7 Technology-Specific Requirements

This Section outlines technology-specific requirements for DER Facilities. Company requires that the Customers DER Facilities interconnecting with the Company Distribution System meet the technology-specific the requirements unless specified otherwise in the DER Interconnection Agreement.

7.1 DER Units with Inverter-Based Interfaces

7.1.1 Inverter Standards

Company requires that the "Inverters" of all DER Units with inverter-based interfaces be certified compliant with the Inverter standards/guidelines outlined in Table 7-1.

Table 7-1: Inverter Standards/Guidelines

IEEE 1547-2018	Inverters shall be Smart Inverters certified compliant with IEEE 1547-2018 "IEEE Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces".
IEEE 1547.1	Inverters shall comply with the most current release of IEEE 1547.1 "IEEE Standard Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems" (new release in 2020)
UL 1741	Inverters shall be certified safety compliant under UL 1741 "Standard for Inverters, Converters, Controllers and Interconnection System Equipment for use with Distributed Energy Resources"
UL 1741 SA UL 1741 SB	Inverters shall be certified compliant as Grid Support Utility Interactive Inverters under either UL 1741 SA or UL1741 SB until 01/01/2022. After 1/1/2022, inverters shall be certified compliant under UL 1741-SB

Company recommends that Customer propose Inverters listed as compliant on the California Energy Commissioner's (CEC) list of eligible Inverters available at the following location:

Solar Equipment Lists | California Energy Commission

Customer may propose Inverters that are not listed on the CEC list, but additional time will be required to verify certification and compliance with the outlined requirements.

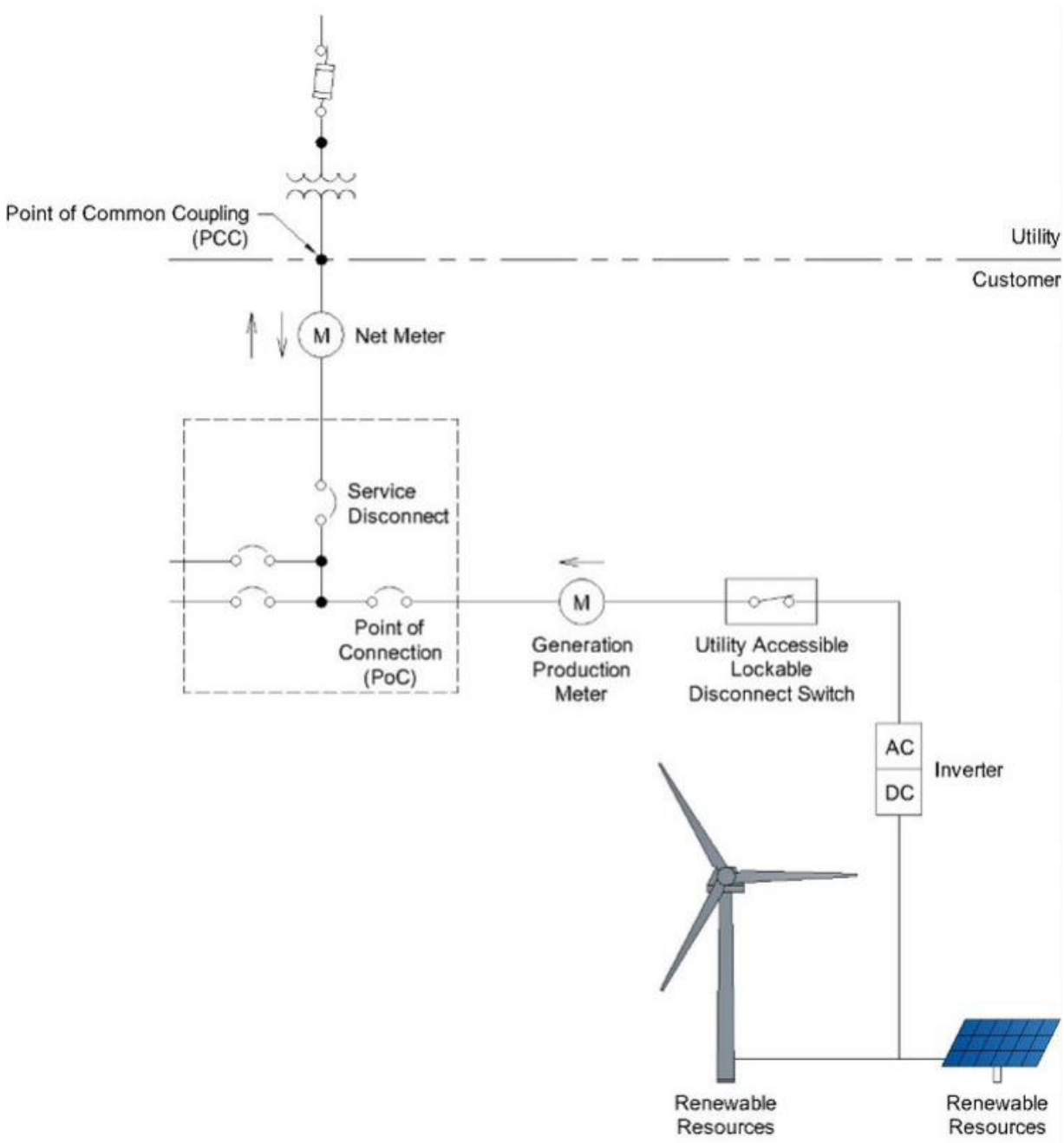
Inverter settings will be determined by the Company. The Company will have the ability to view, modify/control DER operations through the inverter functions/setpoints.

