed necessary by NV Energy to determine any necessary changes to Utility infrastructure which may be required as a result of the interconnection.

## 7. Net Metering System Metering Arrangement

This section provides the requirements for metering Net Metering systems:

- 7.1 The Revenue Net Metering will be arranged so that Utility measures the net electricity delivered or received during the billing period.

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- 7.2 A second (REC/Generation/Production) meter measures the electricity generated by the Customer-Generator. NV Energy will provide this meter only if the Customer-Generator participates in the Renewable Generations Program.
- 7.3 Connections to the supply side of the main disconnecting means installed in accordance with NEC Articles 230.82(6) and 705.12, are allowed. The connection shall be on the load side of the metering points. Connections on the load side of the main disconnecting means installed in accordance with NEC Articles 705.12 and 240.21, are allowed.
  - 7.3.1 Modifications to the electrical equipment may compromise the equipment listing. All modifications shall be approved in writing by the Authority Having Jurisdiction, the manufacturer, or a Nationally Recognized Testing Laboratory. Forward the documentation to Meter Operations.
  - 7.3.2 The visible break, readily accessible and lockable disconnect switch and REC meter shall be located per Sections 8, 9, and 11 of this standard.
- 7.4 "Solar Ready Service Panels" may be used if they meet NV Energy requirements. Submit the service panel's specification sheets and part numbers used as part of the net metering application for engineering review.


### 8. Energy Storage Device Metering Arrangement

This section provides the requirements for metering Energy Storage Devices when they are paired with a Net Metering System.

- 8.1 Installation of Energy Storage Devices requires a revenue quality, bi-directional, Utility interval meter to be installed at the main service panel.
- 8.2 AC-Coupled Energy Storage Devices installed in parallel with renewable generation require an additional meter socket to be installed by the Customer-Generator per the diagrams in Attachment 4 of this standard. The meter installed at this socket is used to monitor power flowing to and from the Energy Storage Device, Utility power or customer renewable generation.
- 8.3 DC-Coupled Energy Storage Devices installed on a shared renewable generation inverter will need a bi-directional meter socket installed by the Customer-Generator per Attachment 5 or Attachment 6 of this standard. If the renewable generation is incentivized, the REC meter may be exchanged with a bi-directional meter to meet this requirement.
- 8.4 The load-side (bottom) clips of the ESD meter socket shall connect to the ESD inverter. The line-side (top) clips of the socket shall connect to the main service.
- 8.5 Connections to the supply side of the main disconnecting means installed in accordance with NEC Articles 230.82(6) and 705.12, are allowed. The connection shall be on the load side of the metering points. Connections on the load side of the main disconnecting means installed in accordance with NEC Articles 705.12 and 240.21, are allowed.
  - 8.5.1 Modifications to the electrical equipment may compromise the equipment listing. All modifications shall be approved in writing by the Authority Having Jurisdiction, the manufacturer, or a Nationally Recognized Testing Laboratory. Forward the documentation to Meter Operations.
- 8.6 The visible break, readily accessible and lockable disconnect switch shall be located per Attachments 4, 5, or 6 of this standard. It must be within 10 feet of the service entrance equipment.
- 8.7 The Energy Storage Device meter must be located within 10 feet of the service entrance equipment.
- 8.8 Regular metering installation procedures found in other relevant standards apply as needed based on the specific nature of the project, including but not limited to: RPM-G, RPI-G, RPI-2, etc.

### 9. Customer-Generator Engineering Requirements

This section provides the engineering requirements that the Customer-Generator must comply with to install a Net Metering system or Energy Storage Device paired with a Net Metering system:

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- 9.1 The required location of the REC and ESD meter socket is within 10' of the service entrance equipment. (See Attachment 1).
- 9.1.1 Electric Meter Operations will consider the REC (generation) and ESD meter to be farther than 10' from the existing service entrance equipment if there are extenuating circumstances with the project design. Evaluation of the REC and ESD meter location will include, but is not limited to, a review of safety issues and accessibility to the REC and ESD meter. Relocation of the REC and ESD meter for aesthetic reasons is not sufficient.
- 9.1.2 For Customer-Generators served by a dedicated transformer with the net (revenue) meter located on or near the transformer (remote from the service entrance equipment), installation of the REC or ESD meter socket must be within 10' of the service entrance equipment disconnect rather than the net meter.
- 9.2 Locate the visible disconnect switch within 10' of the net meter. (See Attachment 2.)
- 9.2.1 Distribution equipment including but not limited to subpanels and transformers are allowed to be installed between the Visible Disconnect switch and the REC and ESD meter.
- 9.2.2 The installation of the above distribution equipment must NOT electrically bypass the Visible Disconnect switch. The intent of the Visible Disconnect switch is to isolate applicant owned generation from NV Energy equipment.
- 9.2.3 For Customer-Generators served by a dedicated transformer with the net (revenue) meter located on or near the transformer (remote from the service entrance equipment), install the source disconnect within 10' of the service entrance equipment disconnect rather than the net meter.
- 9.2.4 Under all circumstances the source disconnect must be within 10' of the service entrance disconnect with a direct line of sight and no obstructions (fence, etc.) between the two.
- 9.2.5 AC disconnect must be wired in accordance to Jurisdictional code.
- 9.2.6 All sources of generation, including but not limited to renewable generation and Energy Storage Devices, must be protected by a Visible Disconnect that isolates the source from the grid. Retrofitting equipment into an existing net metering system shall not bypass any existing protections.
- 9.3 During the design phase, it is recommended that design professionals thoroughly investigate the proposed installation for NEC and Utility compliance issues as part of the due diligence process. Any compliance issues are to be addressed prior to finalization and stamping of the designs.
- 9.4 Customer-Generators who have primary voltage service and who own all of the service equipment on the load side of NVE owned primary metering equipment (a privately owned and maintained system) may use an NVE primary metering switch having a visible air break and under the control and operation of NVE as the means of disconnect. Note that if the Customer-Generator's generation remains connected to their system, the potential may exist in such a situation for the renewable generation to feed into the customer owned system upon the loss of NVE source.
- 9.5 There must be at least 6 inches of clearance below the Utility sealed section of a service panel. All Customer-Generator owned equipment including conduit must provide this clearance.

## 10. Customer-Generator Operating Requirements

This section provides the operating requirements that the Customer-Generator must follow and the responsibilities that they must assume for operating a Net Metering System generator or Energy Storage Device in parallel to the Utility system:

- 10.1 Quality of service – The operation of the Customer Generator's generation facility must not reduce the quality of service to the Utility's electric system or other Utility customers. No abnormal voltages, currents, frequencies, or interruptions are permitted.

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- 10.2 De-energized Utility Circuit – The generator or Energy Storage Device will at no time energize a de-energized Utility circuit.
- 10.3 Inhibited Parallel Operation – If while operating in parallel with Utility’s system, any of the protective devices operate inhibiting parallel operation, the Customer-Generator will perform the following procedures prior to attempting any further parallel operation with Utility:
- 10.3.1 Determine whether Utility’s circuit is energized or de-energized.
- 10.3.2 If Utility’s circuit has been continuously energized, then the Customer-Generator will not attempt to reconnect their system in parallel with the Utility until the cause of a protective device disoperation has been corrected by a certified person and the Utility has inspected and has satisfied itself that the Customer-Generator’s system is operating properly.
- 10.3.3 If it is determined that the Utility circuit is de-energized, the Customer-Generator must not attempt to re-connect their system until it is confirmed by Utility that power has been restored and Utility’s circuit is energized.
- 10.4 The Customer-Generator is responsible for damage caused to other customers and to the Utility as a result of improper operation or malfunction of their generation facilities.
- 10.5 The Utility is not responsible for damage caused to other customers and to the Utility as a result of improper operation or malfunction of the customer’s generation facilities.
- 10.6 It is recommended that on the loss of power from the Utility that the Customer-Generator not isolate itself from the Utility while continuing to generate (unless operating in Backup Operation mode). The Customer-Generator shall coordinate reconnection of their generation to the Utility per Section 10.3 after the Utility voltage and frequency are restored to normal. Utility is not responsible for damage caused to the Customer-Generator’s facility as a result of the utilities automatic or manual reclosing of its feeder.

