Retrofitting PV plants with equipment for limiting the active power

for **SUNNY BOY, SUNNY MINI CENTRAL, SUNNY TRIPOWER**

Contents

According to §66 of the German Renewable Energy Sources Act (EEG), existing plants with a power greater than 100 kW and commissioned before 2009 must be retrofitted with feed-in management by 2011-01-01. A right of continuance is not provided for.

The costs of the modification are to be covered by the operator. In the case of a power reduction, the network operator must pay the plant operator for the output losses resulting from the power reduction.

This document describes the possibilities for retrofitting existing PV plants in accordance with legal requirements.

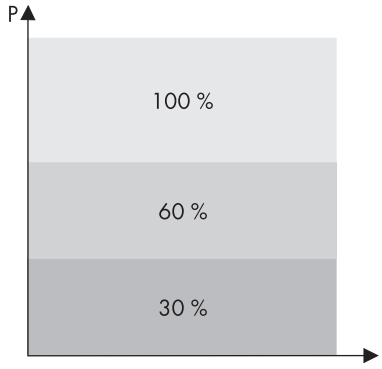
1 Requirements according to §66 EEG 2009

According to §66 EEG 2009, the technical and operational requirements from §6 no.1 must be met from January 1, 2011 by PV plants which began operation before January 1, 2009.

§6 EEG 2009 no.1 defines that PV plants with a power greater than 100 kW must have technical or operational equipment installed for remote reduction of the feed-in power in the event of grid overload and provide the ability to retrieve the current feed-in, which the network operator must be able to access.

2 Technical solutions

The requirement defines that the feed-in power should be reduced remotely. The following levels have proven themselves: 100 % (no power limit), 60 %, 30 % and 0 % of plant power.

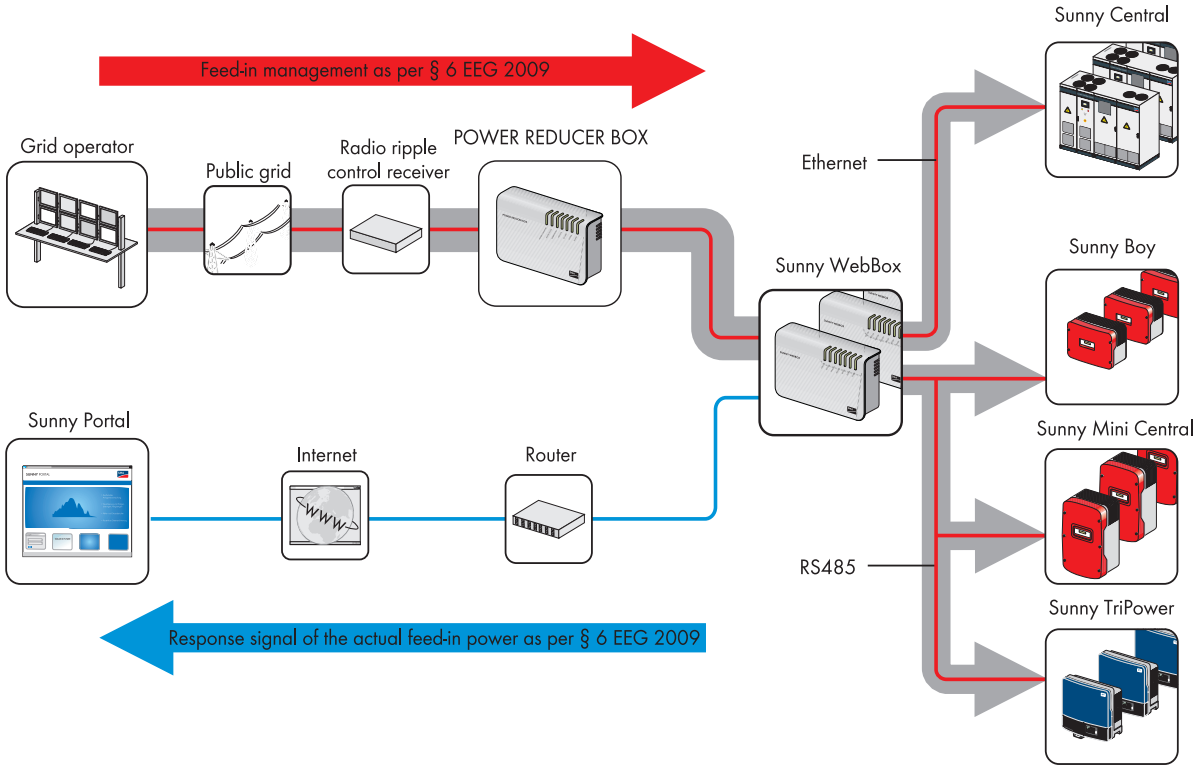


Ripple-control is often used to carry commands (radio or audio frequency). The required receivers are generally sold by the network operators. Implementation suggestions for the requirement "power reduction" are described in the following sections.