7.1.2 Inverter Based Generation One-Line Diagrams

The one-line diagrams presented in this section are illustrative of several typical inverter-based DG installations. The NEC may permit other configurations and may have additional wiring and equipment requirements.

Figure 7-1 below, illustrates the typical one-line diagram for a Customer's DER Facility that is connected at a circuit breaker in the electric service/load panel. The NEC 120% rule[16] applies when the DER PoC is made on the opposite end of the load bus from the primary power source.

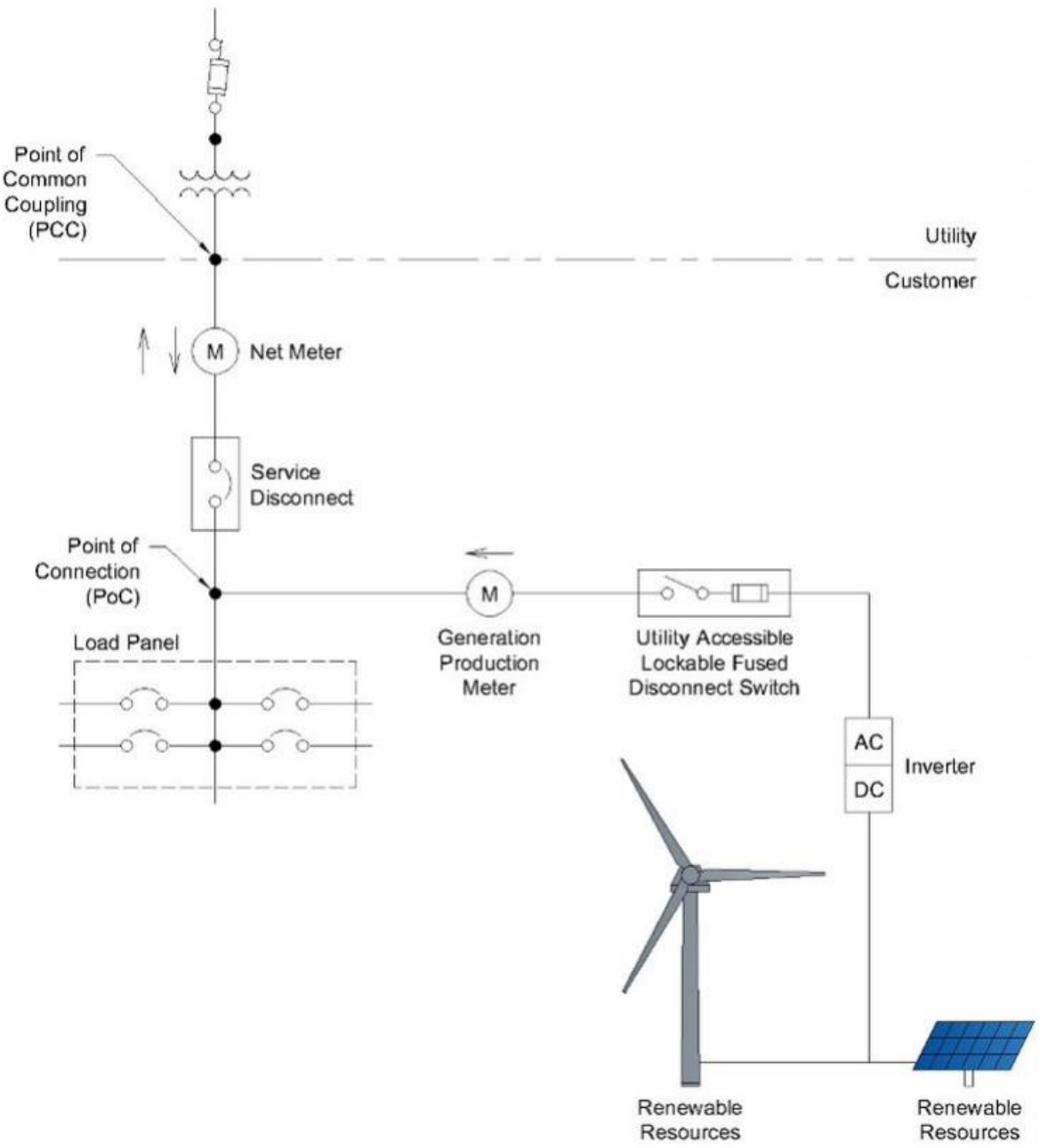
Figure 7-1: Load Side DER with PoC in a Load Panel



