MINISTRY OF NATIONAL EDUCATION

NATIONAL INSTITUTE FOR RESEARCH AND DEVELOPMENT FOR CRYOGENIC AND ISOTOPES TECHNOLOGIES – ICIT RM. VALCEA

The National Institute for Research and Development for Cryogenic and Isotopes Technologies – ICIT Rm. Valcea is a scientific research establishment coordinated by the National Ministry of Education – State Authority for Scientific Research, Technological Development and Innovation.

ICIT Rm. Valcea was founded in 1970 under the designation of "G" Plant in Rm. Valcea as an experimental industrial pilot plant. The research which was conducted has culminated in the patenting of the technology producing heavy water and its use in the design and construction of ROMAG heavy water plant in Drobeta Turnu Severin. In 1991, the “G” Plant underwent a reorganisation process resulting in the Institute for Cryogenics and Isotope Separations which was accredited in 1996 as a component of the national research and development system.

In the past years, ICIT Rm. Valcea has developed a large-scale internal programme for scientific and technological innovation which is intended for the valorisation of results in production by technological transfer and the orientation of activities towards the demands of society.

The main research-development objectives of ICIT Rm. Vâlcea are:

- Contributions to the national nuclear programme - nuclear fission and nuclear fusion
- Development of studies and research in the area of cryogenics and relevant equipments
- Hydrogen and fuel cells Renewable energy resources
- Environment and quality of life
- Technological transfer and specialised services (pure gases and gas mixtures, analyses, consulting, expertise, technical assistance etc.)
- Development of the management system for the public and private financial resources (including Structural Funds) allocated to scientific research;
- Development of human resources in research, fostering of training and development of young researchers and of highly-qualified research teams.

The research activity of the ICIT Rm. Valcea contribute to satisfaction of the current social and economic requirements by channelling efforts toward research and development directions of the national and international interest:

- Isotope separation with the research of the equilibrium and the processes the separation of the hydrogen production, certification and delivery of heavy water standards.
- New solutions to produce the energy using hydrogen fuel cells and renewable energy sources.
- Cryogenics and Physical Vacuum is the direction supported theoretical and experimental for studying and development of the liquefactor by nitrogen, hydrogen and helium, of the pumping systems and the equipment to measuring high vacuum.
- Technologies for the production and storage of the hydrogen and tritium.
- Advanced materials, new or modernized products and technologies such as selective adsorbents, the specific catalysts and structures of the nanostructured carbon.
- Promotion and valorisation of the research results by developing the technologies for gas separation to using in the purification technique and the analytical equipment's. At the same time, these technologies can be harnessed to reduce noxious agents from industrial gaseous emissions.
- Environment and life quality is a direction with a special importance, especially for being in line with European Standards.

For the purposes of achieving the strategic objectives, ICIT Rm. Valcea has created a research and development infrastructure comprising the following:

➢ **Laboratories for research & development, innovation and technological transfer,** directions of the activity are to enhance the quality and competitiveness of products/services and to sustain efforts for regional development. The laboratories are accredited by RENAR for testing activities which include isotopic analyses, environment analyses (water, air, soil), analyses of pure gases and gas mixtures, analyses of foodstuffs, alcoholic and non-alcoholic beverages.

The evolution of the activity research from ICIT Rm. Valcea, in the last years has led to its transformation into a centre of excellence in a few particular areas considered to be very important both as support for economic and social life of Romania and also for Romanian research in the European context.

Latest equipment that is used in the institute's laboratories and the highly qualified staff allow canalizing to the sustained efforts in developing the vast field of the environmental monitoring and quality of the life.

➢ ***Experimental Pilot Plant for the Separation of Tritium and Deuterium***

The mission of the Experimental Pilot Plant for the Separation of Tritium and Deuterium, which is an objective set at national level, is to develop the detritiation technology for the heavy water employed as a moderator for the CANDU nuclear reactors and to test the specific materials and equipments in tritiated environment and at cryogenic temperatures. The beneficiary of the heavy water detritiation technology is S.N. Nuclearelectrica for Unit 1 and Unit 2 from NPP Cernavoda.

Pilot Plant from Rm. Valcea shall be constituted practically in a European plant, with involvement in the programs EURATOM / EFDA-JET-EFDA ITER of the European Community, through the wide offer of participation on the issues from the nuclear fusion (of F4E project) for specialists from the Institute and participating with the specific materials field of the fusion (catalysts, fillers, cryogenics, ultra-purification, gas deuterium, tritium production).

Pilot installation for the separation of the deuterium and tritium is included in the list of the nuclear facilities supervised by the Atomic Energy Agency in Vienna, as a part of the reporting system and the control of the nuclear safeguards.

