

3. Institutional Development Plan of INCDIE ICPE-CA for the next 4 years

The institutional development plan of our Institute for the next 4 years is an extension of our current development plan, having in mind the actual changes in different legal aspects, our strengths and external opportunities and to act in order to eliminate our weaknesses and to minimize external threats.

Starting from our vision and mission, we prepared the basic rules of our internal institutional life in accordance with European and other international directives. In the field of HR- the most important component of our Institute, the basic rules are included in our general labor contract, which correspond to the the European Charter for Researchers and Code of Conduct for the Recruitment of Researchers, adopted by the European Commission in order to promote open and transparent recruitment and appraisal procedures; they are aimed at developing an attractive, open and sustainable institutional life for researchers. Beside researchers, the technological developing engineers from our Institute has a well defined role, as it is stated in Oslo Manual devoted to the measurement and interpretation of data relating to science, technology and innovation, "Innovation is a continuous process...and it is more difficult to measure a dynamic process than a static activity". We modified our structure because, as stated in the same manual. "Organisational innovations are not only a supporting factor for product and process innovations.... Organisational innovations can improve the quality and efficiency of work, enhance the exchange of information, and improve firms' ability to learn and utilise new knowledge and technologies".

In order to improve our technological security, we implement in 2011 a data management system through our laboratory for management of knowledge/information. In order to have a well prepared staff, we finished and we will apply, starting from 2012, an individual performing and monitoring system (DEP). Also it is under way the implementation of the Government Statement HG 946, for which we complete up to now around 70 procedures.

Coming back to our development plan, this plan is established taking in account the National Reform Plan from 2011, the Strategy of Development for the period 2014-2020, as well as the Europe's Horizon 2020 and the future framework program FP8, with special emphasis on innovation.

3.1. Scientific SWOT analysis

Strengths

- The quality and structure of staff, pluridisciplinarity, 20% administrative staff;
- Relatively low-average age (43 years) of institute staff;
- No. of institute employees- average size of the institute;
- Highly qualified personnel able to attract national and international funds: 54 PhD, over than 30 PhD students;
- Interdisciplinary activity of the personnel;
- Clearly defined responsibilities of staff, through procedures of activities and by setting performance criteria that can ensure greater efficiency of research (DEP - Procedure of developing and evaluation of the performance certificated staff);
- Existence of the research facilities, similar with laboratories from EU countries;
- High level equipments for all research domains;
- Existence of trained staff for each equipment;
- Performant equipment investment which ensures the employment of complex research issues, starting from basic research to the application;
- Establishment of new branches in different parts of the country (North - Baia Mare, East - Constanta, Centre - Avrig) providing the possibility to enhance other contact with the economy;
- Recent internal re-organization of the Institute in three major departments whose work is engaged in three areas of interest to electrical engineering, both at national and European level: energy efficiency in obtaining and conversion of energy, new sources of energy, advanced materials for applications in electrical engineering and microelectromechanical systems, 4 accredited laboratories for characterization and testing of materials and products, (including laboratory for EMCompatibility) and two bodies for technological transfer;
- Infrastructure available for a powerful design with a direct link between design and manufacturing;
- Specialized software for testing of virtual prototypes, field modelling, a.s.o.;
- Specific research equipment completed with technological equipment that allow obtaining and testing of prototypes;

- Implementation of quality-environment management system;
- The existence of a well-defined and secure IT system;
- Good links with the economy;
- Possibility of offering technical assistance and services to industry and other partners;
- Member of different clusters for products, included in our activity area;
- Good knowledge of the mechanisms for technology transfer, protection and exploitation of intellectual property rights;
- Links with similar national entities for technological transfer;
- The existence of *Office for Knowledge and Information Management*; existence of a PR advisor.

Weaknesses

- Relative low international visibility of the institute taking into account the institute' youth and small number of staff with international visibility;
- Many papers published in low ranked revues and from here quite poor scientific visibility;
- Lack of experience in the field of modeling and simulation of materials and processes;
- Lack of experienced staff in some departments and absence of leaders with technology experience in some research groups;
- Lack of homogeneity regarding the research topics in departments;
- Absence of an annual training plan to ensure a higher and even interdisciplinary qualification of institute's young staff;
- Insufficient approach of all opportunities offered by the institute through the infrastructure and staff available (the infrastructure areas enhanced in a very fast running project – "PROMIT");
- Weak exploitation of the products through technology transfer and marketing and consequently low incomes from saled / transfered licenses;
- Low exploitation by international patent application of created knowledge;
- Low development of the collaboration and to participate in international networks and clusters for research activities in the field of electrical engineering;
- Non-knowing of the market by a significant part of the staff (young staff);
- Strong dependence of institute from budgetary funds;
- Absence of leaders with technology experience in some research groups.