[16] NEC707.12(B)(3)(2)

Figure 7-2 below, illustrates the typical one-line diagram for a Customer's DER Facility that is connected on the load side of the Customer's service fuse/breaker disconnect, but ahead of a load panel. This configuration requires that the conductors and load panel, on the load side of the DER POC, be sized to carry the sum of the service and DER protective device ratings[17].

Figure 7-2: Load Side DER with PoC Ahead of a Load Panel



[16] NEC 705.12(B)(2) & (3)

Figure 7-3 below, illustrates the typical one-line diagram for a Customer's DER Facility that is connected after the Company service meter, but on the supply side of the Customer's service fuse/breaker disconnect using a double lugged meter enclosure. In this configuration, an existing meter enclosure may have to be changed to a meter enclosure that accommodates double lug load side connection.

Figure 7-3: Supply Side DER with PoC at a Double Lugged Meter Enclosure

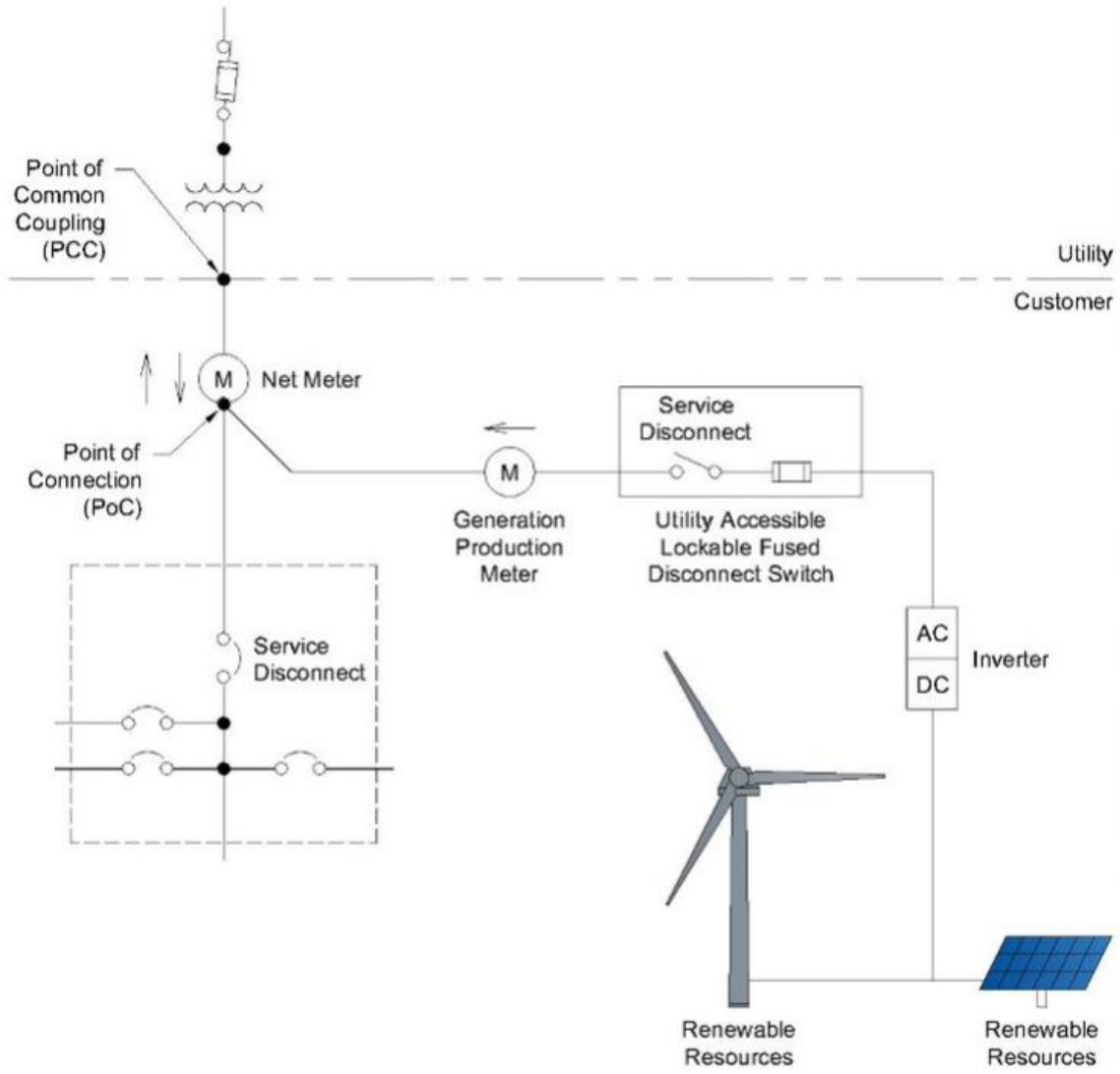
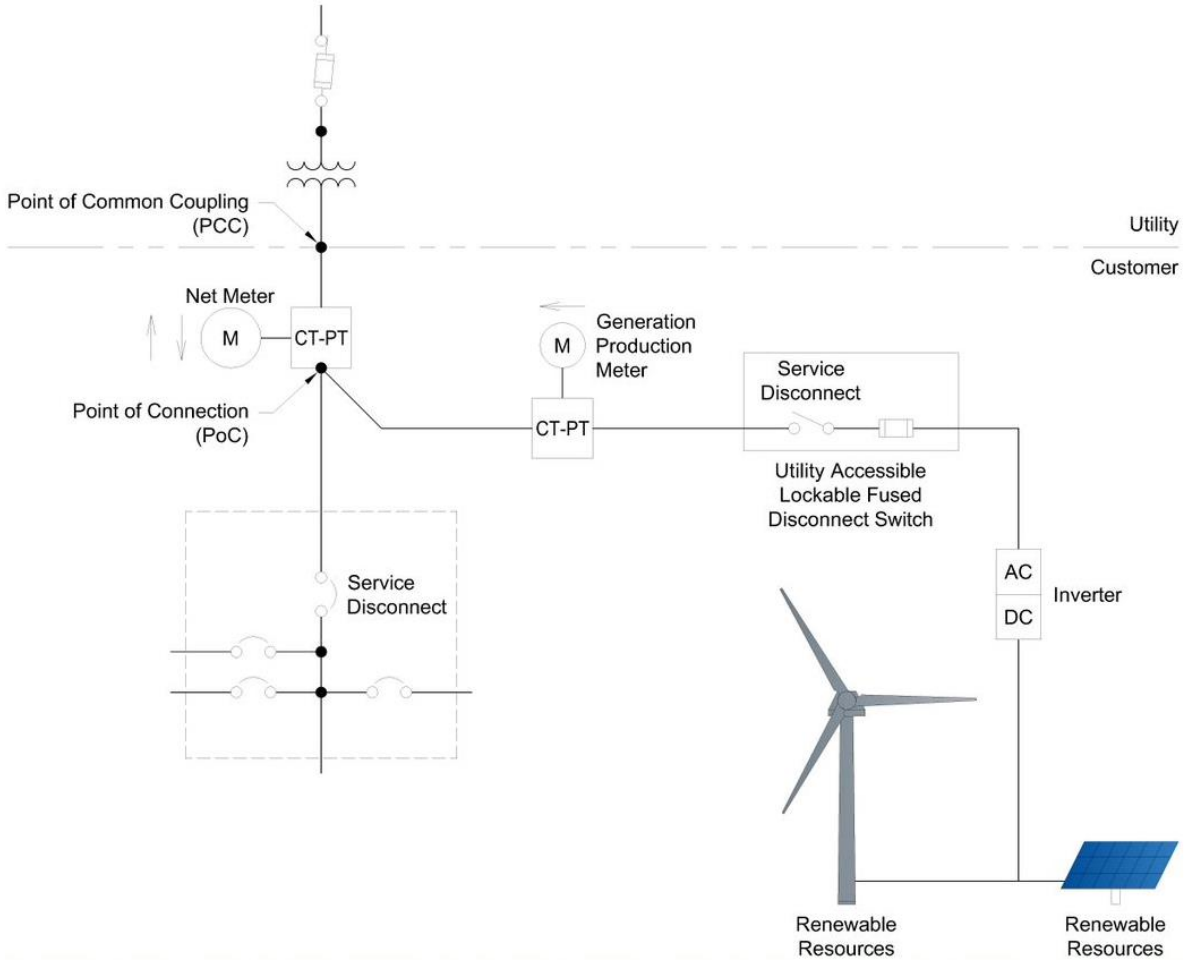


