

# Problem PE-N Relay – GoodWe HV Hybrid Inverter

I took the trouble to make a few measurements on the GoodWe high voltage hybrid inverter with the oscilloscope, as I mainly experience problems when the inverter switches back to On-Grid mode. The wiring is done as the [Manual ET29\\_9](#) says on page 33 (Wiring diagram with neutral line ungrounded). Please see also the attached video links for further input. If there are open questions to the setup, please feel free to ask.

It turns out that the control of the PE-N relay is problematic. The relay dropping out too early is the main cause of problems with overvoltages against the earth potential. These overvoltages are present for **up to six seconds** and can therefore potentially damage electrical equipment and trigger residual current monitors.

In the following diagram the expected sequence is shown with comments for the transitions.

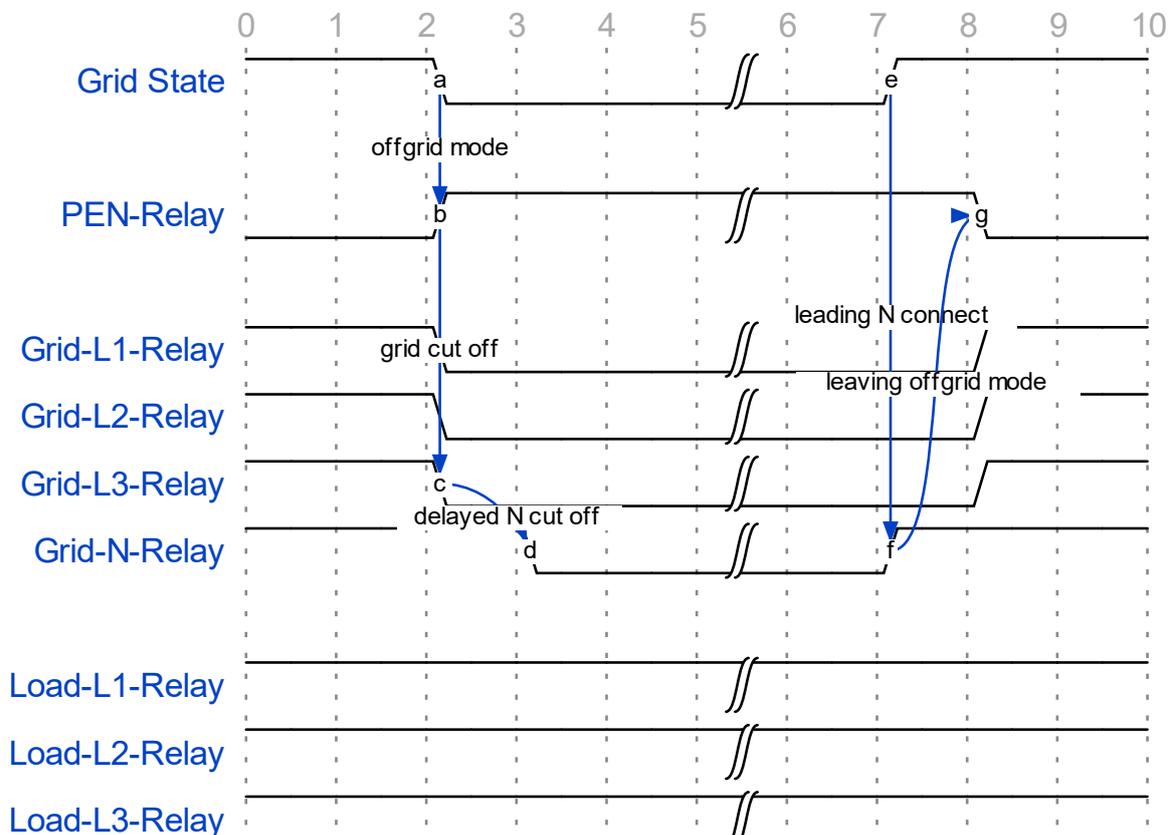


Figure 1 - expected sequence grid loss and recovery

Table 1 - description of sequences

|       |   |
|-------|---|
| a → b | The grid loss is detected. The PE-N relay should immediately be closed.   |
| b → c | All phase relay (L1,L2,L3) need to be opened first.   |
| c → d | For a short time, a second PE-N connection needs to be accepted (at house connection box from grid side and inside GoodWe inverter). After it is ensured that the phase relays are opened, the neutral point relay at grid side can be opened with a small delay. |

|       |  |
|-------|--|
| d → e | Off-grid mode active. The grid is now fully disconnected.  |
| e → f | The grid state is okay again. The reconnection process can need to start with leading neutral point relay on grid side.          |
| f → g | The reconnection of the phase relay is starting now. All phase relays can be closed again and the PE-N relay can also be opened. |