Opportunities

- Position of the institute like as RDI institute;
- Research investment policy of the Romanian Government;
- Approaches of new areas and research topics due to the existence of financing plans offered by National Programmes and Sectorial Research Programmes and due to the existence of National Energy Strategy until 2020;
- Existence of the National RDI Strategy and Plan, of the National Reform Plan;
- The European political context favourable for research and development of human resources for research, programm HORIZON 2020;
- Opportunities for European cooperation in the frame of EU actions;
- Research financing by EU research framework programs: FP7, FP 8, ERA NET, etc.;
- EU regional development policy that allows access of the institute to structural funds and funds for economic and social cohesion, European strategy Danube - Black Sea, etc.;
- Restructuring and development of new criteria on the economic environment which will allow increasing the need for research / design / transfer services;
- EU policies on sustainable development and development of SMEs;
- Available funding programs for start-up and spin-off companies;
- Attracting European funds and contracts with third parties;
- Increased access to information sources (ANELIS and around 25 IEEE journals in the field of electrical engineering);
- Possibility to attend to national and international conferences in the electrical engineering field and prestigious journals subscriptions;
- Very good colaborations with the Romanian universities and institues;
- Possibility of training of technical staff for new areas of research of young people;
- The formation of interdisciplinary working teams;
- Possibility to collaborate with industrial partners in developing new research projects; engaging SME' in research projects in National and European research programs

- Existence of industrial partners for the transfer of technology and products of research;
- Economic recovery of Romania;
- The need to introduce the system of energy management (SREN 16001);
- The electrical engineering industry and also the research in electrical engineering is a horizontal activity, which still determine the progress in all this domains of activity.

Threats

- National political and economical changes that occur and can influence the research strategy and funding;
- Lack of a coherent research policy at national level in close correlation with the country's economic development plans;
- Contradiction between research directions employed by national research policy and development strategy of Romanian economic entities;
- Big difference between political statements of Romanian Government on the supporting of the research and development and its funding;
- Lack of long-term government strategy on Romania's economic development;
- Deepening disparities in national economic development;
- Deepening disparities between supply and demand;
- Continuous changing of national fiscal policy;
- Long periods of stagnation / decline in European economy;
- Migration of industries in low-cost foreign locations;
- Low interest in the economic environment for implementation of new innovative products;
- Ignorance of importance of protecting intellectual property rights;
- Weak evolution of the economy for Romania and EU countries;
- Globalization of the research;
- The existence of large European research centres that have the ability and strength to raise significant funds and human resources;
- Small number of young people who want to work in research;
- Migration of experienced researchers toward the national and foreign business medium;
- Increasing competition; greater exposure to global competition in the markets.

3.2. Strategic scientific objectives and directions

The strategic scientific objectives and the directions in which we intend to develop our institute, are in worth with the Governmental Statement through which we was established in August 2004 as a National RDI Institute for Electrical Engineering – HG 1282 / 2004 – and in tight connection with our declared and assumed vision and mission to become an important “link” of the progress in electrical engineering, performing applicative research in the usefulness of state and private holded commercial companies.

Our activities will be directed to help local and central administrative bodies:

- to develop the economy based on knowledge and innovation;
- to protect the environment through our developed products and technologies;
- to help to build a governance based on a business development.

3.2.1. Objectives

As a consequence, for the next years we intend:

- Increasing of number of applications in European HORIZON” 2020 Programme, including the last FP7 and the new FP8 calls as well as other programmes, like: Cross-border Programmes, Black Sea Cooperation Programme, European South – East Programme, etc.;
- Strengthening of the external cooperation with CERN – Geneva. FAIR – Darmstadt, JINR – Dubna;
- Increasing the cooperation with other Romanian institutes in the frame of the ELI-NP Programme and of The Advanced Studies Centre – Danube Delta – Black Sea;
- Increasing the role of ICPE-CA in big national programmes and projects with national and international relevance (ELI, Hadronotherapy, Electrical Mobility, Energy Management System and others);
- Enhancement of the level of extra-budgetary projects with Romanian and foreign customers;
- Increasing visibility of ICPE-CA through papers published in ISI high ranked journals and through participation in national and international fairs and patents presentation;
- Increasing the number of researchers with international visibility;
- Increasing the number of patent applications and patents granted;
- Applications for international patents;

- Enhancement of technological transfer through national and international programmes like Innovation, specific calls in FP7 and FP8;
- Organization of scientific workshops and conferences in order to increase our scientific and technological visibility;
- Organization of seminars with industrial partners in order to increase visibility of our products and technologies, to enhance the knowledge of industrial needs;
- the improvement of co-operation between institute and industry, especially by development of public-private partnerships;
- Increasing the number of service contracts (characterization / testing) and technical assistance to industrial companies and attracting extra-budgetary funds;
- Increasing the capability of making EMC tests for third parties (tests, know how) involving both standard methods and methods that assume validation;
- The extension of EMC laboratory accreditation;
- To finalize by own resources the mobile laboratory for the measurement of the radiated electromagnetic field level;
- To finalize the mobile laboratory for the measurement of the acoustic and vibration field level;
- To promote innovative products and technologies developed in INCDIE ICPE-CA in order to identify the economic agents to transfer these products and technologies. The transfer in the economic environment of products and technologies developed in INCDIE ICPE-CA will result in an extra-budgetary financial contribution to the institute's budget from the sale of license agreements, technical assistance for implementing of products and royalties due to the institute as results of granting rights to use patents owned by INCDIE ICPE-CA;
- "Technology Transfer Center. Intellectual Property" will pursue strengthening the ties with different clusters in order to establish more contacts with the economy;
- Operating costs of the "Technology Transfer Center. Intellectual Property" will be covered from specific transfer activity;
- Research objectives for Advanced Materials:
 - (1) Higher participation in national and international research efforts (through participation in FP7 and in the new FP8) to replace materials with a high content of strategic elements (like Co, rare earth in permanent magnets, Li in electrical power sources, Al and Cu in electrical conductors) with other having a smaller amount of that elements in order to promote a sustainable policy through economy of resources (materials together with energy);
 - (2) Development of a research group for simulation/modeling of physical processes and material structures, for testing of virtual prototype in order to reduce the research costs (including here the reduction of time consuming experiments and also of materials – in many cases very expensive);
 - (3) Design and development of new materials with applications for green energy, green car, the development of multifunctional composite materials, thin films, biomaterials and materials used in MEMS;
 - (4) Development of new pole of excellence for advanced materials;
 - (5) Increasing of the visibility of our advanced materials research activity;
- Research objectives for ECCE (Efficiency in Conversion and Consumption of Energy):
 - (1) Introduction of an Energy Management System, promotion of a national application of the standard SREN 16001 and to assist electrical energy consuming companies in order to save energy:
 - 1.1. Development for efficiency of energy consumption and materials in the economy;
 - (2) To develop products and technologies, using the skill of our Institute in advanced materials and microelectromechanical system, which save energy, which convert with high efficiency renewable energy sources in usable energy (electrical, thermal):
 - 2.1. Development of electromechanical systems of converting the renewable energies in cooperation with entities and companies from Romania and abroad;
 - 2.2. Development of fuel cells for household using by converting the renewable energies, in collaboration with universities and institutes from Romania and abroad;
 - 2.3. RDI in applications of superconductivity in electrical machine;
 - 2.4. Development of biogas reactors with performant cogeneration;
 - 2.5. Development of electrical machine with high efficiency (like IE3, IE4, a.o.);