Figure 7-4 below, illustrates the typical one-line diagram for a larger Customer's DER Facility with an output rating greater than 200 amps which therefore requires CT generation metering. In this illustration the DER is connected in a junction box after the Company service meter, but on the supply side of the Customer's main service fuse/breaker disconnect. In this configuration the service meter enclosure must have the rating of the sum of the Customer's service disconnects, main and DER.

Figure 7-4: Typical Inverter Based One-line Diagram with CT Metering



7.2 Battery Energy Storage Systems (BESS)

Electric energy storage is considered a generator under the DER Facility definition in this Document. Battery energy storage systems are typically one part of a Customer Renewable Energy generation project and consist of batteries, Inverter(s), and an associated control system. BESS connections will be reviewed as part of the Customer's DER Faculty Interconnection Application and will be required to meet the technical and operational requirements of this manual.

Under Net Metering, a BESS can be paired with a Net Meter eligible Renewable Energy DER Unit. However, a BESS- only DER Facility is not eligible for the Net Metering program, as the energy stored may not be from renewable sources. A BESS-only DER Facility is eligible for Interconnection under the Parallel Generation-Non-Export or Parallel Generation-Qualifying Facility program. A BESS-only DER Facility may be allowed to export energy to the Company's Distribution System when participating in a Company demand response or other grid services program and responding to a Company-issued dispatch instructions.

7.2.1 BESS Standards

Company requires that Inverters of all BESS with Inverter-based interfaces be Certified to Underwriters Laboratories (UL) Standard UL 1741-SA and California Rule 21.

Company recommends that Customer propose Inverters listed as compliant on the California Energy Commissioner's (CEC) list of eligible Inverters available at:

Solar Equipment Lists | California Energy Commission

Company requires that the BESS be Certified compliant with the Battery and Energy Storage System Standards outlined in Table 7-2.

Table 7-2: Battery and Energy Storage System Standards

UL 1973	Batteries shall be Certified compliant with UL 1973 "Standard for Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications".
UL 9540	Energy Storage Systems shall be Certified compliant with UL 9540 "Standard for Energy Storage Systems and Equipment".

Company recommends that Customer propose BESS components listed as compliant on the California Energy Commissioner's (CEC) list of eligible Battery and Energy Storage Systems available at:

