Guidance No. 3 for Interconnection of Energy Storage Systems Operated Behind a Production Meter and Paired with Onsite Renewable Generation Connected Under a Net Metering Tariff

Purpose

This document provides guidance for the interconnection of electric storage to operate in parallel with the utility and a customer's renewable generation. The battery is connected on the renewable generation's side of the Production Meter in a net metering (NEM) arrangement.

Background

In Proceeding No. 15AL-0048, the Company agreed to terms guiding the installation of customer sited storage facilities. This guidance document addresses the term that states:

> The Company will allow an energy storage system to be located on the same side of the production meter as a NEM eligible onsite renewable generator provided that the storage system is charged exclusively by the onsite renewable generation and that only the production recorded by the production meter will be eligible for REC incentives.[1]

This guidance may be modified from time to time to be consistent with the Company's policies for interconnection and operation of customer-sited storage.

Exclusions

This guidance addresses configurations and requirements related to the term above. This guidance does not address non-renewable generation, non-net metered self-generation, stand-alone storage without generation, standby rates, buy-sell metering, or any tariffed rate where net metering Schedule NM is not applied.

Interconnection Reviews

All electrical sources, including storage, that operate in parallel with Xcel are required to have an interconnection review and an Interconnection Agreement to ensure safety, system reliability, and operational compatibility. For purposes of this guidance, a source is considered to be operating in parallel with the grid when it is connected to the

[1] Attachment A, Decision No. C16-1075, Pages 20-21.

distribution grid and can supply energy to the customer simultaneously with the Company supply of energy. Any source operating in parallel with the grid is required to have an interconnection agreement.

When a storage system is installed in conjunction with a renewable generation system, both may be reviewed at the same time and be included in one Interconnection Agreement[2]. When a storage system is installed after the renewable generation system, the review level will be based upon the combination of the onsite generation rated capacity and the storage nameplate capacity for the selected operating mode[3] of the energy storage. When the energy storage and renewable generation share a common inverter, the review level will be based on the rating of the shared inverter. The operating modes will be part of the Interconnection Agreement requirements and any change in operating modes that impact the ability of the energy storage system to adhere to the settlement requirements may require another review of the facility and possibly mitigations. If the energy storage is installed at the same time as the renewable source, a combined review is to be encouraged as the total time and cost will be less than two separate reviews.

Telemetry and Control

Whenever an electric storage system is co-located on the same site with a NEM eligible generation system, its rated nameplate capacity will be included with the onsite generation for determining whether or not telemetry and/or remote separation control are needed[4]. When the energy storage and renewable generation share a common inverter, the telemetry level will be based on the rating of the shared inverter. This applies regardless if all sources are installed at the same time or at separate times. The determination is also based upon the selected operating modes of the energy storage as stated at the time of installation. Any change in operating modes that impact the ability of the energy storage system to adhere to the settlement requirements may require a change in telemetry.

[2] Interconnections are reviewed based on the combined nameplate ratings of the sources that can actually be simultaneously supplied to the grid, such as two inverters. The ongoing operation capacity portion of the review is based on the actual simultaneous performance ratings. If the contribution of the energy storage to the total contribution is limited by programing or by some other on-site limiting element, the reduced ongoing capacity will be used.

[3] Operating Modes includes such requirements as charging the energy storage only from an on-site renewable energy source that is net-metered, non-export requirements, or stand-alone storage systems.

[4] Less than full nameplate will be considered if the added source is limited by programing or onsite equipment element rating.

Energy storage Configurations

There are three basic energy storage configurations that are permitted under this guidance[5]. In all three configurations, the energy storage is assumed to be using a shared hybrid inverter along with the renewable generation. The Diagrams provided assume there is a Protected Load Panel connected on the renewable generation's side of the Production Meter.

- Hybrid Inverter with a Second Load Meter (Diagram No. 3a).
- Hybrid Inverter with a Transfer Switch (Diagram No. 3b).

Each diagram provides the representative configuration in principle and may have other features not reflected in the diagram but the operational principle shall be consistent with the operational principle demonstrated by the diagram. The desired functionality may be controlled by inverter or control system programing. The diagrams are attached at the end of the text and are considered a part of this guidance.

There may also be a configuration without a Protected Load Panel. This would be identical to Diagram No. 3b, but without a transfer switch or Protected Load Panel.

For configuration 3b, metering will be the standard service NM and production meter for the residential and small commercial tariffs. For configuration 3a, the net meter will be the standard for service under NM. The Production Meter will be upgraded to a dual register bi-directional meter. The added load meter will be a standard load only meter. At some future date, the meters may be upgraded to bi-directional meters. Large commercial and industrial customers will use bi-directional meters suitable for their rate class.

The configurations under Guidance No. 3 will result in some loss of meter recorded REC and corresponding payments for installations eligible for REC payments. Batteries consume some power for maintaining a charge. A discharge - charge cycle has turn-around energy losses. This is true whether the cycle occurs supporting the Protected Load Panel during an outage or for use of the energy storage to manage the customer's energy usage.