- (3) Contribution to the development of big national and international (research and economic units) projects with high level devices having an increased energy efficiency;
 - 3.1. RDI in electromagnetic devices used in elementary particle accelerators (FAIR, ITER, CERN, ELI-NP Magurele, a.o.);
- (4) Introduction of energy consumption analysis for all the life cycle of the products;
- (5) Visibility increase of our research in the ECCE field.
- Research objectives for the topic MEMS/NEMS:
 - (1) Development of new MEMS/NEMS, using advanced materials and techniques and technologies proper to our institute, in order to contribute together with our other departments – special with that for ECCE – to our main goal of our applicative research, namely to assist the commercial companies of the electrical engineering field to enhance the level of the sold products, finally in the benefice of the whole society.
In these directions:
 - 1.1. Standard multi-physics analysis and simulation technique to handle both micromechanical components and electronics;
 - 1.2. Development of MEMS systems for electrical engineering and biomedical applications;
 - 1.3. Application devices of integrated MEMS such as micropower sources and tunable MEMS device for reconfigurable wireless electronics;
 - (2) Finishing of an feasibility study of MEMS and NEMS necessities of the industry;
 - (3) Development of prototypes of MEMS/NEMS using the facilities existing in our institute for direct necessities of industrial partners;
 - (4) Increasing the visibility of our skills in research and prototyping of MEMS/NEMS.
- General reducing of consumption of resources, management and conservation of natural resources based on ecological principles, paying attention to recycling of materials;
- Possibility of reducing pollution due to initiation of research projects for clean technologies (greater flexibility and adaptability to environmental requirements, involvement in projects on specific environmental issues);
- Decreasing of consumption of technological fluids, electricity and heat;
- Increasing the turnover of each laboratory with an average of 20% per year;
- Maintaining and improving of Integrated Quality-Environment Management System, achievement of Integrated Quality-Environment-Data Management System;
- Further increase of working conditions and implementation of integrated system quality – environment – health;
- Maintaining SRAC and RENAR accreditation;
- Improving information bulletins sent to researchers;
 - The achievement of these objectives involves:
 - the increase of scientific and technical level of the research works by periodical organization of seminars in which will be analyzed: the experimental procedures, methodologies of approaching of a new project, the recent published papers from the laboratory research domains, the scientific papers which will be submit for publication or communicate at conferences and symposia;
 - the acquisition of new high quality apparatus, as well as some annexes for existing apparatus;
 - the increase of the access to actual scientific literature by further subscription at journals of interest and reference books acquisition, participating at “ANELIS” project;
 - new scientific cooperation with national and international universities and institutes;
 - involvement in the implementation of national projects with real applicative direction and transfer to market economy potentials;
 - involvement in implementation of projects undertaken by EU funds providing visibility of Romanian research in Europe;
 - providing characterization and testing for third parties in order to increase the laboratory self-financing by attracting non public funds;
 - exploitation of research results through participation in the certification of product / new technology.

3.2.2. Strategic directions

1. Higher participation in national and international research efforts (through participation in FP7 and in the new FP8) to replace materials with a high content of strategic elements (like Co, rare earth in permanent magnets, Li in electrical power sources, Al and Cu in electrical conductors) with other having a smaller

amount of that elements in order to promote a sustainable policy through economy of resources (materials together with energy);