Solar Equipment Lists | California Energy Commission

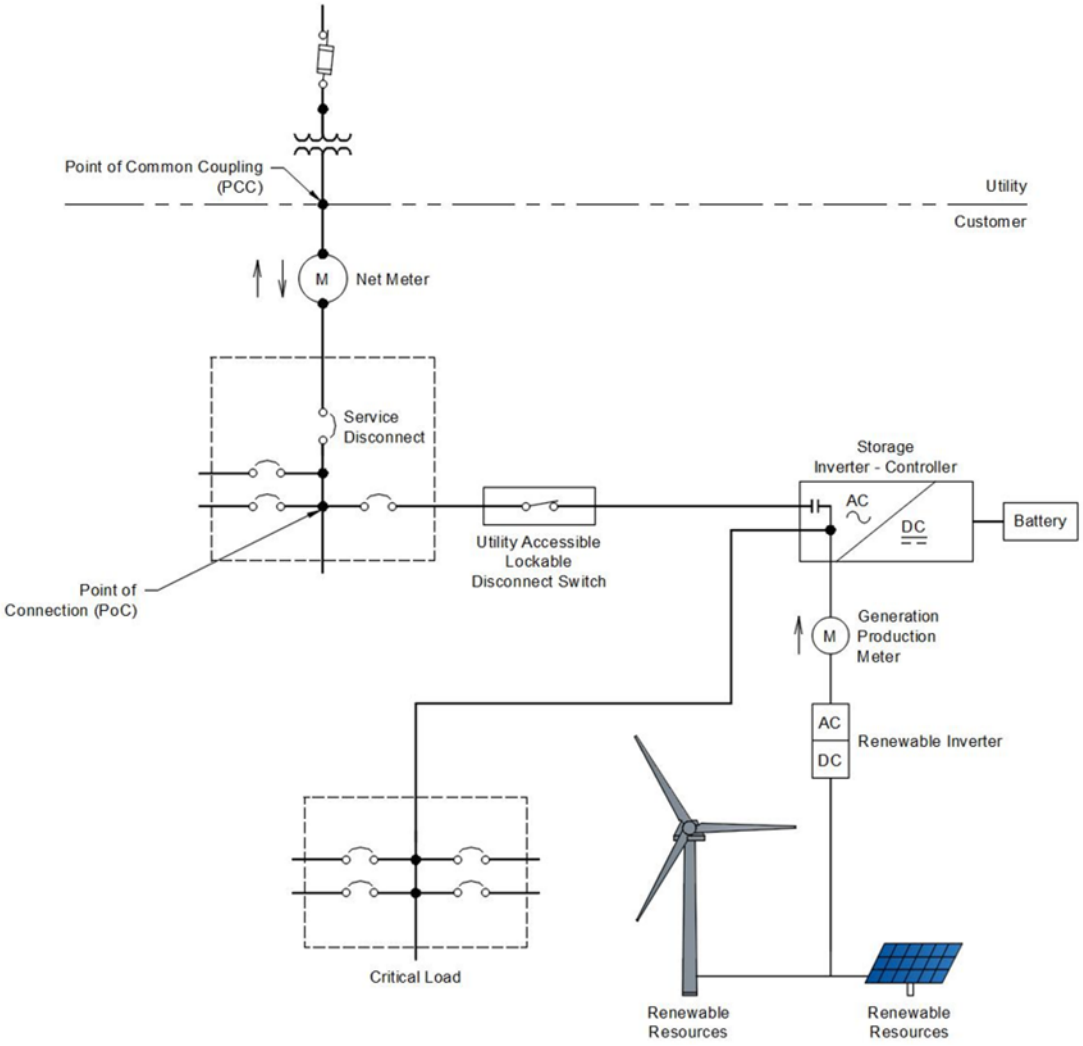
Customer may propose Inverter and BESS components that are not listed on the CEC list, but additional time will be required to verify certification and compliance with the specified requirements.

7.2.2 BESS One-Line Diagrams

The one-line diagrams presented in this section are illustrative of several typical DG plus BESS installations. The NEC may permit other configurations and may impose additional wiring and equipment requirements.

Figure 7-5 below, illustrates the typical one-line diagram for a Customer's DER Facility with renewable DG and storage connected at a circuit breaker in the electric service/load panel. The NEC 120% rule[18] applies when the DER PoC is made on the opposite end of the load bus from the primary power source.

Figure 7-5: Load Side DG plus Storage DER with PoC in a Load Panel



below, illustrates the typical one-line diagram for a Customer's DER Facility with renewable DG and storage connected after the Company service meter, but on the supply side of the Customer's service fuse/breaker disconnect using a double lugged meter enclosure. In this

[18] NEC707.12(B)(3)(2)

configuration the meter enclosure must have the rating of the sum of the Customers service disconnects, main and DER.