The Pilot Plant participate the work programs and technical assistance projects organized by IAEA Vienna in the scope of the facility.

➢ ***National Centre for Hydrogen and Fuel Cells – NCHFC***

ICIT Rm. Valcea has initiated in Romania the research activity in the production domain, the storage and the hydrogen application in the fuel cells. In the same time, ICIT Rm. Valcea is the coordinator on the national plan of the integrated platforms by research for the fuel cells with the hydrogen.

Given the long experience in the field of the hydrogen and the fuel cells, it was considered timely to realise the **National Centre for Hydrogen and Fuel Cells (CNHPC)** at ICIT Rm. Valcea for take into account the experience and the existing facilities but also the primary source of energy (hydrogen) cheap and easily accessible.

By realizing the National Centre for Hydrogen and Fuel Cells with funds from the budget, whose inauguration took place in October 2009, aims to achieve the following objectives:

- Development of infrastructure that laboratories for realization the new and competitive materials for the fuel cell components.
- Developing the laboratories for the fundamental research in the electrochemistry domain.
- Developing systems for the production of the hydrogen from the renewable sources: biomass, solar, hydro, etc.

- The development of the stationary and mobile applications using the hydrogen technology.
- Development of the training programs and the training of the young researchers in the field of clean energy and to connect the researchers from Romania to research activity at European / international level.

➢ ***Low Temperature Laboratory, CRYO-HY***

Cryogenics is best defined in the institute as reference to the CRYO-HY project completed with financing under Structural Funds. The project was completed in October 2012 by the development of a low temperature laboratory for energetic applications for cryogenic fluids.

This facility has a space available for the liquefaction systems, a specific cryostat, equipments for the testing and valorisation of hydrogen transport and storage and three distinct laboratories:

- The Microstructural Investigations Laboratory
- The Cryo-measurements Laboratory
- The Laboratory for Super-Conductivity and Related Applications

The CRYO-HY Laboratory shall relaunch cryogenics as a defining topic of the institute as well as in Romania.

➢ ***Technological and Business Incubator - ITA - ICIT Rm Vâlcea***.

ITA - ICIT Rm. Valcea is an innovation and technological transfer entity, which has been established within ICIT Rm. Valcea and which has no legal personality.

ITA – ICIT Rm. Valcea has been reaccredited as an innovation and technological transfer entity under Certificate No 59/21.12.2011 and it is included in the National Network of Innovation and Technological Transfer Entities ReNITT.

The mission of ITA – ICIT Rm. Valcea consists in facilitating the initiation and development of new innovative and advanced technology-based enterprises, i.e. small and medium-sized enterprises.

For the adjust to the requirements of the economy market and also as a result of the infrastructure development, ICIT Rm. Valcea performs the activities of the technology transfer of the production and various services (analysis, expertise, consulting, technical assistance, etc.).

- **Structure of the human resource of the research and development**

In order to be competitive, ICIT Rm. Valcea gears towards the human resources a market and client-oriented activity in order to achieve ongoing advanced training and education. The recruitment-employment is of a great importance in the strategy related to the human resources. In this respect, the enhanced visibility of ICIT Rm. Valcea is required among the higher education establishments in Romania by the planning of visits and scientific presentations for students in their final years of study, in particular for those with the relevant specialisations matching our areas of interest for the institute.

The relationship between ICIT Rm. Valcea and the higher education establishments will also be considered in terms of education by the preparation of papers for licence diplomas, Master's and Doctor's degrees.

Promote and valorisation the results of the research and development are achieved by:

- Development of the scientific papers published in the professional journals;
- Participation with scientific papers in the congresses, conferences, workshops, etc.., national and international;
- Publishing the journal with referents "Progress of Cryogenics and Isotopes Separation", ISSN: 1582-2575, 2 issues per year, indexed BDI.
- Regular participation in international fairs and exhibitions.

In the context of the high technology areas, ICIT Rm. Valcea organizes annual the conference with the international participation "Progress in Cryogenics and isotope separation" and in every two years the Workshop "Management of tritium."

In terms of the belonging to the European Union and the prospect of the European Research Area, ICIT Rm. Valcea seeks to enhance participation of the scientific community to the research and technological development programs of the European Community**.**

As a participant in the National Programs and the European Community for Research and Development, ICIT Rm. Valcea aims to increase the exigency in selecting research topics and to develop the partnerships with the research institute from the country and abroad. This cooperation is a guarantee of the approach of the subjects with a great interest in the international research.

It is important that the results of the research institute to help meet economic and social requirements and to improve the quality of the life in Romania.