## 11. Energy Storage Device Requirements

This section provides the engineering requirements specifically for an Energy Storage Device that is paired with a Net Metering System.

- 11.1 Energy Storage Devices by themselves do not qualify for Net Metering unless paired with renewable generation and charged solely from renewable generation, and must follow the interconnection process described in Rule 15. For stand-alone Energy Storage Devices or those paired with renewable generation that is not Net Metering, refer to the generation interconnection standards RE-1 and RE-2 for Southern Nevada, or ENG01U and ENG02U for Northern Nevada.
- 11.2 The operation of the Energy Storage Device must be certified for all applicable anti-islanding, energy storage, and Utility interactive equipment standards from IEEE, Underwriter’s Laboratories, NEC, and State and local building codes, particularly the latest versions of IEEE 1547 or UL 1741, UL 9540, NEC 706, and others.
- 11.3 Electrical line drawings and manufacturer specification sheets for Energy Storage Devices must be submitted during the interconnection application for engineering review.
- 11.4 There must be signage indicating the presence of an Energy Storage Device on the property. The signage shall be outdoors on the service entrance equipment and shall be weatherized and rated for outdoor use.
- 11.4.1 The breaker panel must have a label indicating which breaker is for the Energy Storage Device.
- 11.5 The Energy Storage Device must have a readily accessible, visible-break, and lockable Visible Disconnect that effectively isolates it from the grid.
- 11.5.1 The retrofitting of an Energy Storage Device into an existing Net Metering System must not bypass any existing Visible Disconnects.
- 11.5.2 Each power source (renewable generator, Energy Storage Device, etc.) must have its own Utility Source Disconnect in order to provide a safe means to service solar REC meters and other meters that may be on those circuits.

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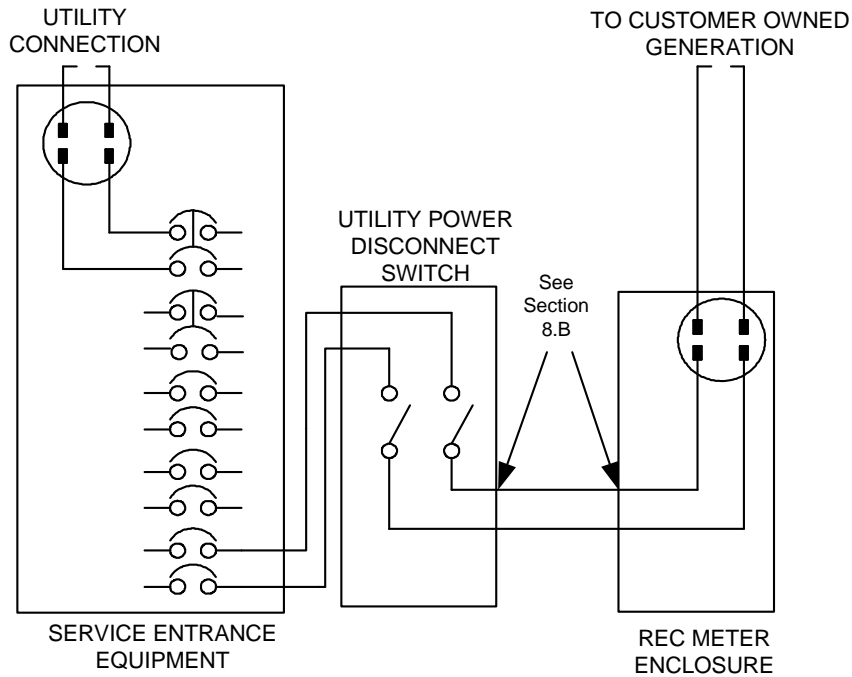
- 11.5.3 The Visible Disconnect must be located within 10 feet and within line of sight from the service entrance equipment.
- 11.6 Backup Operation and Backup Equipment of an Energy Storage Device
  - 11.6.1 Whole or partial building Backup Operation during a loss of Utility power service using Energy Storage Devices is permitted.
  - 11.6.2 The Backup Equipment used to engage the Backup Operating mode must prevent any and all exporting of power to the grid while in Backup Operating mode.
  - 11.6.3 The Backup Equipment must use hardware that uses a physical break to interrupt the circuit. This hardware can include switches or relays. Devices that do not use a physical break to engage Backup Operation such as solid state relays or other semiconductors are not permitted.
  - 11.6.4 For partial building backup designs, the set of backup loads must be located on a panel designated for Backup Operation that is separate from the main service panel.
  - 11.6.5 For whole building backup designs, the main service panel may be used for Backup Operation if it will be isolated from the point of common coupling with the Utility grid during outage conditions.
  - 11.6.6 The Backup Equipment may be located either internally or externally to the Energy Storage Device.
  - 11.6.7 The Backup Equipment does not preclude the requirement for an effective Visible Disconnect.
  - 11.6.8 The Energy Storage Device and renewable generators must follow procedures outlined in the latest version of IEEE 1547 for reconnecting to the Utility grid once power service is restored.