Figure 7-6 : Supply Side DER with PoC at a Double Lugged Meter Enclosure

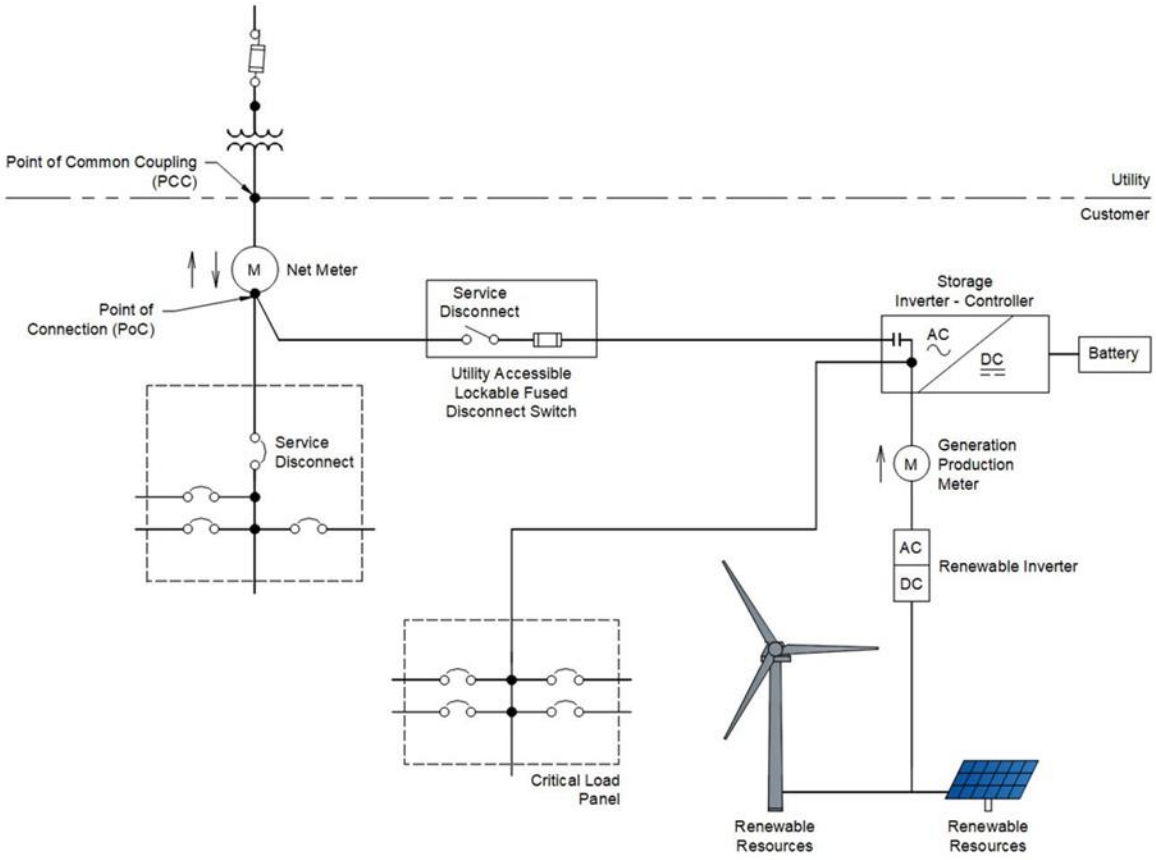


Figure 7-7 : Supply Side DER with PoC at a Double Lugged Meter Enclosure

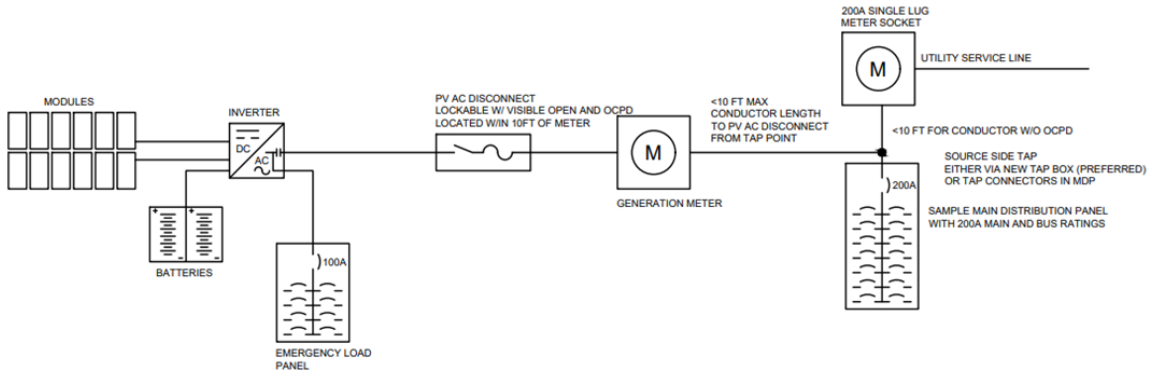
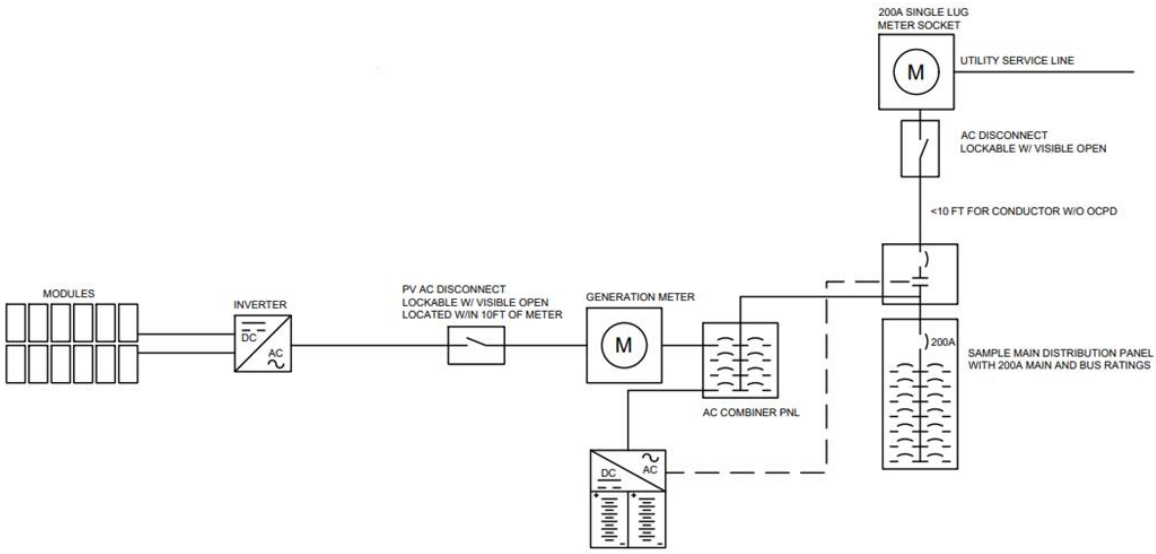


Figure *7-8* below illustrates the typical one-line diagram for a Customer's DER Facility with renewable DG and storage connected after the Company service meter, but before the main distribution panel. In this configuration the AC disconnect will be ahead of the automatic transfer switch. The AC disconnect will only be operated by the utility during service work.

Figure 7-8 : Typical PV Install with TESLA Service Rated Gateway and Powerwall Battery



7.3 Machine-Based Generation without Inverter-Based interface

For all three-phase synchronous or induction generators, the DER Facility circuit breakers shall be three-phase devices with electronic control.

7.3.1 Synchronous Generators

Customer shall be responsible for properly synchronizing its generation with the Company's Distribution System by means of either manual or automatic synchronous equipment. Automatic synchronizing is required for all synchronous generators that have a Short Circuit Contribution Ratio (SCCR) exceeding 0.05. Loss of synchronism protection is not required except as may be necessary to meet IEEE1547-4.2.5. Unless otherwise agreed upon by Customer and Company, synchronous generators shall automatically regulate power factor, not voltage, while operating in parallel with the Company's Distribution System.

7.3.2 Induction Generators

Induction Generators (except self-excited Induction generators) do not require a synchronizing function. Starting or rapid load fluctuations on induction generators can adversely impact Company's Distribution System voltage. Corrective step-switched capacitors or other techniques may be necessary and may cause undesirable ferro-resonance. When these counter measures (e.g. additional capacitors) are installed on Customers side of the Facility Interconnection, Company must review these measures. Additional equipment may be required as determined by Company.