

Project Idea – Renewable Energy Controller for private households

The goal of this project is to build a base system that allows private homes to optimally make use of a renewable energy source such as a photovoltaic system.

Often these systems already come with an interface to read the current power production. This could be used as a sensor information in an ROS automated smart home to turn on/off different energy consumers such as a heat pump for warm water or charging an electronic vehicle.

Another way to make use of an automated reading of this sensor information to calculate statistics such as daily/weekly energy production/consumption.

The project will be built for our own house with our specific gear in mind. However, the idea can be applied to other systems as well.

Technical overview

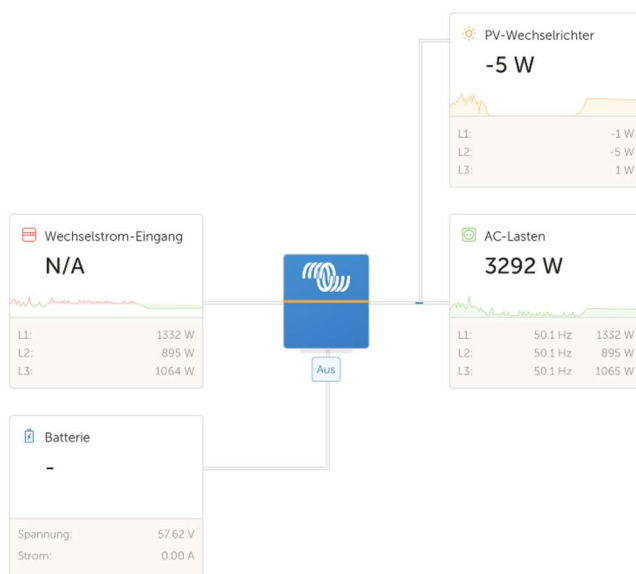


Figure 1 - Overview of the system

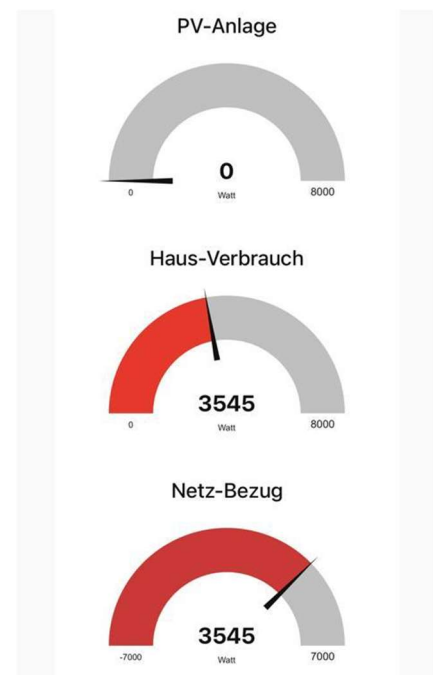


Figure 2 - current sensor retrieval using Modbus via TCP/IP with a Raspberry Pi and NodeRed.

Figure 1 shows the whole system, which is controlled by our central inverter (blue box). This connects the PV system with the grid power, battery power and the energy consumers in the own house.

Figure 2 is a Screenshot of an already deployed measuring system which is running on a Raspberry Pi using NodeRed, which read the current power from multiple Modbus interfaces from the central inverter.

Project Realization

To gather the information my plan is to use the same Modbus interface that is already being used but directly on the notebook running ROS. A quick search shows that there are already packages available to read the modbus via TCP/IP [1] [2].

This sensor information will be sent to multiple events in the databus in ROS, one for each producer/consumer.

A compute node will read out these value informations and post process them.

Afterwards I have multiple possibilities depending on the available time.

Some options would be:

- 1) Display the current produced energy on the display via the Arduino in the kit
- 2) Activate/Deactivate a Smart Home Plug (I am not sure if this would be sufficient as then I would not use the Arduino at all)
- 3) Activate/Deactivate an LED using the Arduino depending on the produced power.
- 4) Activate/Deactivate a relay that is connected with a larger power consumer.
- 5) Use a temperature sensor from the Arduino Kit as an additional sensor and Activate/Deactivate a relay that is connected with a larger power consumer. Could be useful for heating up warmwater only when PV is active water is colder than x degree.
- 6) ...

I believe with a proper readout and the availability to add more compute nodes the possibilities are endless as it can be extended at any time with multiple sensors and actuators for various power consumers.

[1] https://index.ros.org/p/industrial_modbus_tcp/gitlab-InstitutMaupertuis-industrial_modbus_tcp/#melodic

[2] <https://index.ros.org/search/?term=modbus>