## 12. Attachments

- Attachment 1: Incentive Net Metering One-Line Diagram
- Attachment 2: Metering Arrangement
- Attachment 3: Required Tagging
- Attachment 4: AC-Coupled ESD System Electrical Drawing
- Attachment 5: DC-Coupled ESD System Electrical Drawing
- Attachment 6: DC-Coupled ESD System with Inverter-Tied Backup Loads Electrical Drawing

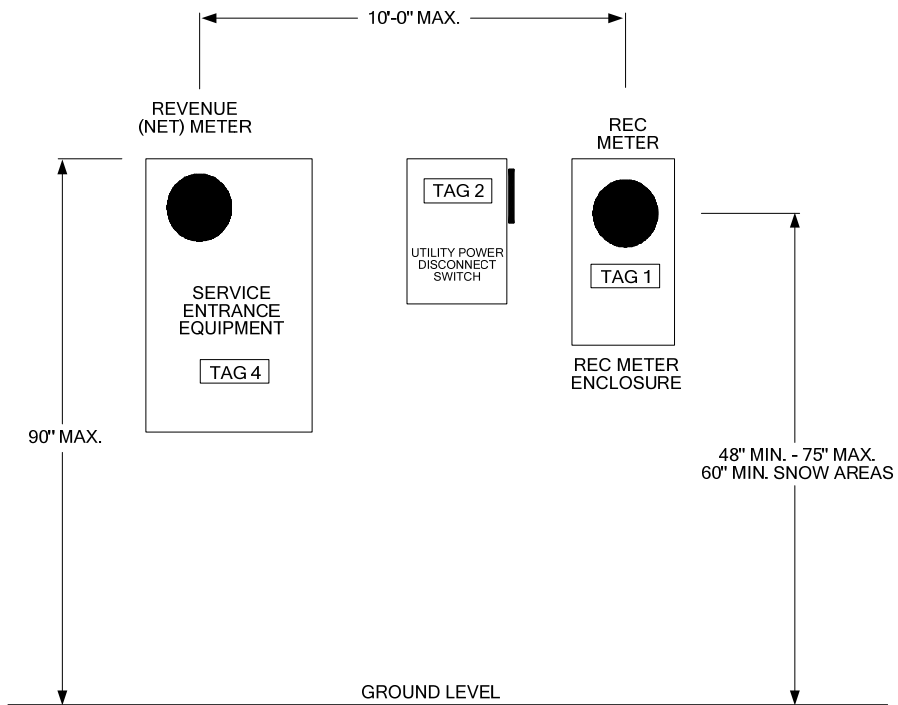
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**ATTACHMENT 1:  
INCENTIVE NET METERING SYSTEM ONE LINE DIAGRAM**



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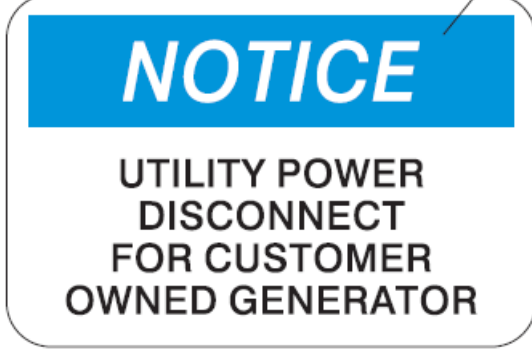

