Appendix V
To the Instructions for the Teams of experts-evaluators

PRELIMINARY/FINAL REPORT

I	**The Name of the Institution to be evaluated**	National Development and Research Institute for Cryogenics and Isotopic Technologies
II	**Evaluation Period**	11-12 April 2012
III	**Members of the Team**	
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1. Summary of the Evaluation and Main Conclusions

As a result of information gleaned during the site visit and from critical reading and analysis of documentation available, the evaluation team concluded that an overall grade of 'A-' should be assigned (with an associated numerical final grade = 3.2). There were positives to be found, with some of the research teams performing reasonably well and with obvious signs of staff commitment throughout the institute. Detailed relevant comments can be found in the specific discussions of individual teams in Section 3. However, since a grading of 'A-' requires significant action for reform across the institute as a whole over the next 3 years, this report begins with a summary of the weaknesses found and a detailed list of recommendations given:

1.1 Details of Specific Weaknesses:

(i) The quantity and quality of academic output in the form of research papers was well below reasonable expectations for an institution of this size, with the infrastructure available (both currently and in the near future);
(ii) Measureable successful technological output (rather than academic output) was limited to national-level technological transfer (dominantly to Cernavoda) and to service provision. Little or no investment from private industry was evident;
(iii) Filed patents and patent applications were only of national coverage (no international patents had been filed) and had not generated any revenue in the accounts presented;
(iv) Aspirations for the future both at senior management level and amongst junior researchers were unfocused and, when explicitly presented, seemed too modest;
(v) The institute did not appear to have developed a coherent strategy for its future. In particular, decisions about new research directions did not appear to be made on the basis of meaningful international scoping and benchmarking. Hence a realistic vision of the manner in which ICIT could develop niche and unique areas of R&D, that were globally competitive or leading, was not forthcoming;
(vi) There is a consistent lack of vision regarding the support that should be given to higher performing groups, which have the potential to establish themselves as regionally leading or even internationally competitive in their fields.

1.2 Recommended Objectives and Measures for Improvement:

(i) *Development of an Institutional Planning Document:* Most importantly, senior management needs to develop a detailed strategy for the future development of the institute. This should be manifested in a detailed Planning Document to be completed within the first 6 months following publication of this report. Senior management should firstly decide what the balance of the output from the institute should be and how this is likely to affect their future viability. In deciding upon this required balance, they should consider the relative importance of technology transfer (to both public facilities and private industry), commissioned academic services, and basic academic research. Areas where concerted changes are needed should be explicitly identified and the nature of changes required detailed. The conclusion of the Planning Document should be an explicit action plan. This plan should make clear the short and medium term objectives for the individual teams that constitute the institution. For R&D elements of the institutional plan, future developments should be informed by meaningful benchmarking exercises considering current activities in other research groups around the world, rather than simply within Romania. **Deadline: 6 months.**
(ii) *Creation of an International Advisory Board:* which would help the management team in identifying the niche areas of R&D where the institute could be competitive as well as in designing various new policies based on good international practices. **Deadline: 6 months.**
(iii) *Greater Aspirations for R&D Output:* If academic research is deemed to constitute a significant element in the future plan, then explicit targets should be set for each of the research teams. Targets should be agreed amongst senior management and individual research teams, but should be considerably more stretching than those apparent at the moment. Specifically, greater numbers of scientific research papers in internationally recognized journals of higher quality need to produced. Journals with impact factors greater than 2 should be targeted and the value of papers published in journals with impact factors less than 1 should be questioned. Typically, each research group should be expected to publish of the order of 0.5 papers per capita per annum or more. In addition, greater levels of grant income from the EC and other international sources, should be targeted. **Deadline: 6 months for new policy, 3 years for implementation.**