2. Introduction of an Energy Management System, promotion of it national wide and to assist electrical energy consume with high companies in order to save energy;
3. To develop products and technologies, using the skill of our Institute in advanced materials and microelectromechanical system, which save energy, which convert with high efficiency renewable energy sources in usable energy (electrical, thermal);
4. Contribution to the development of big national and international (research and economic units) projects for high level devices having an increased energy efficiency;
5. Development of new MEMS/NEMS, using advanced materials and techniques and technologies proper to our institute, in order to contribute together with our other departments – special with that for ECCE – to our main goal of our applicative research, namely to assist the commercial companies of the electrical engineering field to enhance the level of the sold products, finally in the benefice of the whole society;
6. An adequate HR policy in order to enhance the quality of the research personnel and offering in the same time to all staff members of a career in research; increasing the number of full-time researcher only for a given project (time limited hiring);
7. An efficient administrative system in order to allow for the research staff to can demonstrate a time efficiency in research of at least 90%;
8. Development of the infrastructure of our institute in order to be able to participate in big national and international programmes;
9. Generalization of modeling in all fields of applicative research in order to build and to test virtual prototypes, increasing the efficiency in research (saving of time and material costs);
10. Building of poles of excellence in the main areas and important research field of our institute: advanced materials, RES including more energy management, MEMS/NEMS, EMC, thermal analysis;
11. For EMC Laboratory: the extension of frequency range in the LF and ULF domain (ULF submarine communications); the extension of frequency range in the UHF up to 300MHz, the limit of allocated frequency; the development of tests and research in 0.3 – 4 THz (THz - Time Domain Spectroscopy) in order to become an important player at national and international level;
12. Development of new accredited services for electrical engineering;
13. Increasing the national and international visibility of our staff through high quality papers in good ranked international journals, and increased participation of our staff in high level international conferences, application for international patents, further organizing of conferences, workshops with international participation in field in which our institute has a solid position;
14. Improving the scientific documentation facility of our staff, using centralized access to international journals (like ANELIS), also our own IEEE membership documentation possibility in specific electrical engineering journals, a powerful and secure network of PC, connected to different facilities, development of our data management plan;
15. Further development of our system of the institute's memory;
16. Increased participation of our scientists in solving problems needed by the industry (economy) through participation of our researchers in specialized clusters;
17. Further development of strategic partnerships with prestigious Romanian and abroad universities, as well as with large traders or services providers in our country, in order to:
 - *Develop of electromechanical systems of converting the renewable energies in cooperation with entities and companies from Romania and abroad;*
 - *Develop of fuel cells for household using by converting the renewable energies;*
 - *Develop for efficiency of energy consumption and materials in economy;*
 - *Perform RDI in applications of superconductivity in electrical machine;*
 - *Perform RDI in electromagnetic devices used in elementary particle accelerators;*
 - *Develop of MEMS systems for electrical engineering and biomedical applications.*

Allocation	TOTAL COSTS					Number of resulted INDICATORS [total 2012-2016]									
	2012	2013	2014	2015	2016	Patents submitted	Patents awarded	Cesions	Licenses	Articles non ISI	Articles ISI	Transferable products	Transferable technologies	services	others
TOTAL [mii lei]	27163	30734	32006	35555	37890	88	37			195	372	167	45	115	
Basic financing [%]	45	46	44	48	48	45	45			45	45	45	45	45	
Institutional Improvement [%]	15	14	16	12	12	15	15			15	15	15	15	15	
National Programme [%]	28	24	20	17	18	33	33			33	33	33	33	33	
Economic entities [%]	2	3	5	6	7										
FP7 [%]	5	8	10	12	12										
Other sources of financing [%]	5	5	5	5	3	7	7			7	7	7	7	7	
From which for national interest infrastucture (IIN)	1279	1343	1410	1480	1555										

Table 1. Evolution of some visibility parameters of ICPE-CA between 2012- 2016

Allocation	TOTAL					Equipments					Buildings					Others				
	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
TOTAL [mii lei]	4600	5000	3900	5000	5000	2200	3100	3300	4500	4400	2400	1400	300	50	0	0	500	300	450	600
Basic financing [%]	5	5	10	10	10	5	5	10	10	10						0	5	10	10	10
Institutional Improvement [%]	0	0	0	0	0	0	0	0	0	0						0	0	0	0	0
National Programme [%]	5	5	10	10	10	5	5	10	10	10						0	5	10	10	10
Economic entities [%]	0	0	0	0	0	0	0	0	0	0						0	0	0	0	0
FP7 [%]	0	0	0	0	0	0	0	0	0	0						0	0	0	0	0
Other sources of financing [%]	90	90	80	80	80	90	90	80	80	80	100	100	100	100	0	0	90	80	80	80
From which for national interest infrastucture (IIN)																				

Table 2. Structure of forecasting investments for the period 2012-2016

3.2.3. Scientific visibility – publications, patents, benefit of research results

- About the current staff structure of the institute, for a better visibility there is imposed to achieve a given set of annual specific objectives described in the Procedure of developing and evaluation of the performance for the certificated staff (DEP) in ICPE-CA, as follows:
 - implication in the developing of at least 33 products/year, 9 technologies/year resulted from the applicative research;
 - implication in the certifying/homologation of at least 25 products, technologies /year resulted from the applicative research;
 - publication of at least 75 scientific papers in ISI journals/year;
 - presentation of papers at conferences with referents, min. 40 / year;
 - exploitation of research results through patents, min. 17 submitted patents/year;

The general application of our developed DEP procedure will force the elaboration of the level of skill of all the staff, contributing in this way to a general enhancement of our main activity – research in the field of electrical engineering for new products and technologies – and in this way to the enhancement of our scientific and technological output, all contributing directly to the increase of our scientific visibility,

- developing of transferable products towards the economic agents, with direct effects on increasing the number of jobs and increasing the business turnover of the customer;
- Increased international visibility through participation in bilateral projects;
- Increased international visibility through participation in European collaborative projects;
- Increased international visibility through participation at conferences with high scientific level;
- Increased international visibility through participation at brokerage events, technical fairs, patents fairs and exhibitions;
- Increased international visibility through participation at Editorial Committees of international journals;
- Increased international visibility through organizing or co-organizing of international scientific events;
- Increased national visibility through organizing of round tables, workshops and “Open Doors” with partners from universities and economic environment;
- Increased international visibility through organizing of joint laboratories with universities (Polytechnic University and University of Bucharest);
- Increased national and international visibility by participation at clusters and networks of research and technological transfer;
- On-line promotion of our “Micro-Nano Bulletin”;
- Promotion of the incubators at local level, Sfantu Gheorghe and of its branch in Avrig;
- Establishing of working points in different regions in order to enhance the knowledge about know-how and products need of economic agents;
- Continuous site updated with the latest research results;
- More active promotion of research results in the media.