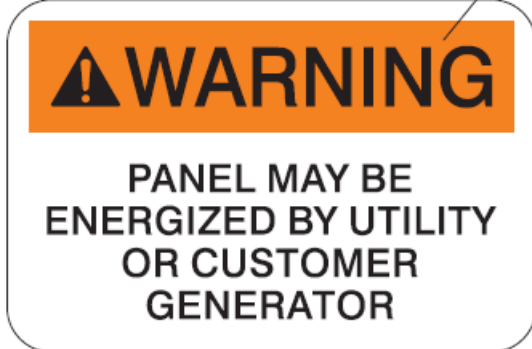
**ATTACHMENT 2:  
METERING ARRANGEMENT**




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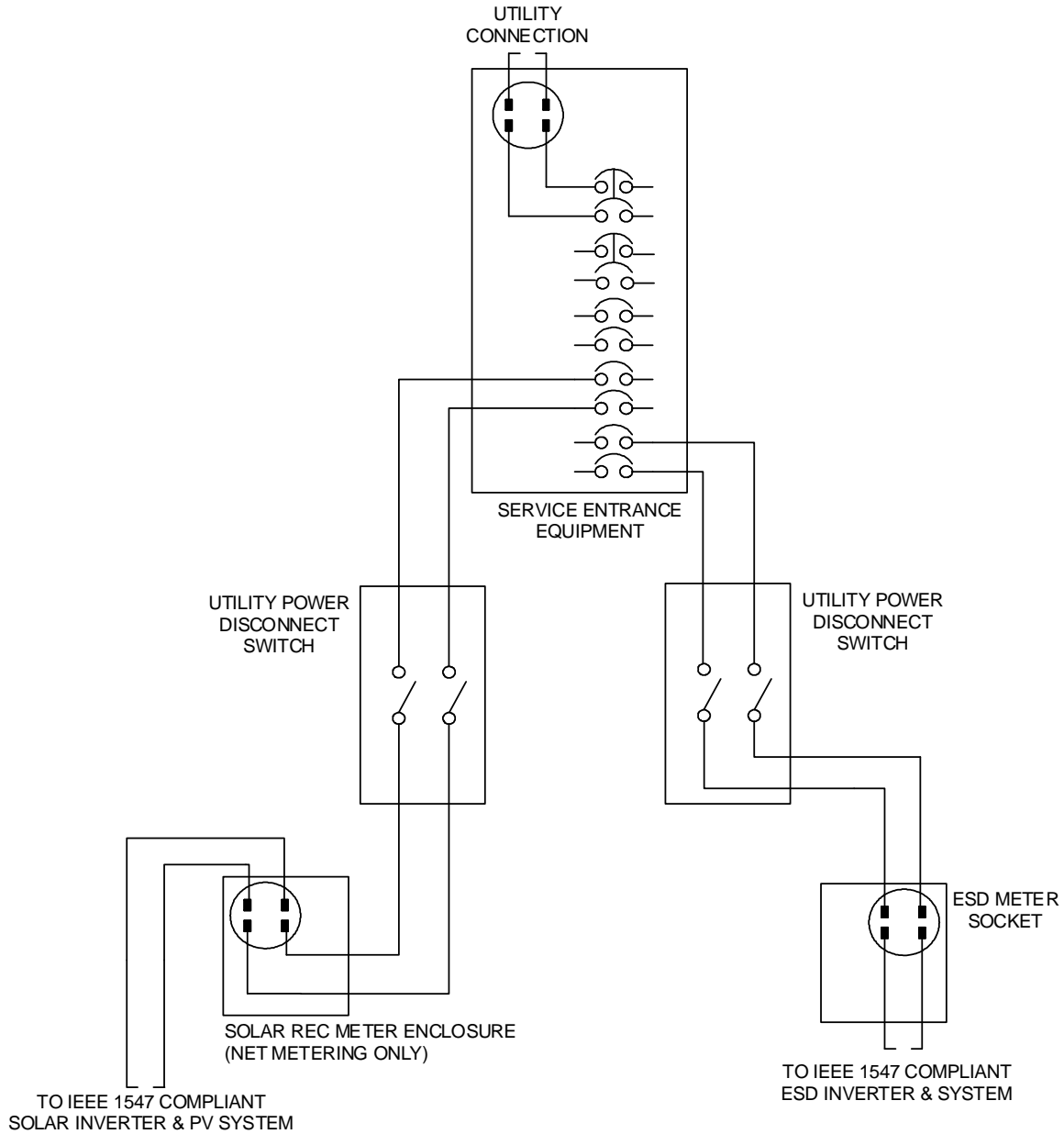



