"*Integrated control system for the energy supply of isolated communities in Cuba, using hybrid systems*."

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ABSTRACT:

During the last four years, CIEMAT has been involved in projects to hybridize renewable systems for the electrification of isolated places in Cuba. The projects have been widely accepted and have had as a main objective to design and adapt hybrid systems for the gasification of biomass and photovoltaic and wind energy to local conditions based on proven technologies. This objective has been achieved through a series of studies on the conditions and replicability of these technologies in the Cuban environment and with the development of a series of training actions that have given rise to an emerging community of knowledge, leading to the design, installation and commissioning of a hybrid demonstrative system.

The activity, funded by the Spanish Agency for International Development Cooperation (AECID), is a commitment to the implementation of hybrid systems focused on universal access to energy. This project began at the end of 2015 and will last till 2021, and has been carried out in two phases. Hybridization of renewable systems, composed of two or more energy generation systems, is a solution with great potential in multiple places in Cuba. Among them, areas isolated from conventional electricity supply, with specific needs for both electricity and heat and with resources that can ensure its manageability and satisfy the demand of the populations affected. The first phase (named HYBRIDUS Project) has developed an electric and thermal energy cogeneration model by means of a biomass-solar hybrid system for agricultural operations on the island of Cuba, with the final objective of transferring that knowledge to the populations who would potentially benefit from the technology. The emphasis has been placed on the eastern part of the island, with special attention on the municipality of Guamá in the province of Santiago. Appropriation of the technology by the population has been addressed throughout the project through two strategies. The first, adapting the proposed technology (the biomass gasification and photovoltaic hybrid system) to local conditions, considering both the resources and the needs of the population under these conditions. This adaptation also starts with an in-depth analysis of the previous experiences. The second strategy to achieve the objective has been the creation of local capacity, using various agents involved (beneficiaries/users, operators, technicians, professionals in the energy sector…) in such a way that a process of technological appropriation is produced and to ensure sustainability over time and the ability to replicate the experience for other populations. The second phase (named HIBRI2 Project) is on-going and will start up a demonstration facility in Matanzas province that will serve to analyze the scope of the proposal developed during the project. This paper will describe the overall activity, focusing on the design of the hybrid system