This guidance requires batteries to be charged with 100% renewable energy from the on-site eligible renewable generation source. The installation must be designed and programed to comply with this condition. For inverters, the programing selected must be protected from modification so only the inverter manufacturer or installer can change

[5] Photovoltaics are typically installed taking service under the Net Metering Service tariff.

the renewable only charging programing. The means of achieving this shall be provided as part of the Interconnection Agreement and Interconnection Application. Other means of securing the settings may be mutually agreed upon on a case-by-case basis. Xcel Energy reserves the right to conduct an inspection to verify compliance at a later date if problems arise or indications of possible non-compliance are present.

Hybrid Inverter with Second Load Meter (Diagram No. 3a)

When a Protected Load Panel is installed with the hybrid inverter and supplied through that inverter, a second uni-directional Load Meter must be installed between the hybrid inverter and the Protected Load Panel. The main Production Meter will be a dual-register bi-directional meter. These meters and the service meter must be able to be synchronized for the same time intervals. These three meters will enable the derivation of renewable production and load. The inverter software programming must be inaccessible and password protected.

Hybrid Inverter with Transfer Switch (Diagram No. 3b)

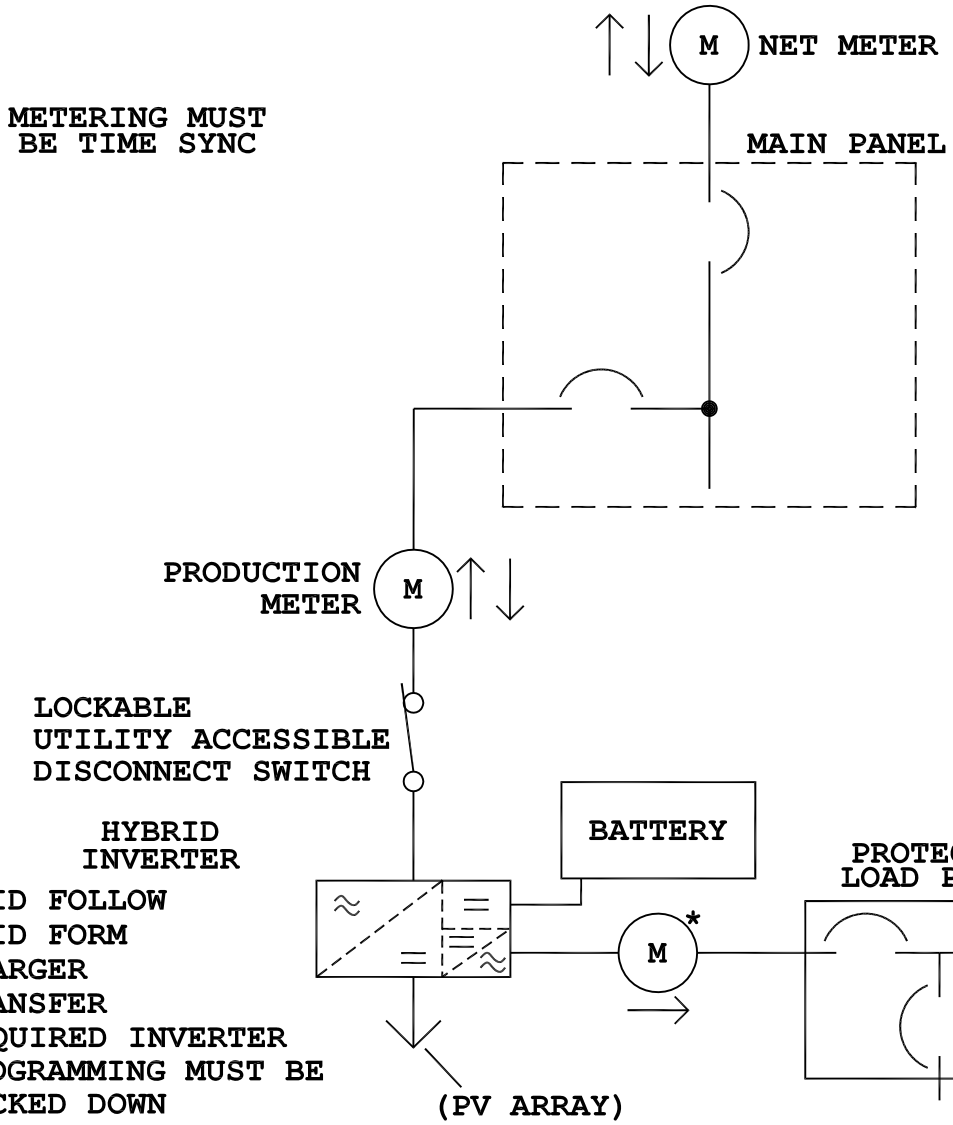
If a Transfer Switch is used to supply the Protected Load Panel under normal conditions, no power will flow in reverse through the Production Meter. This eliminates the need for the second Production Meter. The required Service Metering and Production Metering will be the standard meters for net-metered eligible generation. At some future date, the meters may be upgraded to bi-directional meters. The inverter software programming must be locked down and password protected.

Illustrative diagrams of approved configurations are attached.