## Measurement Setup

- GoodWe ET 29.9 (PE-N relay control activated, VDE4105 setup, latest firmware from SolarGo App: DSP 10.10049 / ARM 13.439 / AFCI 02 / BAT1\_2 BMS 00 / Communication 1.1.3.14)
- Measurement setup: see attached picture; (neutral conductor, L1, L2 and L3 of LOAD are all measured with passive probe against earth, divider factor 10); a hairdryer hangs between L1 and N as load (not shown in figure below)
- Please also see the video on my YouTube channel for the full setup: [Video Setup](#)

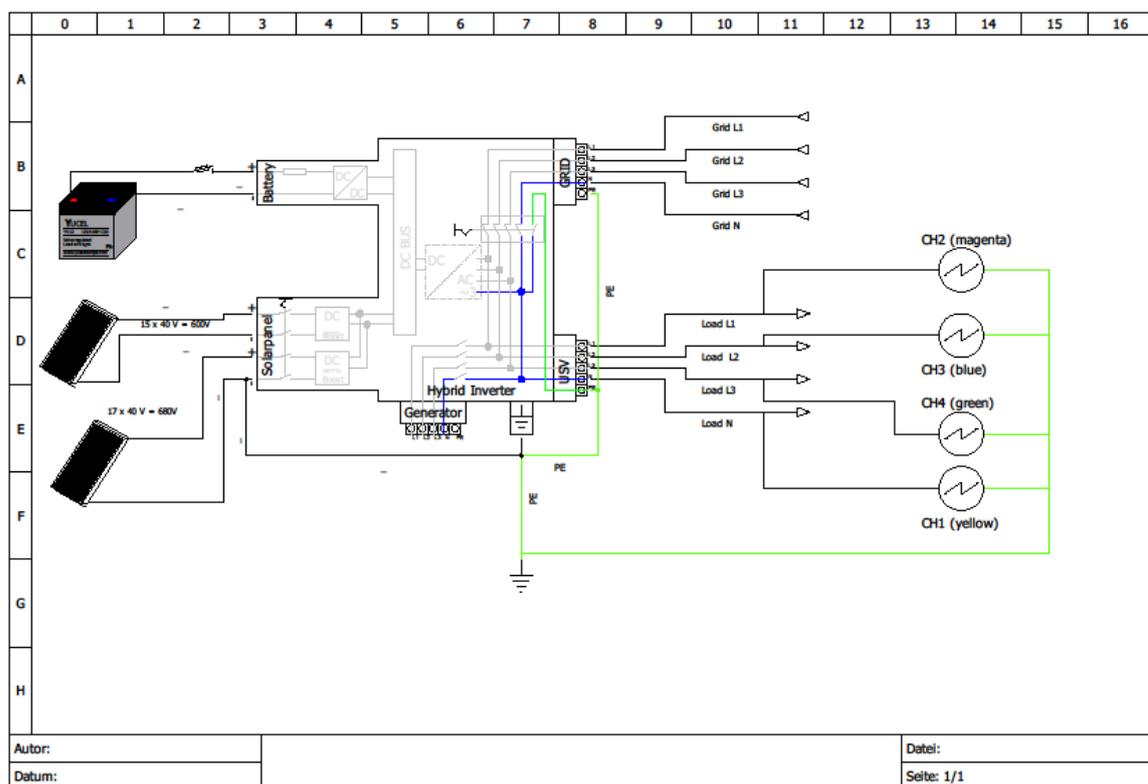


Figure 2 - measurement setup with probes

## Off-grid case:

Here I simply switch off the three-phase grid with the circuit breaker. The whole procedure is also available as a video: [Video Offgrid Case](#)



Figure 3 – Overview

During grid loss there is a phase of 30ms where the neutral point on grid side is disconnected and the PE-N relay is not closed. The voltage between neutral point and earth potential increases up to ~33V.

