SCADA Development for an Islanded Microgrid

Enikő Lázár, Radu Etz, Dorin Petreuş, Toma Pătărău, and Ionuț Ciocan

TECHNICAL UNIVERSITY OF CLUJ-NAPOCA
APPLIED ELECTRONICS DEPARTMENT
26-28 G.BARITIU STREET 400027 CLUJ-NAPOCA ROMANIA Tel./Fax.:
+40-264-594806

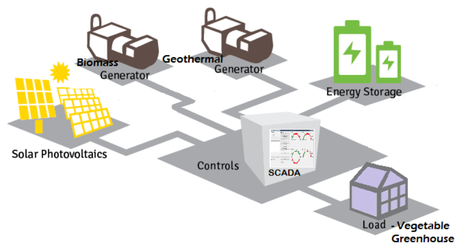
SIITME 2015
21th International Symposium for Design and Technology in Electronic Packaging
October 22rd–25th, 2015

INTRODUCTION

The huge increase in energy demand, the rising pollution levels and global warming, the high oil prices, the fact that fossil fuels are not renewable energy resources are all essential energy problems for the world's countries. Renewable energy resources, such as solar, biomass, and geothermal energy, have less impact on the environment.

For the electricity market to function properly, it is recommended that the renewable energy resources are included in the power generation processes. These sources offer the most economical and cleanest forms of power generation.

This paper presents SCADA development for an islanded microgrid. The novelty of this work is the development of a SCADA system which accomplishes an interface that is able to collect necessary data from a microgrid and also to control its generators.



The considered microgrid

MICROGRID UNDER CONSIDERATION FOR SCADA DEVELOPMENT

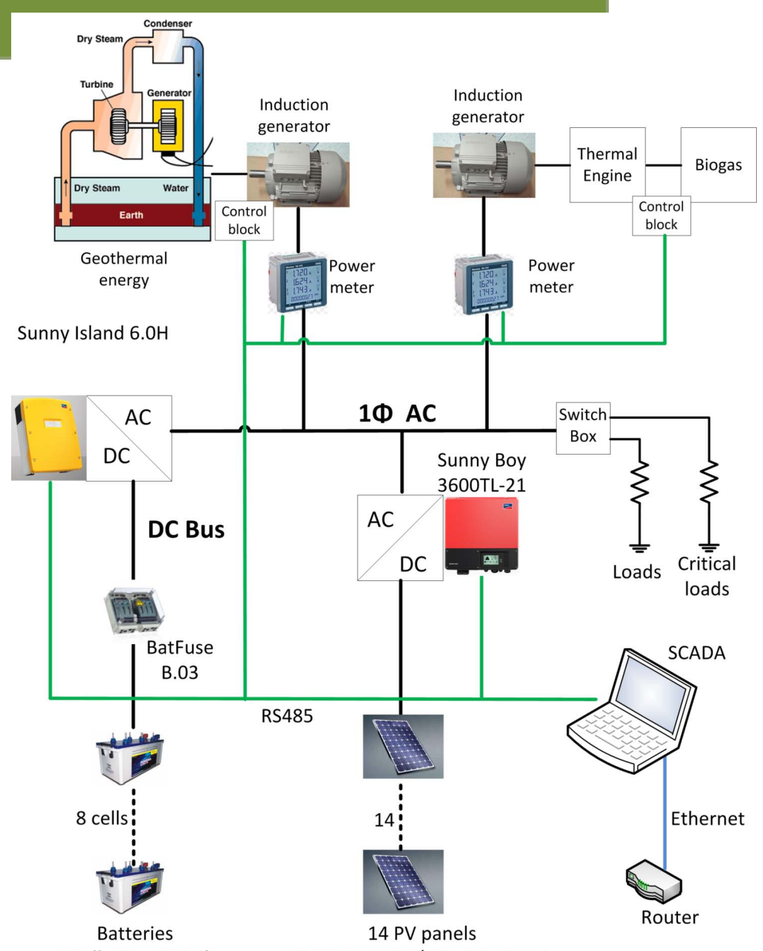
The microgrid is composed of:

- a 3kW geothermal generator
- a 3kW biomass generator
- 14 solar panels of 250W each
- 8 VRLA batteries of 250Ah