**ATTACHMENT 3: REQUIRED TAGGING**  
**NV ENERGY WILL ATTACH THE TAGS BELOW TO ALL NET METERING SYSTEMS**

<p><b>Tag 1. Install on REC Meter Box (956205)</b></p> 	<p><b>Tag 2. Install on Disconnect Switch Box (956200)</b></p> 
<p><b>Tag 3. Install on Transformer, J-Bar, or Service Conductor (951022)</b></p> 	<p><b>Tag 4. Install on Net Meter Box (956210)</b></p> 

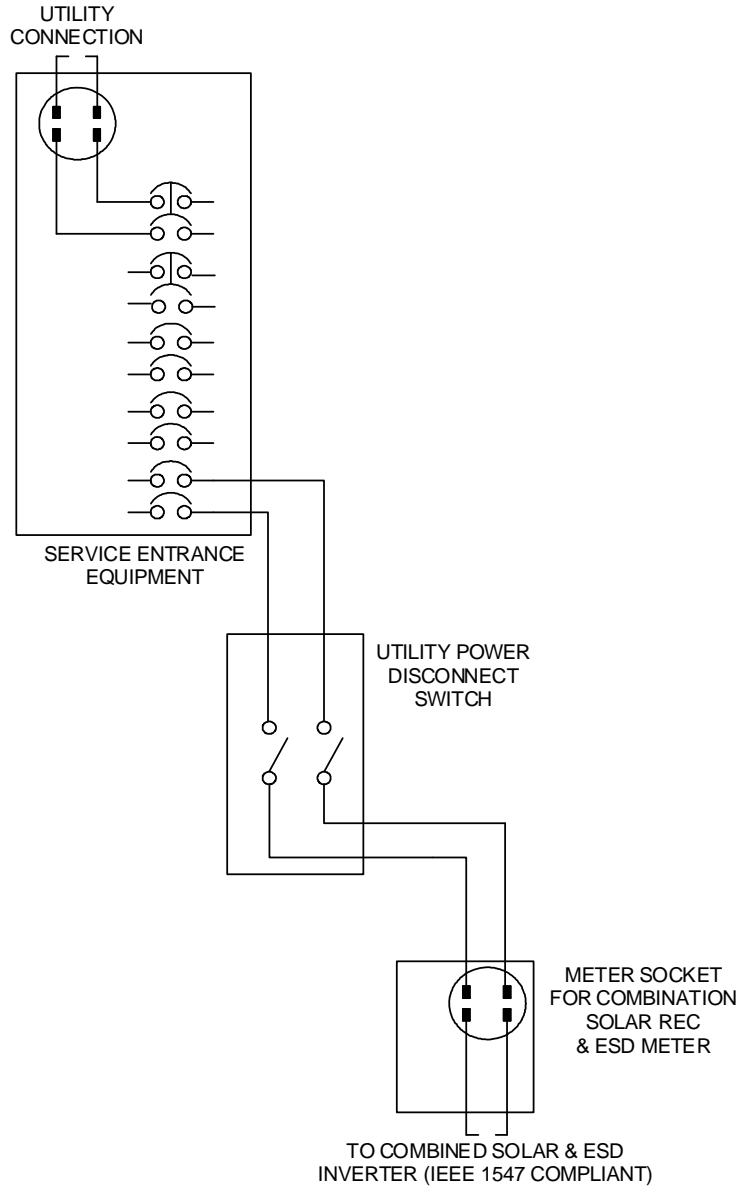
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**ATTACHMENT 4:  
AC-COUPLED ESD SYSTEM ELECTRICAL DRAWING**



