

## Autonomous hydrogen systems – control strategy

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### Abstract

*This paper describes the control strategy for a Stand-Alone Energy System Supported by Totally Renewable Hydrogen Production. The basic control strategy considers the pressurized hydrogen gas storage as the energy buffer. The basic logic is that the exceeding renewable energy (solar and wind) is used to accumulate hydrogen, while the fuel cell uses this hydrogen to produce electrical energy within insufficient solar/wind energy. The system is completely autonomous, conceived for off-grid operation. It is composed by solar panels and a wind turbine as primary energy converters, hydrogen tanks as energy buffer and a fuel-cell and an electrolyzer as secondary energy converters.*

**Keywords:** Hydrogen, Autonomous System, Fuel-Cell, Control Strategy

## 1 Introduction

An important market for renewable energy based electrical production systems is, nowadays, rural and remote sites electrification. Autonomous electrical production systems, based on renewable energies are the most competitive economical options, when compared with solutions based only on diesel generators.

## 2 System Description

The main objective of this project is the development of a fully autonomous system, where every component is based upon renewable energies. Figure 1 presents an overall scheme of the system.

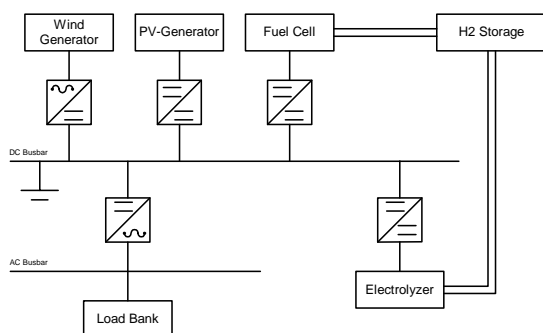


Fig. 1. System configuration.

The control of the overall system is a fully automated process that, regarding the sensor array

information, establishes a set of controls that will run all of the system's components.

The basic control idea is that the electrolyzer generates hydrogen whenever there is an excess of solar or/and wind energy. This means that if the solar and wind energy are more than enough to demand the load requirements its excess should be used to produce hydrogen. Whenever the wind and solar energy are insufficient to face the load demand the fuel cell uses the stored hydrogen to produce the required lack of energy.

Several interlocks are considered to protect the system. A typical example is the one that does not allow the electrolyzer and fuel cell to work at the same time, thus the electrolyzer should only work when in presence of excess power.

## References

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