Two types of generators are used in the microgrid:

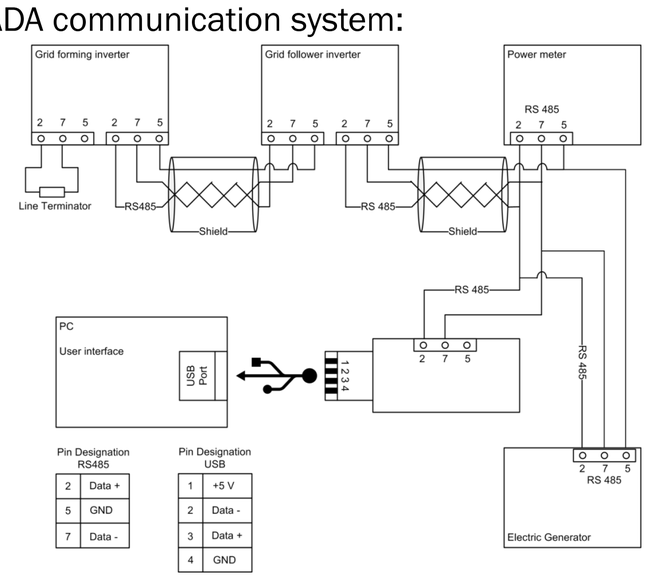
- grid forming generators
- grid following generators

The grid forming generator is a Sunny Island 6.0 battery inverter. Its main function is to set the grid voltage and frequency. The Photovoltaic generator converts the solar energy into electrical energy using 14 solar panels and a Sunny-Boy 3600TL MPPT inverter.



COMMUNICATION AND SCADA

The SCADA communication system:



Modbus Standard Telegram			
Device addr	*Functional code*	*Data*	*Checksum*
1 byte	1 byte	4 bytes	2 bytes

SMA Data Telegram Content					
Protocol header					*User data*
Source	*Destination*	*Ctrl*	*PktCnt*	*Cmd*	*Data*
2 bytes	2 bytes	1 byte	1 byte	1 byte	max 255 bytes

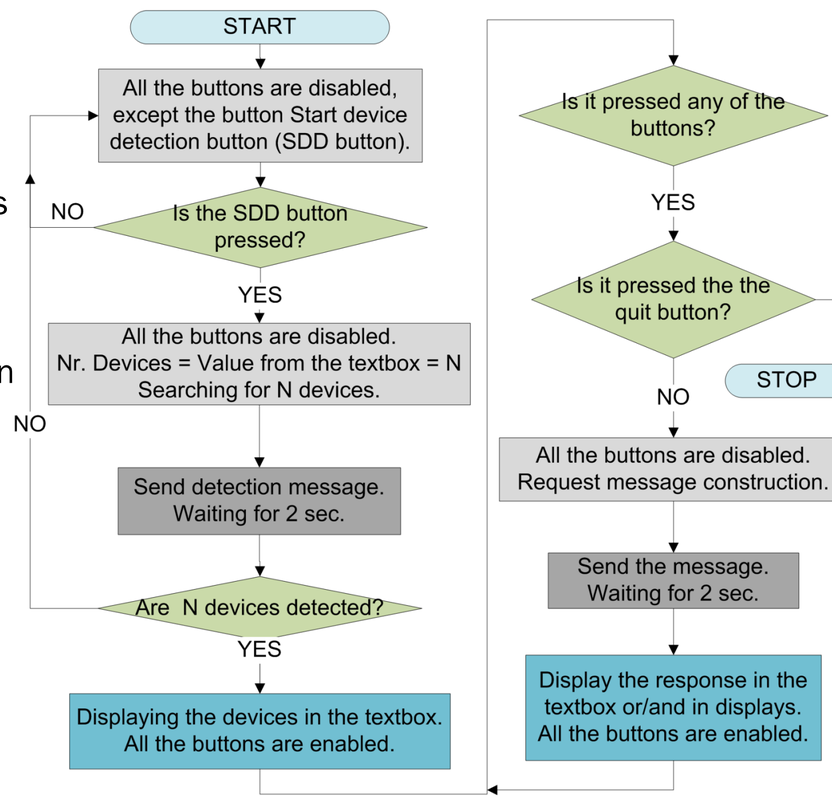
SMA Net Protocol						
Frame			*Content*		*Frame*	
Start	*Address*	*Control*	*Protocol Header*	*SMA Data*	*Checksum*	*Stop*
1 byte	1 byte	1 byte	2 bytes	7-262 bytes	2 bytes	1 byte