3.3. The human resource strategy

The achievement of the scientific objectives shown at 3.2 involves:

1. Maintaining the same or similar structure of our staff (fig. 1) (more than 66% having university degree) with high number of PhD in natural and engineering sciences, also PhD students (fig. 2.)

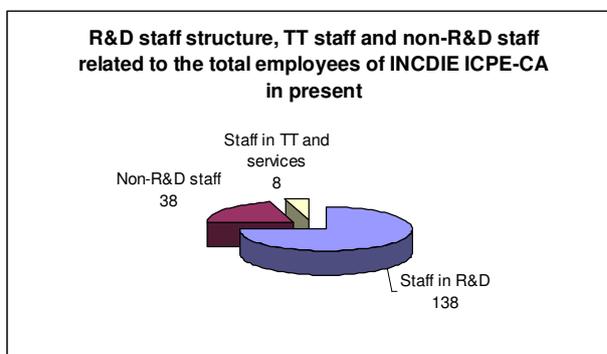


Fig. 1. Structure of our staff in 2011

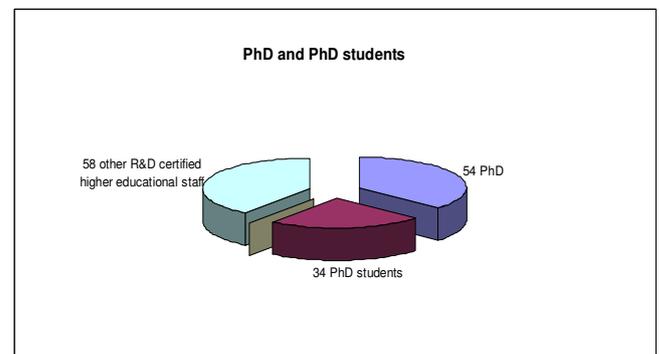


Fig. 2. PhD and PhD students in the staff of ICPE-CA

2. Maintain the mean age of the staff at around the actual level (around 43 year) through hiring in each year of young researchers in order to compensate the annual growth of the ages of our staff:

2.1. We will continue the politics of youth employment, through the following mechanisms:

- selecting the students and the master students with meritorious results in practice activities which are made in the institute's laboratories;
 - attracting young researchers whose scientific and technical activity is known, to eliminate the risks specific to the ignorance of their expertise and experience.
- 2.2. Engagement of some young researchers with experience, well known in the national and international scientific environment;
 - 2.3. Maintain the proportion of researchers with less than 35 years at 60%;
 - 2.4. Hiring researchers only for given projects for the time period requested to finish the project.
3. Further improving of the working conditions (performant equipment, access to the scientific life in the specific working field, temperature and air condition, higher security at the working place, medical assistance, possibility to promote in scientific degrees through periodic (yearly) organization of scientific qualification tests, assuring a scientific career);
 4. Including of the young researchers in PhD studies with topics in which the institute is working; here the best possibility is to hire PhD students for the given period of the PhD studies and to employ it after finishing the PhD thesis:
 - 4.1. Maintain the policy regarding human resources by support in finalizing of doctoral theses and supporting of some expenses related to these studies;
 5. Improve the qualification of staff by participation at specialized courses;
 6. Increasing the number of researchers mobility to European and international research centers and initiating exchanges with other research centers in Europe;
 7. Continuous improvement of training in quality and environment management through specific activities, including PhD studies, courses, scientific meetings etc., ensuring an office staff, competitive, creative and motivated;
 8. Increasing the number of specialists having international visibility of their scientific research required to access national funds as project director, to increase the number of evaluators for NASR and other ministries (Economy, Regional Development, Environment), to apply for international/national expert evaluators;
 9. The personal of our incubator ITA ECOMAT in Sf. Gheorghe together with its branch in Avrig and the specialists in our Center for Technology Transfer will be further trained in order to enhance in general our contacts to the industry and in this way to be more present, for our and for the benefit of our industrial customers, in the economy;
 10. Involving young researchers in the laboratories activities: works in research projects, standardized analyses, elaboration of scientific papers;
 11. Because the electrical engineering domain is by definition an interdisciplinary/multidisciplinary domain which involves electromagnetism, electronics, physics (electromagnetic optics, materials theory), chemistry, materials science these disciplines should be reflected in the staff structure;
 12. In the recruiting policy domain, in an ultra-liberal market economy system like the autochthon one, it is clear for everybody that the recruiting policy has retribution as main criterion. As a result, further efforts to improve the activity of the laboratories and increase the incomes, which will automatically result in a better recruiting potential.

