Organisation and country:
Dunarea de Jos University of Galati, Romania

Type of organisation:
□ Enterprise □ SME **x Academic** □Research institute □ Public Body □ Other**:**

Former participation in FP European projects?
✓ **Yes** □ **No**

Web address: **www.ugal.ro**

Description of the organisation:

"Dunarea de Jos" University of Galati is one of the most important higher education institutions in Romania. It is the most representative university in the south-eastern part of the country. "Dunarea de Jos" University of Galati has been nationally and internationally acknowledged during its 63 years of existence. "Dunărea de Jos" University of Galati encompasses 16 faculties, 49 departments, 8 doctoral schools and offers numerous academic programs that overarch all levels of university training: 65 bachelor degree programs, 48 Master programs, 11 open and distance learning academic programs, 27 PhD degree programs, many high-level postgraduate study programs, and programs for professional reconversion and training. All programs included in the educational offer are either accredited or authorized. The degrees granted by "Dunarea de Jos" University of Galati are recognized in almost all countries."Dunarea de Jos" University of Galati is one of the most important research centers in Romania. Over 20 accredited centres develop research activity and collaborate with similar Romanian or foreign research centres.

Automation and electrical engineering department have major concern to develop a sustainable energy system In this context, the Department of Automation and Electrical Engineering manages, master's program the Efficient Energy Use and Renewable Energy Sources. Facilities for the Master's programme were made in particular, by research projects.

During 2006-2008 the members of the departments was a partner in the national project entitled *Research on Interconnection assemblies wind power conversion system in order to Increase Energy Efficiency for a specific application*. Substantial scientific contribution was made in the activities that were carried out a comparative study on alternatives for achieving wind systems for different applications: the consumer unique, network with national network and a study on power quality requirements of wind system

National project, has researched (2007-2010) a *Cogeneration system with fuel cell and thermal station without connection to the grid*, and had the goal modelling, experimenting on the model, determining the characteristics of the system, as well as optimising the processes of multiple energy conversion. In the same period, has researched *Power quality evaluation methods for energy efficiency increase in electrical systems with renewable sources.*

The international project (financed by EEA Grants http://eeagrants.org/project-portal/project_04-09/RO0054) with title "*Integrated micro CCHP - Stirling Engine based on renewable energy sources for the isolated residential consumers from South-East region of Romania (m-CCHP-SE)"* (project site www.mcchp.ugal.ro) and had the scope to develop a trigeneration system for simultaneous production of power, heat and cold type off-grid. The specific objective of this project was to study, model, simulate, design and manufacture the mCCHP-SE system experimental model and to implement it in the experimental residential house located within the area of the Dunarea de Jos University campus (South-Eastern region of Romania).The aim of this project was to design and build an experimental model of a trigeneration as an alternative solution for obtaining electricity, heat and cold using traditional resources (wood), renewable energy (biomass, biogas) and solar energy system and that will serve as an experimental unit to investigate the potential of trigeneration systems for energy production and conservation.

The energetic fluxes in the mCCHP system imply generation, transport and storage of energy. Each of these processes presupposes the manipulation of certain quantities of energy. The energy "carriers" may be fuels, thermal agents (usually fluids like water or air) or electrons, depending on the type of energy – thermal or electric.
The circulation of these "carriers" (which is the concrete form by means of which the energetic fluxes are achieved) presupposes the existence of a number of complementary components, which facilitate this circulation. The transport of pellets, the water recirculation pumps, the ventilators, the fuel-power-heat- and cold storages and the heat exchangers may be considered as examples of complementary components.
As available on the market, the main components of the system incorporate part of the complementary components and that is why they are already included in the structural model of the system. The rest of the complementary components need to be added. Thus, the structural model of the system becomes the functional scheme, which may then be used in the dimensioning of all the components, this way obtaining the functional model of the system.
For the structural models with thermally activated chiller was built the global functional scheme presented in