(iv) *Development of a Recruitment Strategy:* a long term recruitment strategy should be developed through which the institution might hope to improve its performance in the longer term. Competitive recruitment policies are strongly needed to attract internationally recognized researchers to strengthen the key areas of competence and become new drivers of research. A policy to also attract dynamic and ambitious graduates not just from the local area of the country is likely to be necessary. **Deadline: 6 months for new policy; 3 years for implementation.**
(v) *Transparent Performance Indicators for Staff:* documentation should be produced in which the performance expectations for staff at different payscales should be made explicit. This should be commensurate with nationally evaluated R&D performance indicators. Clear policies to better motivate all employees, through various rewards for outstanding accomplishments as well as disincentives for routine low ambition endeavors are needed. Also, a clearer separation of R&D and non R&D responsibilities between the team members, according to their demonstrated skills, could benefit all, and especially the ones with strong research focus, able to compete with their foreign peers. **Deadline: 6 months for new performance indicators, 3 years for implementation.**
(vi) *Reorganization of the research teams:* A reorganization of the teams to strengthen their management and optimize the distribution of expertise, such that the young researchers could benefit from a clearer direction and a more effective training, is clearly needed. Such a reorganization should also contribute to the build up of the critical mass of human resources in the key areas where the institute will decide to compete internationally. **Deadline: 6 months for new reorganisation policy; 1 year for implementation.**
(vii) *Specific Implementation of Strategy to Increase Private / Industrial Funding:* If the applied research and R&D consultancy is to be regarded as being among the essential output elements of the institute's activity, a more aggressive and pragmatic strategy for finding niches of international relevance should be put in place, capable of bringing in concrete funds for the institute. **Deadline: 6 months for new policy, 1 year for implementation.**

2 Discussion of Overall Institute Performance

C1 Quality of R&D activities and results (Section Score = 2)

C1.1 Publications and Patents (Subsection Score = 2) According to the self-assessment document, there were 190 research active staff in place at the time of the assessment audit. Over the ~5-year period from 2007 to 2011, these members of staff generated 100 scientific papers with non-zero Article Influence Scores (AIS). The 100 papers generated a total of 124 citations and were associated with journals for which there was a total cumulative AIS of 66.

This level of scientific publication output equates to ~0.1 paper per annum per capita, which is well below what would be expected of an internationally competitive research institution. Indeed, this would be extremely modest even for an institution aspiring to national competitiveness in terms of scientific publication. The journals in which articles were published had an average AIS of 0.66, which is also modest. 35% of the journals in which work was disseminated had an Impact Factor (IF) greater than or equal to 1; 17% greater than or equal to 2; 8% greater than or equal to 3 and 6% greater than or equal to 4. There were no articles published in journals with IF > 5. Again, taken as a whole, the journals in which work from the Institute is published possess journal impact factors significantly below that which would equate to an internationally competitive institution. Citations follow a similarly modest trend, with each article published between 2007 and 2011 garnering an average of 1.24 citations each during the 5 years.

In addition to scientific paper publication, 14 books and an additional 4 chapters in books have been published. This level of publication appears to be healthy, but should not be the primary dissemination route for a research active institution.

In terms of patents, according to the self-assessment document, 6 national patents have been registered in the period and a further 15 have been submitted. All of these patents are national rather than international. While the filing of patents can represent a useful facet of institutional output, particularly as a result of applied research, it should be noted that there has been no revenue generated from either the licensing or sales of these patents either in 2009 or 2010. Under these circumstances, one should question the wisdom in focusing on patents as a major facet of output.

C1.2 Private / International Funds (Subsection Score = 3) Across the institution, R&D funds from FP7 (other than ERC) appear to be typically ~€300k per annum, while ERC funding appears to be typically around the €50-70k per annum. Other international public sources generate ~€10-30k per annum, while no revenue from international private entities was claimed either in 2009 or 2010. There was also zero revenue from R&D contracts from national private entities in the same two years. For an institution of this size, such revenue totals from these sources are very modest.

On the other hand, the revenue generated by microproduction activities is highly significant, at ~€900k in 2009 and €1.5M in 2010. Equally, although exact figures were not definitively established during the visit, it was clear that significant revenue was also generated through the technology transfer relationship between ICIT and Cernavoda and through the supply of services and scientific expertise in a number of teams. There was also a significant level of R&D funding from national sources, particularly to support 'infrastructure of national interest'.

C1.3 International Patents (Subsection Score = 1) No international patents were registered or submitted during the assessment period.