3.5. Financial SWOT analysis

The activity of the institute in the period between 2007-2011 is shown by a series of indicators that can be found in the annual financial statements as an expression of economic and financial management, human resources management and research, development and innovation management in the process of implementing the strategy of the institute.

Analyzing the financial situation of the institute, it can be seen that it is influenced by internal attributes that help achieve the objectives (strengths), internal attributes which prevent the achievement of objectives (weaknesses), external attributes that help achieve the objectives (opportunities) and external attributes that impede the indicators (threats).

To optimize both indicators it is necessary to identify the strengths and opportunities and their implementation as well as the identification of weaknesses and threats in order to take mitigation measures.

Financial management is determined by the management of research, development and innovation as well as the management of human resources.

Strengths

1. Diversity in obtaining income, namely:

- Through research through contracts financed under national programmes;

- Through contracts with core funding as a result of the “national institute” status which allows access to such funds;
 - Through contracts with European funding (FP7 and Structural Funds);
 - Through research contracts with third parties;
 - Through potential use of service contracts by our four licensed laboratories;
2. Obtaining profit as a result of both the existence of contracts with third parties, and the optimizing of costs, profit which can be used both to stimulate the employees and for investment in infrastructure;
 3. The existence of high-performance research equipment for a wide range of areas of activity which allows us to obtain remarkable results in the scientific field;
 4. The existence of specialized software for the accounting and financial activities which helps in achieving an appropriate management of contracts;
 5. Existing working procedures in the financial and accounting fields, procedures that facilitate the execution of quality work in less time;
 6. The existence of an internal circuit that allows efficiency in document preparation and transmission;
 7. Available funding programs for start-up and spin-off companies;
 8. More than 50% of the salary costs are covered within contracts other than the nucleus research program;
 9. All indirect costs covered from contracts.

Weaknesses

1. Research activities are underfunded, leading to lower revenues;
 2. Share of income from direct contracts in total revenue is not sufficient to offset the underfunding of the National Plan;
 3. Reduced capitalization of patents both domestically and internationally;
 4. Slow activity and monitoring reporting of contracts which leads to heavy delays on refunds and therefore to payment difficulties;
 5. Few activities of marketing and exploitation of research results;
- Salary costs of the team are not covered completely by the services carried out by our Incubator and by our Center for Technology Transfer.
6. Strong dependence on the nucleus research program.

Opportunities

1. Research funding through:
 - National Research and Development programmes; Research programmes (sectoral funding) of the various ministries;
 - FP7 and in the future FP8 programmes;
2. An European political context which favors research through the establishment of the European Research Area;
3. Infrastructure development achieved through the use of national sources (using 35% of the projects' value for the institute's endowment) and international (through competing and winning projects financed with EU funds, axis 2.2.1. "Modernization of infrastructure designed to promote the research potential in electrical engineering ");
4. Accessing national and European funds in partnership with other local organizations;
5. Increasing the number of incubated SME's.
6. Expanding the incubator services, by offering consultation services for SME's in the field of accessing funding programs via contract basis;
7. Opening a Branch Incubator in Avrig, center of the country;
8. Technology transfer services;
9. Continuation of the Bisnet Transylvania project for the years 2012-2013 with an increased budget;

Threats

1. Frequent taxation changes;
2. Financial and accounting restrictions;
3. Reduced budgetary allocations for research;
4. Globalization of research;
5. Competition with research centers in developed countries;
6. Limited resources on the sources of information;
7. National coordination structures;
8. Reduction of the budget for the national projects already contracted;
9. Lower number of incubated SME'S due the financial crises;
10. New established Business Incubators in the region.

3.6. Infrastructure: investment plan and strategy

As mentioned in the section 3.1, the institute has a good research infrastructure which in the following year must only be completed. For the next years, as an investment strategy we can mention:

1. Continue upgrading the institute buildings (investments per year of about 0.5 mil. lei/year);
2. Construction of a new space for the Center of Excellence for Radiochemistry (started in 2011, total 2.5 mil. lei);
3. Completion of the Center of Excellence endowment with new equipments (in 2012/2013, 1.2 mil. lei);
4. Creating *laboratory for design, assembly and testing for prototypes of electromagnets for particle accelerators* (FAIR – Darmstadt, ELI-NP Magurele, ITER, CERN) – investment of around 4.5 mil. lei, starting from 2012;
5. Adaptation of laboratories functionality in close accordance with the research directions;
6. Maintaining optimum operating parameters of actual R&D laboratory infrastructure by some periodical revisions and changes of some defected pieces;
7. Acquisition of equipment up-grades, where is necessary;
8. Ensuring an appropriate work environment, of civilized job, by applying of instructions regarding health and safety, fire prevention, protection of information, etc.

Regarding point 1

It is a continuous activity to maintain at least the general conditions of the building, but also to replace some equipment, to install others, to increase the thermal insulation of the building, to minimize the consumption of fluids and electricity. In this idea we will minimize the electrical energy costs, the gas bill for heating and hot waters and the need of technological water (generalization of the use of recycled water). The total yearly effort is assumed to be around 0.5 mil.lei.

Regarding point 2

The feasibility study for our Center of Excellence for Radiochemistry started in 2011 was a consequence of a memorandum between the University of Bucharest (Faculty for Physical Chemistry) and ICPE-CA to move the nuclear unit from the central area of Bucharest to our institute and to build here a unit for research, training and instruction, with the possibility of the students to study here and to be trained in specific activities of our laboratories. The related costs are estimated at 2.5 mil. lei in 2012/2013.

