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EFFICIENT RENEWABLE ENERGY SYSTEMS EXPLOIT ON THE AIM OF REDUCING THE ELECTRICITY GENERATION FROM CONVENTIONAL POWER PLANTS

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Abstract
In the actual context of worldwide scientific research for new solutions of power generation from renewable energy resources, IPA SA & associated companies run the CEEX/MNER Project ENCONVEC. The Project main goal is a demonstration of technical solutions for implementation of renewable energy generators under specific Romanian geo-climate and socio-economic particularities. The present paper presents the project status regarding main objectives and research approaches focused on thermal and photovoltaic solar energy conversion, also considering wind, waves and biomass energy potentials.
Keywords: clean energy, renewable, efficiency.

1. Introduction

The future large-scale usage of renewable energy is a worldwide priority, which shouldn't be ignored by anybody. The objectives of the *National strategy for valorification of renewable energy sources* (GD *1535 -18/12/2003*) include integration of renewable energy sources in the national electricity grid, fighting with the technical-functional and psycho-social barriers in the process of valorification of renewable energy sources and promotion of private investment on the renewable energy sources (RES) market. [2]

Optimal large-scale usage of renewable energy sources in Romania represents at the moment a priority and a must in view of Romania's efforts to meet the requirements of the European Union (until 2010 there must be covered, from renewable sources, approximatively 4,3% of the electrical energy production in Romania). Based on these assumptions, the proposed aim and objectives of this on-going project are fully justified. [2]

Renewable energy sources have an important potential and offer unlimited usage availability at local and national level. Valorification of renewable energy sources can be

done on basis of three main assumptions: accessibility, availability and acceptability. [2] Renewable energy sources ensure an increase in the supply with energy from own sources and thus limitation of the imports in energy resources, supporting sustainable economical development.

2. Project aim and objectives

The main aim of the project is to illustrate the viability of using renewable energy sources as clean and efficient sources, being a durable alternative in the near future to conventional energy sources. [2]

Objectives

- Increasing the weight of renewable energies in the energy balance of Romania, through promotion of some efficient and economical technical solutions, which will consequently contribute to the future large scale integration through identification of a greater number of potential users; [2]
- Education of potential users by underlining advantages and the simplicity/easiness in using these installations, with long-term positive effects in environmental protection such as reducing the greenhouse effect; [2]
- The development of scientific knowledge in the field of renewable energy conversion. [2]

3. The working schedule

The research project will be carried out in 36 months (October 2005 – September 2008), the project development including the following main steps:

- Elaboration of a study regarding the state of the art in the field and presentation of reference models in using renewable energy sources; [2]
- Design of experimental models for perform ant systems that can use solar energy (thermal and photovoltaic), wind energy (an eolian source will be integrated into a hybrid system, including a diesel generator, batteries and a PV source), wave energy and biomass (theoretical technical models); [2]
- After developing the small experimental models for thermal and photovoltaic energy, wind energy and wave energy conversion, a system for monitoring the main parameters of these models will be developed; [2]
- Experimenting, testing and evaluating the performance of the models; [2]

- Elaboration of dissemination material, of the optimization studies related to the use of renewable energy sources, analysing the opportunity for technological transfers. [2]

4. Technical solutions adopted for research and experimental activities

As mentioned above, the project is mainly focused on: a) development of some small experimental models related to converting solar energy to thermal energy (thermo solar) and to electrical energy (photovoltaic); b) conversion of wind energy to electrical energy (study conducted in the framework of a hybrid system including a wind turbine electro mechanic emulator , storage batteries); c) development of an experimental model for recovering wave energy to convert it to electrical energy; d) theoretical presentation from a technical point of view of the the ways of developing biomass-based installations for producing thermal and electrical energy. In figure 1 is presented the basic structure of the ENCONVEC project. [2]

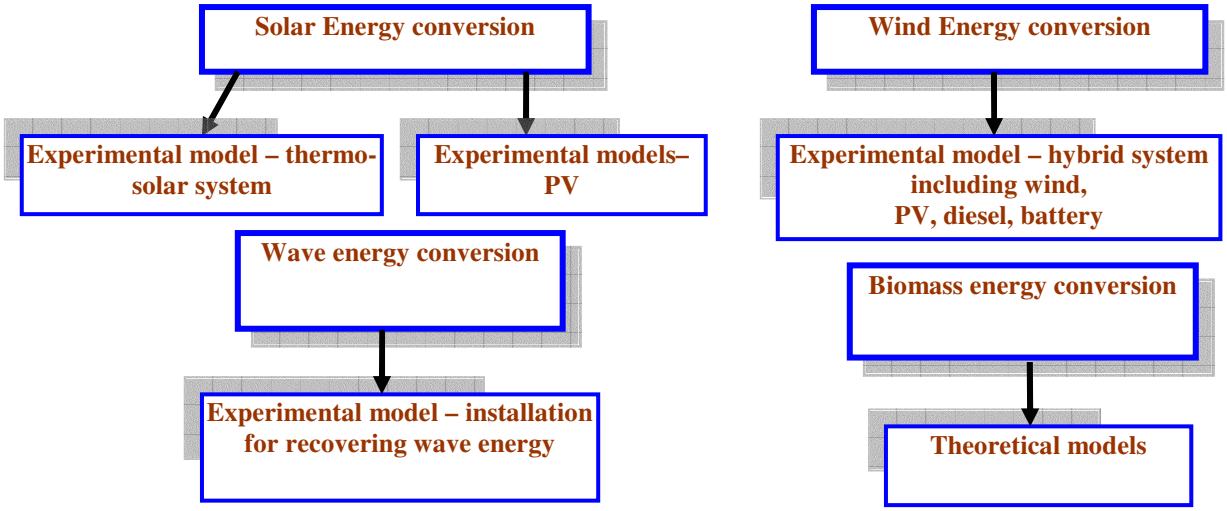

Figure 1: Block Diagram of the project development

Depending on the type of conversion studied, the main activities are as follows:

4.1 Experiments and research related to the conversion of photovoltaic energy into electrical energy including two PV systems: a) Experimental model of a photovoltaic system for pumping water (2 PV modules of 12Wp, 16,5V dc, solar pump: LJ 20). [2]

4.2 Experiments and research in the framework of an experimental model with hybrid structure for conversion of renewable energies (wind, diesel generator, batteries) [1] [3] [4]

The structure proposed for the system

The experimental model of the hybrid system for conversion of renewable energy was developed around a *wind turbine electro-mechanical emulator (simulator)*, which reproduces

to a shaft the static and dynamic characteristics of any turbine, in the proposed power range, making it possible to conduct experimental investigations *regardless of the weather conditions* [1, 3, 4]. This technique is commonly used by all the research collectives in the field of wind energy conversion [1, 3, 4].

4.3 Experiments and research related to the experimental model for the conversion of wave energy [2]

4.4 Aspects related to the conversion of biomass into (thermal and electrical) energy

There are presented technical solutions related to the development of two biomass-based installations for producing energy (thermal and electrical). [2]

5. Conclusions

For the promotion of systems based on using renewable energy in Romania, concerted actions, for informing specialists and for raising the awareness of the population and of the local authorities, are needed in order to surpass the psycho-social barriers associated to the use of these energy sources.

The synthesis presented prooves the scientifical experience and potential of a team of researchers from research institutes and higher education units, engaged in illustrating the viability of the field in the future.

Financing and conducting such projects with the structure above will encourage undoubtedly the development of renewable energy sources. Some risk in the application of the results could appear due to the „conservatorism" of the population and even of some decision makers in the energy sector, in relation to the traditional energy sources.

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