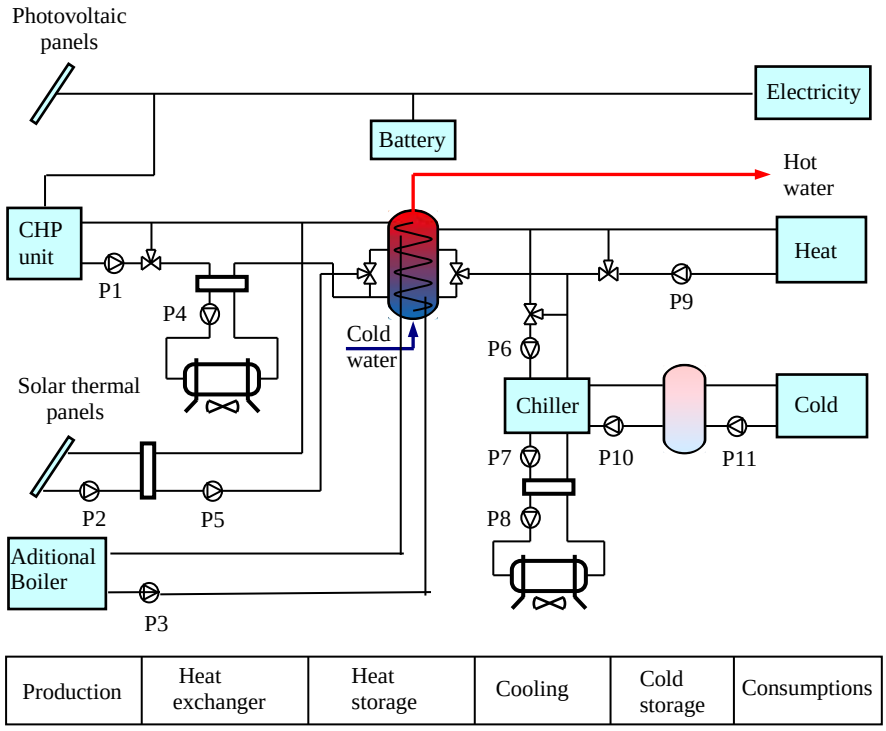

Fig.1 *Global functional scheme for a mCCHP system with a thermally compression chiller*

This system serves as an experimental unit and it has the potential for use in other applications, namely consumers in isolated area (and/or no electrified), rural areas, mountain areas and city outskirts as a durable alternative for their daily residential comfort.

Experimental system pictures

Picture 1 Adsorption chiller and pellets boiler

Picture 2 Chiler **p**umps station

The experience gained was capitalized in the book named Design for Micro-Combined Cooling, Heating and Power Systems **Stirling Engines and Renewable Power Systems**

Editors: **Badea**, Nicolae (Ed.) https://www.springer.com/gp/book/9781447162537

This book provides a manual for the technical and structural design of systems for supplying decentralised energy in residential buildings. It presents the micro-combined cooling, heating & power systems Stirling engines & renewable energy sources (mCCHP-SE-RES) systems in an accessible manner both for the public at large, and for professionals who conceive, design or commercialise such systems or their components. The high performance levels of these systems are demonstrated within the final chapter by the results of an experiment in which a house is equipped with a mCCHP-SE-RES system. The reader is also familiarized with the conceptual, technical and legal aspects of modern domestic energy systems; the components that constitute these systems; and advanced algorithms for achieving the structural and technical design of such systems.

In residential buildings, satisfying demands of durable development has gradually evolved from necessity to obligation and institutionalisation. Consequently a major paradigm change has appeared in the supply of energy to residential buildings, from the centralised production of energy using fossil fuels to the decentralised production of energy using local renewable sources. Furthermore, on the energy system market, energy micro systems which use renewable energy sources are increasingly commercialised. From among these, the mCCHP-SE-RES systems are particularly striking because they offer a high performance and they enhance the relationship between humans and the environment. This book is intended for postgraduate students of electrical engineering, applied mathematicians, and researchers of modelling and control of complex systems or power system technologies.

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