Regarding point 3

The position is foreseen in order to complete the infrastructure from position 2.

The estimated costs for 2012/2013 are 1.2 mil. lei.

Regarding point 4

It is a very important activities of our institute, using our skill in interdisciplinary fields of electrical engineering with physics and chemistry. In the last years we have a very fruitful collaboration with the FZ Juelich in completion of the HESR ring of the FAIR facility in Darmstadt, in which Romania is a shareholder. We can combine our skill in electromagnets with those for superconductive devices, developing the researchers up to the stage to build and test prototypes, normal, superferic electromagnets and superconductive solenoids to be used in all facilities in which elementary particles or ions must be conducted, accelerated in a given way, for infrastructures like FAIR, CERN, ITER, JINR-Dubna, ELI-NP Magurele. For these, we need to build a new building of around 500 m.p. builded surface (together with position 2), assuming a cost of about 4.5 mil.lei, for the year 2012/2013.

The main equipment needed to be bought:

- 3D measuring machine;
- Mounting table and electromagnets welding - 2 ... 3 pieces;
- Lifting equipment (portal crane) for electromagnets maneuvering;
- Tool kit for mechanical and electrical mounting;
- Cryocooler 50K & 4,2K;
- Cryostat for testing of the superconducting coils in liquid Helium (Φ 300);
- Cryostat for testing of the HTS coils in liquid Nitrogen (Φ 250);
- Level gauge of liquid Helium.

Regarding points 5, 6, 7 and 8

All together we assume to have investment costs of around 1 mil. lei/year.

Considering the strategic directions of research proposed in the section 3.2, we present the following necessary equipments, computational software and programmes, which must be acquisitioned from the end of 2012, through the national and international research programmes:

- Complex system of measuring meteorological parameters specific for the monitoring the characteristics specific for renewable energy sources (solar radiation, air temperature, humidity, wind speed, wind direction);
- Testing bench for photovoltaic panels and mini-power plants;
- Wind turbine monitoring system: wind speed in the proximity of the turbine, rotating speed, axle torque, output voltage and current – RMS and instantaneous value (waveform for the analysis of the electric energy quality);
- Particle image velocimetry (analysis system for the determination of speed and the representation of fluid flow spectrum);
- equipment for reduction of vortex at vertical Francis turbines;
- MATLAB software – a developing environment for numerical computation and statistical analysis, + the Simulink package, which offer the possibility of making simulations of a dynamic system using mathematical models;
- ANSYS CFX – software for modeling complete multiphase flowing, with emphasis on computational fluid dynamics (CFD) and finite element structural analysis;
- System of mask aligning for mounting parts for lithography system;
- Software dedicate for the electromagnets analysis– ROXIO;
- Aggregation for advanced vacuum (turbo-molecular pump) – 10^{-9} torr, 100l/min;
- Specific AMC's (nano-voltmeters, cryogenic temperature monitors, DMMs) and acquisition boards of cryogenic data;
- software for heat capacity measurement by using DSC device;
- μ DSC and accessories;
- upgrading of equipment for reflectance/transmission spectroscopy in THz domain;
- digital oscilloscope (main unit and specialized modules) for UHF (50-70GHz);
- calibrated antennas set;
- equipment for isotropic characterization in 1-10GHz band;
- research furniture and IT equipment;
- Linx Eye detector for D 8 Discover X ray diffractometer;
- Detector EDS (Energy dispersive spectra) + EBSD (energy back scattering dispersive spectra) for FESEM Auriga;
- Average Particle Size Analyzer.

3.7. Technology transfer and the attraction of non-public funds

3.7.1 Technology transfer

- Is needed a better insertion in the economy - Partnerships for valorization and transfer of research results materialized in patents or technical assistance or services;
- Visible and more aggressive promotion of the research results obtained by the specialized teams to the mass media, industry, and entrepreneurial persons;
- Involvement in a more aggressive way of CTT and ITA ECOMAT in promoting research results to industry;
- Promotion to SME's of the technology offer of the Institute through the Enterprise Europe Network database;
- Promoting the technology offer during local events organized by the Incubator and by participation at brokerage events;
- Accessing EU funds in partnership with the incubated SME's;
- Participation in general and specialized fairs and patent exhibitions;
- Organizing workshops of given topics with participation of SME's and other commercial companies;
- Attracting of SME's in national and international projects;
- Participation in and construction of clusters with the industry.

3.7.2 Attraction of extra-budgetary funds

Besides the measures mentioned up to now and regarding the increase of our visibility in the industry (economy), we mention some general measures which will have the property to attract more funds from the extra-budgetary region:

1. Enhancement of knowledge of the needs of the economy by offering our products and by listening the answers coming back: this can be happen through internal marketing but special by external marketing during fairs and exhibitions.

2. Promoting internally such researches with a real market potential. This can be for products of a very real need, supposing in many cases applicative research/development in well-known fields: basically our institute's vision and mission.

