

Implementation of renewable energy systems on sailboats for auxiliary energy systems

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Abstract—This paper presents the study and implementation of various sources of renewable energy in cruises. For this purpose, different sources of renewable generation (photovoltaic, wind and hydrodynamic) easily installed in the sailboats were selected.

In order to check the technical feasibility of these types of devices in a cruise, a simulation has been carried out under real conditions of wind, temperature and radiation.

In order to carry out the measures, different devices have been installed in a sailboat with the aim to register real data. The devices were: a radiation detector located in the possible location of photovoltaic panels, and a meteorological station that allows to measure the speed of the wind and the temperature. In addition, a GPS device was used to measure the cruise speed in the case of going out to the sea. The models of these renewable systems have been realized and implemented under the simulation environment of Matlab / Simulink®.

The photovoltaic energy was determined from data of irradiation and temperature. For this, a highly contrasted model available in the literature has been used. The main advantage of this model is that it can be configured from data commonly provided by the manufacturer. As far as obtaining the wind power, this is obtained from the curves provided by the manufacturer of wind speed and power generated.

In addition to photovoltaic and wind energy, other type of energy is generated due to the movement of the sailboat when it is traveling, with a hydrogenerator located at the stern of the boat. Similar to wind power, the hydro-power is obtained from the manufacturer's own curve.

Finally, these models have been used for the simulation from the recorded data of the radiation, temperature, wind speed and boat speed, in order to select and size the devices, and also calculate their energy production for a given period.