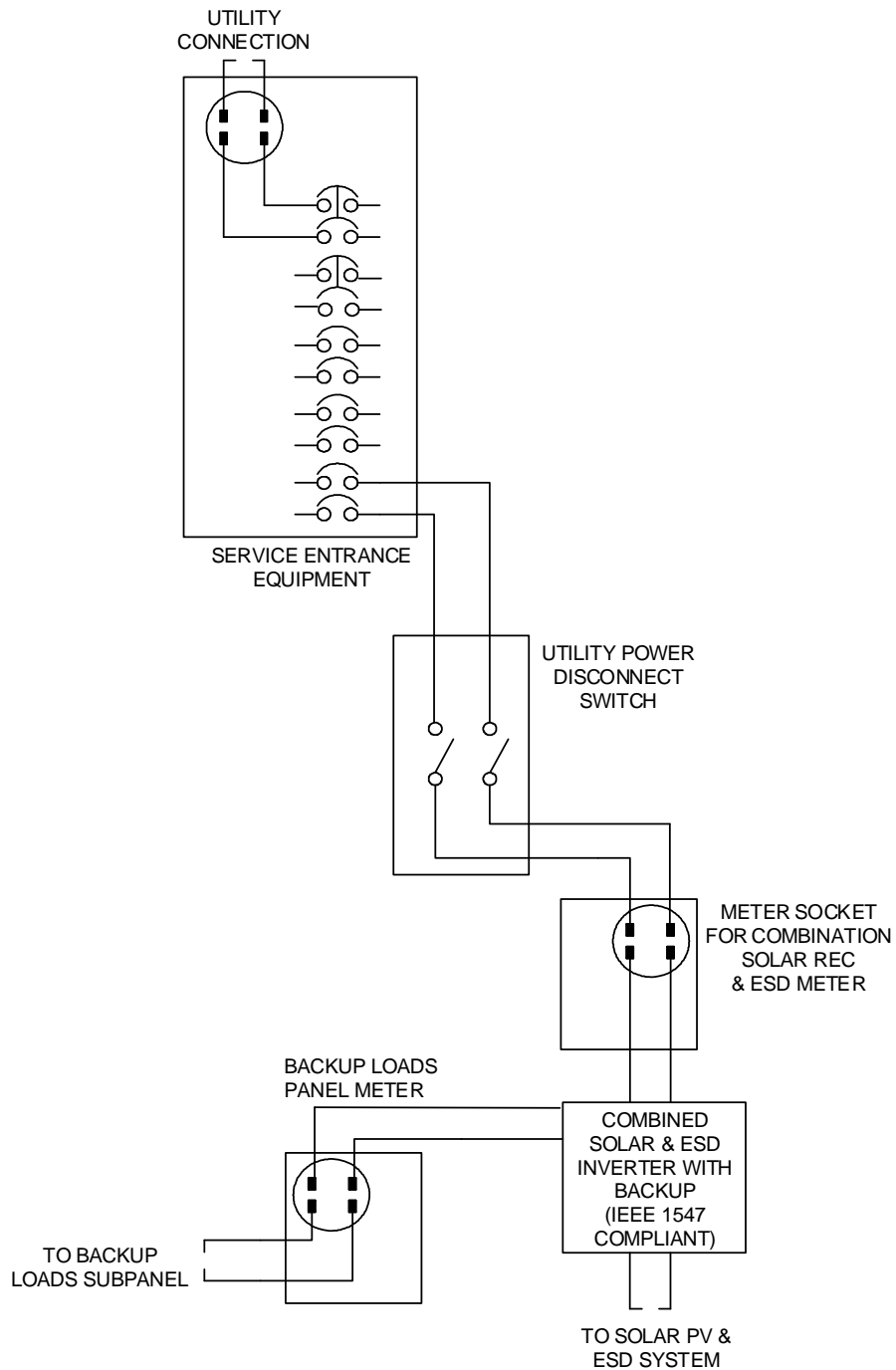
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**ATTACHMENT 5:  
DC-COUPLED SYSTEM ELECTRICAL DRAWING**



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**ATTACHMENT 6:  
DC-COUPLED ELECTRICAL SYSTEM WITH INVERTER-TIED BACKUP LOAD ELECTRICAL DRAWING**



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