- Cultivating of a long-term co-operation with entities from the European Research Area with similar or complementary profile;
 - Co-operation agreements with national and international universities (chemistry, physics, electronics, energy, metallurgy, materials science);
 - Developing of strategic partnerships with external partners to access the EU funds: FP7, SEE, cross-border programmes, HORIZON 2020;
 - Creation of strategic partnerships for the development of bilateral co-operation, to increase the visibility of our researchers;
 - Partnerships with the private sector to access "voucher" funding;
 - Strategic partnerships for the formation of poles of excellence in the field of magnetic materials, carbon materials, energy materials, radiochemistry, energy efficiency, RES a.o.;
 - Identifying new potential partners for the application to new research topics;
 - Involvement in implementation of EU projects;
 - Applying of a more aggressive publicity in various media regarding the Institute capabilities, facilities, infrastructure, etc.
 - Attraction of industrial partners in programs financed from structural funds;
 - Execution of services and products for customers;
3. Extra-budgetary projects are promoted by our general working statement signed with our Union for research and design and also established by several decisions of our Authority: increasing income for an extra-budgetary project.
4. Organizing workshops of given topics with participation of SME's and other commercial companies.
5. Attracting of SME's in national and international projects;
6. Participation in and construction of clusters with the industry.

Also, we can mention:

- To develop R&D partnerships and collaborations with entities from National Defense Ministry and other institutions with special preoccupations in the domain of EMC as well as with international laboratories and universities;
- To develop the strategic partnerships with entities from developed countries, world leaders in EMC, and with IEEE EMC Society;
- Continuing and improving the relations with those companies of which co-operation proved to be efficacious and also with foreign companies;
- Accreditation of new electromagnetic compatibility testing;
- Direct service contracts in various companies/institutions in our country.

Taking into account the strategy of institute for research-development and technology transfer who will determine new national and international RDI projects, we estimate that revenues will grow by about 10%/year having the reference year 2011.

These revenues must cover costs of the institute functional, investment strategy and obtain a profit from direct contracts with economic partners.

3.8. Strategic partnerships and visibility: events, communications, collaborations

In 2008 our institute received the Big Award of the National Authority for Scientific Research for the best promotion of our products and technologies. We were awarded mainly for our outstanding presentation at different fairs, including here TIB fair from Bucharest and the Industrial fair from Hannover. Every year our products can be found exposed in a surface of 90-100 m.p. at TIB and in Hannover our presence can be observed in the stand of our NASR for products and technologies obtained / established recently and also in a separate stand financed by our Ministry of Economy in the expositional hall with the topic Electrical Engineering with products prepared to be transferred through technology transfer to industrial partners.

As strategic partnerships with the economy/society, we can here include:

1. Partnerships with innovative enterprises from the Romanian market, which are able and which want to transfer in their own production our developed products, which desire to upgrade the technology or which need our scientific service.
2. Partnerships with local administrative bodies in order to assist and help it to implement some dimensions specific to a smart city concept, regarding three dimensions of the concept:
 - a. Smart economy – based on knowledge and innovation;

- b. Smart environment – technologies with sustainability regarding the need of resources (as raw materials, energy through RES a.o.);
 - c. Smart governance – based on a business development model (incubator for start-ups and spin-offs for example).
3. Partnerships with bodies of the local administration to develop regions with a given position: through cross-border project assistance and participation, different programmes like SEE, Black Sea & Danube a.o.
 4. Partnerships with Romanian universities and institutions for dedicated research activities (for example our partnership with the University of Bucharest in the field of radiochemistry for research and education).
 5. Partnerships with foreign universities and institutions to solve together, inside of big European projects, problems with original contributions (as an example: our partnership with FZ Juelich, with CERN for life time characterization of power cables working in radioactive environment, with JINR-Dubna for material research through neutron scattering, with the Institute for Iron and Steel - Beijing, for rare-earth based permanent magnets). Here must be underlined that two of our scientists are working in the laboratory of JINR, and two in CERN-Geneva.
 6. Partnerships with Romanian institutions (from Education, Research and Industry) inside different clusters in which we are a member.

Referring to our visibility through scientific events, communications and collaboration must be underlined following aspects:

- Participation in national and international fairs to promote our products and technologies for technology transfer (like the yearly TIB fair, different regional fairs organized for a given topic in Romania, mainly by local authorities, different fairs in Europe – typical Hannover, in Asia – Beijing, Shanghai, Dubai, Kuwait, Iran, in America – like Brazil) and patent expositions (Geneva, Bruxelles, Nuremberg, Budapest, Zagreb, Moscow, Kuwait, Warsaw, a.o.);
- Participation at international scientific conferences and workshops in order to increase our visibility and to contact scientists and companies in order to enhance the visibility and the extra-budgetary income of our institute;
- Organizing scientific events with international participation in our activity fields;
- Further promotion of our image and visibility in mass-media through our Officer for Public Relations (for example in 2011 we have had tenth of interviews in the broadcasting – Romania Cultural, tenth of participation of our scientists in TV talk-show around actual problems in research and economy, around 50 press-releases with scientific / technological achievements of our institute);
- Further promotion of our collaborative, applicative research with Romanian and international institutions.

Big contributions to achieve the above goals is expected to come from our business incubator in Sf.Gheorghe together with the branch in Avrig through:

- Organization of two local events every year whit topics on European funding opportunities and technology transfer in the benefit of SME's;
- Co-organizing brokerage events every year in order to establish partnership agreements for the local companies and in order to promote the technology offer of the institute. The main goal of the local events is to identify possible new partnerships whit local SME's and engaging them in research projects;
- Participation in training courses in the field of technology transfer, intellectual property, accessing European funds, management;
- Creating of a database with the institute technology offer and to promote this database;
- Accessing EU funds in partnership with the incubated SME's;
- encouraging SME'S in research projects, IPR rights, technology transfer.