RESULTS

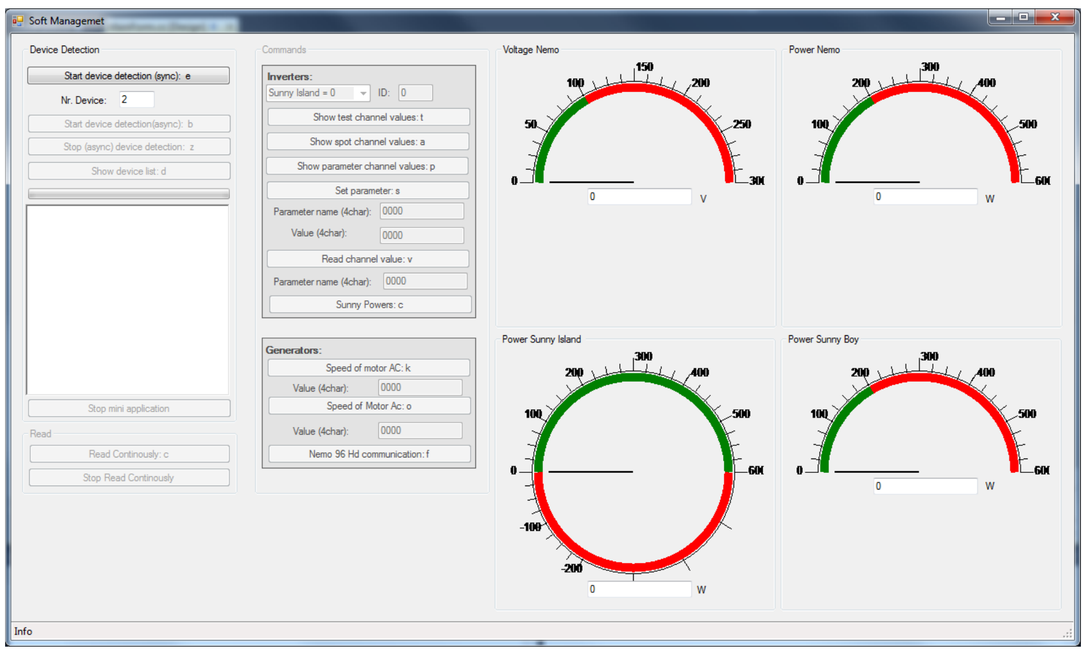
The SCADA PC Interface:

By using this tool the user can detect the connected devices, can display all existent parameters, such as maximum power, active power, etc., can set these parameters, can modify the speed of generators, and can read data continuously. This application uses seven important functions:

- Start device detection
- Read data from inverters
- Set inverters power
- Read data from generator
- Set generators power
- Read Power Meter values
- Read data continuously

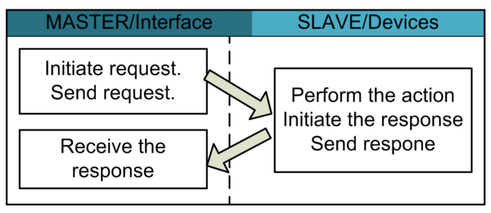


SCADA PC Interface functional algorithm



SCADA PC Interface

SCADA communication algorithm:



CONCLUSIONS

This work gives an overview of the renewable resources today and the development of a SCADA system.

The aim of this work is to present the construction of a SCADA system, to describe the most important available functions, to examine the application's functionality, and this has been achieved. All the necessary data is collected from components of microgrid by this application, and is represented on the PC Interface.

Clearly, further studies are needed to establish an energy management algorithm for keeping a viable and reliable power balance in the islanded microgrid.

ACKNOWLEDGMENT

This paper is supported through the program "Parteneriate in domenii prioritare – PN II", by MEN – UEFISCDI, project no. 53/01.07.2014.

Eniko.Lazar@ael.utcluj.ro