For the second requirement "retrieve actual activity", a second communications channel (Internet, telephone connection, etc.) is required, independent of the remote control for power reduction. However, for this, an existing plant monitoring system via Sunny WebBox and Sunny Portal can be used. If such a structure is not present, SMA Solar Technology AG recommends retrofitting one. In cases where this retrofitting is associated with great expense or where this type of retrieval of the actual activity is insufficient, the requirement can also be met using classic measurement techniques with remote retrieval.

2.1 Solution 1: Power Reducer Box

Identical to the solution for new plants, SMA Solar Technology AG recommends retrofitting the existing PV plant with a Power Reducer Box. If a communications structure is not present with the Sunny WebBox, this must be purchased separately.



The SMA Power Reducer Box receives the digitally coded signal from the network operator, e.g. via a ripple-control receiver, and converts this into a control command for the Sunny WebBox, which is connected by LAN. This transmits the command via the respective field bus (LAN or RS485) to all the connected inverters. Each switching operation is logged both in the Power Reducer Box and in the Sunny WebBox – this means that the data is retrievable via Sunny Portal anywhere in the world.

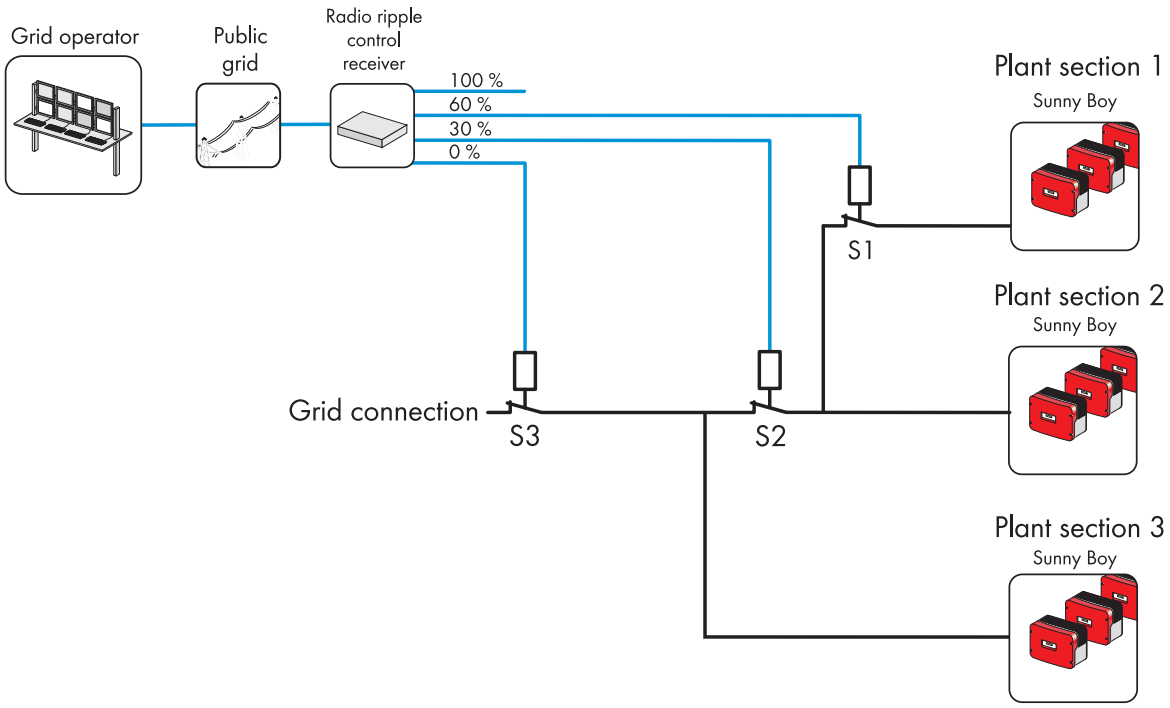
The advantage of this solution is that only the maximum plant performance and not necessarily the present power is reduced. For example, no actual power reduction and therefore no yield loss occurs when, on a cloudy day, the command 60 % or 30 % of nominal power is sent.