FIGURE ILLUSTRATES REPRESENTATIVE CONCEPTS & INTENT. PACKAGED SYSTEMS MAY HAVE HYBRID INVERTERS WITH THESE FEATURES PROVIDED AS PART OF THE PACKAGE.

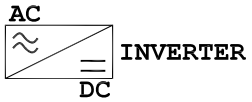
HYBRID EXAMPLE #3a METER OPTION

-BATTERY MAY EXPORT



1. GRID FOLLOW
2. GRID FORM
3. CHARGER
4. TRANSFER
5. REQUIRED INVERTER PROGRAMMING MUST BE LOCKED DOWN

*6. METER REQUIRED WHEN PROTECTED LOAD PANEL IS INSTALLED ON INVERTER SIDE OF PRODUCTION METER

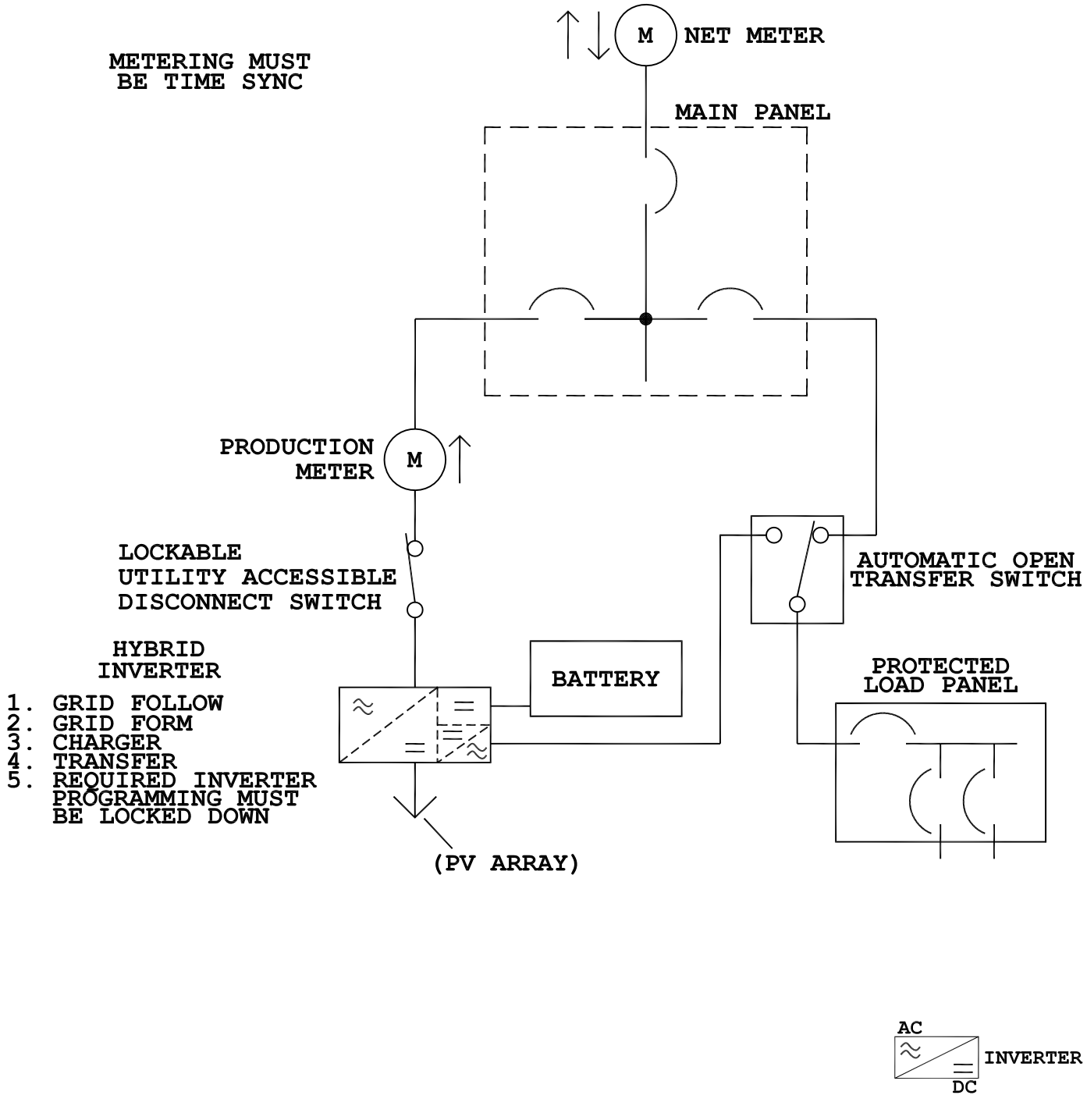


12/05/16

PV + BATTERY CONFIGURATION

FIGURE ILLUSTRATES REPRESENTATIVE CONCEPTS & INTENT. PACKAGED SYSTEMS MAY HAVE HYBRID INVERTERS WITH THESE FEATURES PROVIDED AS PART OF THE PACKAGE.

HYBRID EXAMPLE #3b
TRANSFER OPTION
-BATTERY MAY EXPORT



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