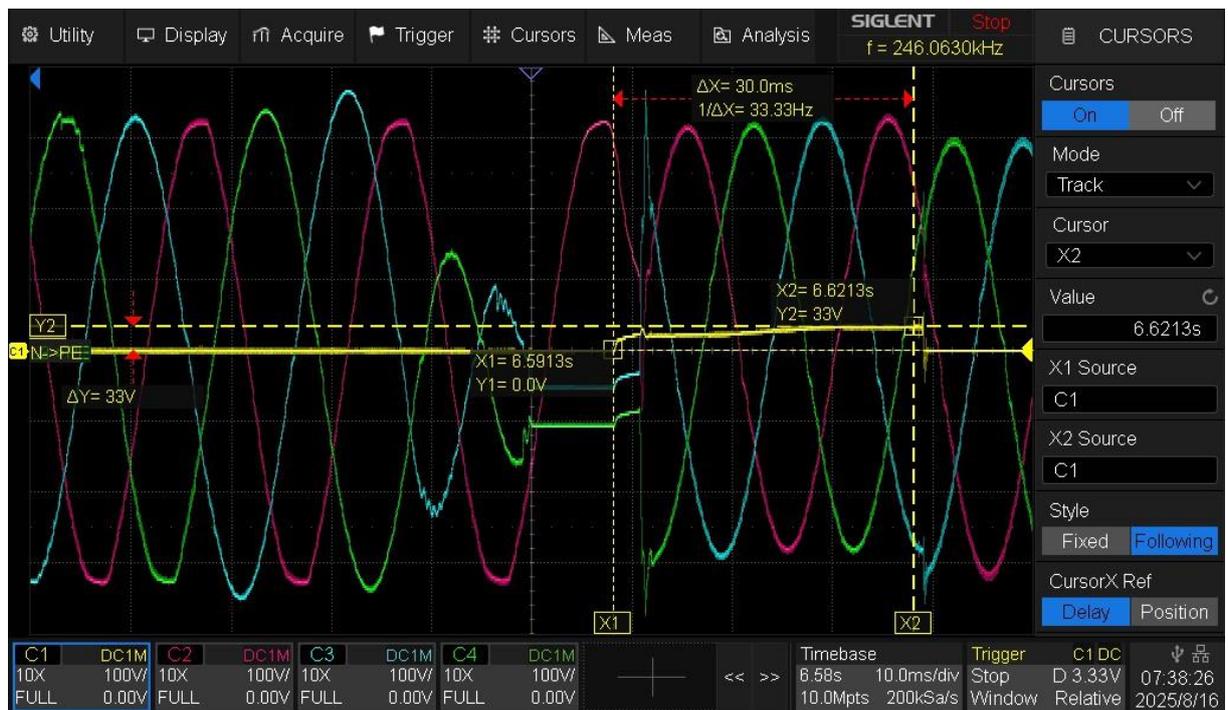


Figure 4 - Detail 1 (grid loss)

During grid reconnection there is a phase of nearly 6s where the neutral point on grid side is disconnected and the PE-N relay is opened. The voltage between neutral point and earth potential increases up to ~110V.

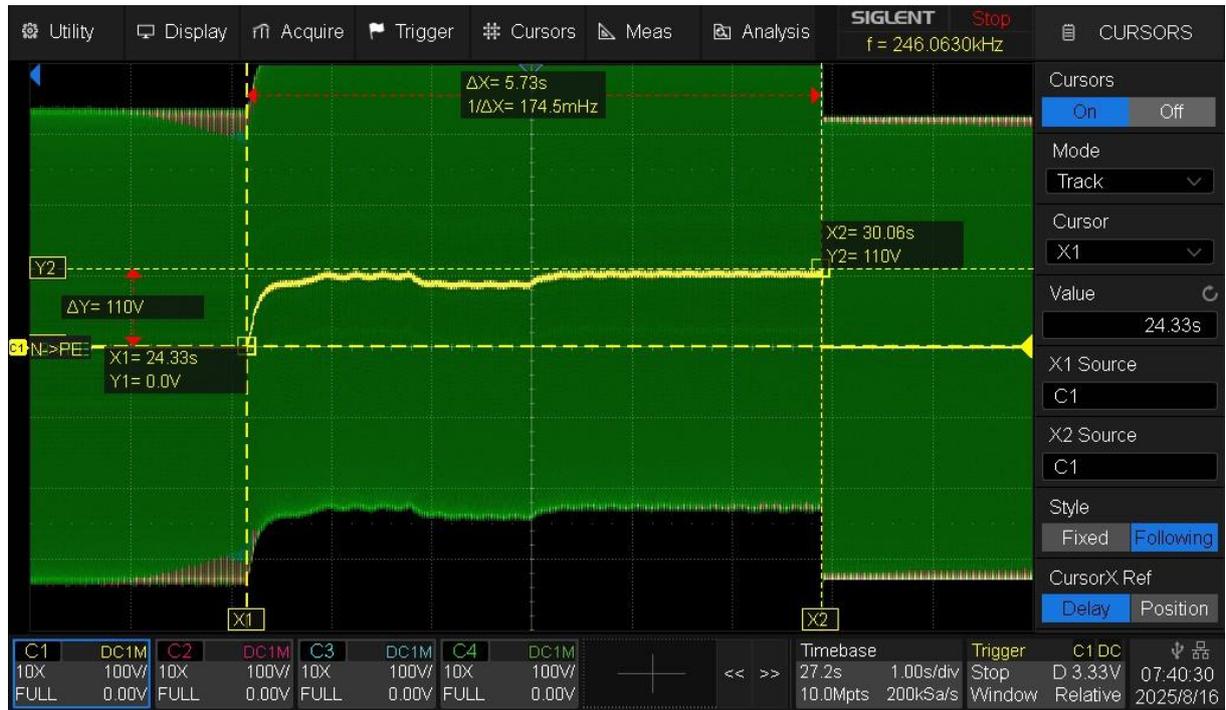


Figure 5 - Detail 2 (PE-N relay opening)



Figure 6 - Detail 3 (grid relays closing)