TECHNICAL ASSISTANCE REQUEST

Sigue, our PV energy management system, is still in prototype phase. Our prototype has been working for several months showing excellent robustness.

Our needs in the previous phase included several points:

- Finding affordable reference cells for the calculation of radiation. In this phase, we have changed our expensive radiation cell by a PV mini-module, more than 90% cheaper, easy to install and with good results in terms of radiation-signal correlation.
- Improve solar radiation to available power conversion. We have implemented an Auto-tuning method to, continuously, recalculate the function that correlates the mini-module signal with the available power. This feature allows us to calculate very accurately the available power and, thus, a better control of the loads.
- Finding manufactures to control loads via http requests. By the use of IFTTT we have tested plugs, relays and AC equipment. Now Sigue is able to manage almost any type of load.
- Developing our own mobile app. Our app has been improved with extended capabilities, and the use of Blynk allows us to create easily our own mobile app from our actual one.
- Adapting our system to grid-tied installations. We have modified our communications from Modbus RTU to Modbus TCP/IP. That change allows us to use almost any PV inverter and, at the same time, use Sigue in grid-tied PV installations. Software for Zero-feed and Feed-In PV installations has been developed and now is ready to be tested.
- Weather forecast. We have implemented a feature to manage the stored energy using the weather forecast. This feature needed the calculation of our batteries SoC, something that we obtain with a more accurate energy balance calculation.

It's has been a hard work period plenty of tests and improvements.

For the next phase of the prize, we face to two main technical requests for the development of our idea. The first one is related with economical aspect while the second one is related to testing.

1. On the one hand, we need to validate the possible savings that a SIGUE system will achieve in standard PV installations. Although Sigue implements features like monitoring, loads remote control and SoC calculations, the aim of Sigue is to use the energy excess and, thus, to save money in both, installations (sizing) costs and usage of gen-set and grid energy. So, the savings must be calculated.

For this purpose, a techno-economic analysis of the SIGE system in standard PV installations, including off-grid and grid-tied installations is needed.
This analysis must include the quantification of the amount of excess PV energy available. Then, estimate the value of powering non-critical load in order to use those excess and, finally, determine if the additional value of powering non-critical loads justifies the added cost of the energy management.

2. Testing the performance of the SIGUE system under different radiation and load conditions.

Sigue bases its function in the calculation of the available power for any installation and its use in different loads. For that calculation, the accuracy of the actual reference PV module must be demonstrated under different solar radiations conditions.
Also, Sigue uses a priority model to maintain loads active. This priority is affected by both, radiation and load characteristics. The correct behavior of this routine must be validated under different conditions.
Finally, we are implementing a new variable load, mainly thought for heater resistances. The ability of Sigue to be able to use the exact amount of excess energy when using variable loads must be tested.