You must observe the following with this solution:

- The command to reduce power is not compatible with some inverter types: You can find the compatibility matrix in the download area of www.SMA.de/en under "Monitoring Systems / Power Reducer Box" in the category "Technical Description" of the Power Reducer Box.
- Plant communication with the Sunny WebBox is required. Plant communication via Sunny Boy Control and Sunny Boy Control light cannot be used to transmit commands. The PV plant may require retrofitting.

2.2 Solution 2: Disconnecting parts of the plant

Using the installation of additional relays / contactors, when a command to reduce power is given, part of the PV plant is disconnected from the grid. The following example shows a possible wiring.



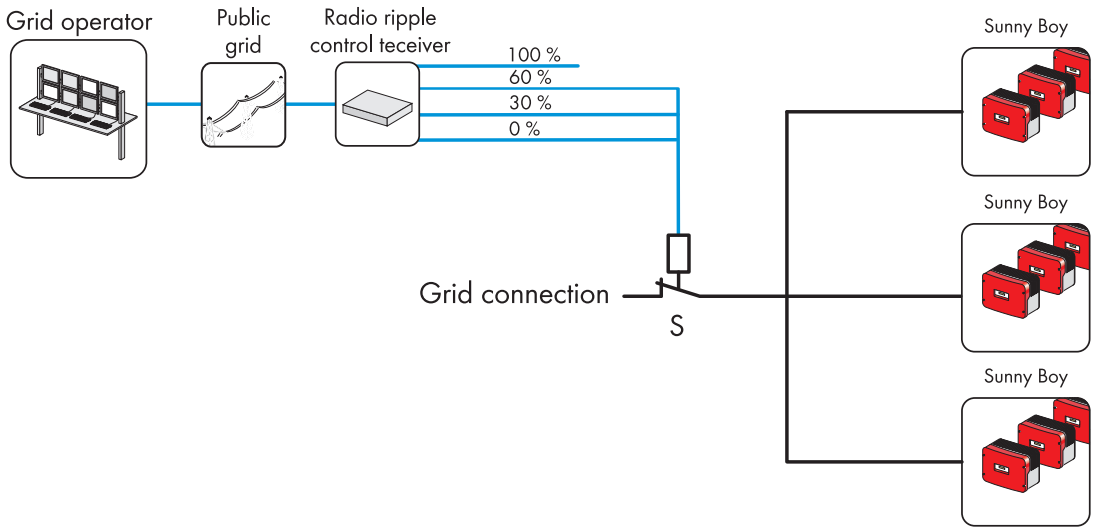
To fulfill the requirements, the nominal power of plant section 3 may, at the most, have the required power of the second reduction level. In the example, this means that the nominal power of asset component 3 may at most have 30 % of the nominal plant power. The sum of plant section 2 and 3 must also be less than or equal to the first reduction level. In the example, the sum of plant section 2 and plant section 3 may not exceed 60 % of the total power.

For the relay / contactor S3 the external grid monitoring is already being used and therefore, it is already available in most PV plants. The additional function of feed-in management for this relay / contactor can be achieved by adding the relay contact of the ripple-control receiver in the control circuit of the relay / contactor S3.

With this solution, the yield loss in case of a power reduction can be higher compared to solution 1, since part of the PV plant is deactivated independent of the actual plant performance. This additional yield loss, which result from deactivating part of the plant compared to reducing the maximum power, is generally not compensated by the network operator and must therefore be included when considering costs.

2.3 Solution 3: Deactivation of the entire PV plant

In this solution, the relays / contactors already present in most cases are used, which are controlled via the external grid monitoring. First, the relay output ports of the ripple-control receiver which is to achieve a power reduction are wired in parallel. This parallel connection is then connected to the control path of the relay / contactor (S) so that both a command to deactivate from the external grid monitoring, as well as every command to reduce power from feed-in management opens the relay / contactor S and thereby deactivates the entire PV plant.



This solution has low installation costs, but additional costs are incurred through yield losses resulting from each reduction. Every command to reduce power causes the entire PV plant to be deactivated. The resulting additional yield losses are generally carried by the plant operator.