C1.4 Start-ups and Spin-offs (Subsection Score = 3) The self-assessment document states that no 'start-up' innovative enterprises have been created by members of staff in the institute during the assessment period. However, it was clear that there were 11 distinct commercial activities managed within the 'Technology transfer" incubator (Team 13) and that microproduction was a major revenue source for the institute. Equally, although not officially linked with a distinct spin-off company, the technology transfer aspects of the work were impressive.

C1.5 Sharing and Dissemination (Subsection Score = 3) As stated above, the technology transfer / sharing between ICIT and Cernavoda was seen to be strong. Academic dissemination was much weaker: there was significant evidence that members of the institute were active in the attendance of conferences and presentation of posters, but it was not clear that many oral presentations were given. Equally, there was no definitive evidence given to establish that any invited or plenary talks had been given by staff at either national or international conferences.

C2 Human Resource Quality (Section Score = 3)

C2.1 Performance Uniformity (Subsection Score = 3) The research accomplishments are not uniform over groups, although consistent efforts are being made by all teams to publish quality research articles and to register relevant patents as well as to attract research funding from national and international sources. For instance, team E3 reports no publications with a nonzero relative article influence score, and teams E1 and E13 claim only two such papers, in contrast with other teams that are more visible internationally with publications in higher impact journals. A similar analysis refers to international research grants, with relatively strong contributions from teams E7 and E8 (involved in EURATOM projects), whereas other teams either do not report such grants or have been involved only in specific support actions. Significant disparities occur also when analyzing the patents registered by the research staff of the institute. Although some differences naturally occur due to the specific mission of each research group, some of them being more focused on technology as opposed to others involved in basic and applied research, the discrepancies are rather large. The existence of teams with an inferior performance is apparent, suggesting that management changes need to be made to insure that each team has a strategy and an area of performance which is well defined and internationally competitive.

The research accomplishments are not uniform over research personnel either. The papers with higher relative article influence scores are published consistently by a few senior researchers, such as Dr. Elena David (paper A20, A23, A82 in the list), Dr. Mihai Varlam (A11, A9, A10, etc.), Dr. Carmen Varlam (A6, A64, A65, A90), Dr. Sorin Soare (A12), etc., and a few PhD students, such as Daniela Ebrasu (A66, A67, A96), Violeta Niculescu (A94, A88), etc. Such accomplishments are in many cases results of individual efforts, as is the case for the higher impact papers published by the PhD students with their advisors, without other significant contribution from their research team/institute. Moreover, the papers with a high relative article influence score (A11) and up to seven citations (A9, A10, A35, A36, A68), were published by an international team that includes Dr. Mihai Varlam as the only contributor from the institute. Such results are not matched by the research group that Dr. M. Varlam is in charge of, within the institute. The disparity in the publication track record, suggests that not all the staff are competitive, with some higher performers playing the role of development engines and others enjoying a "free ride" with no obvious repercussions.

The research teams differ in composition, lacking a balance of experienced and young researchers. Some of the newly setup teams are clearly inexperienced and are led by researchers that either do not hold a

PhD degree (for instance team E10 lead by Raluca Popescu) or need significant improvement in their managerial skills (Dr. Radu Tamaian, the leader of team E11 who openly admits that he does not know the research topic of some of his subordinates). A reorganization of the teams to strengthen their management and optimize the distribution of expertise, such that the young researchers could benefit from a clearer direction and a more effective training, is clearly needed.

It is noticeable that, although the institute has a significant number of researchers, the way they are distributed is not optimal and in some areas the critical mass for competitiveness is not reached. The increase of the number of research teams from 11 in 2007 to 13 in 2011 does not help surmount the challenge of building critical mass in specific topics. Moreover, the mixture of R&D and non-R&D tasks required from research personnel does not stimulate strong performance in either direction. A clearer separation of responsibilities between the team members, according to their demonstrated skills, could benefit all, and especially the ones with strong research focus, who have demonstrated an ability to compete with their foreign peers.

C2.2 Average Age and Brain Gain (Subsection Score = 3) The average age reported for the research staff in 2011 is 42.73 years, falling from 44.25 in 2007. The average age is encouraging, suggesting that the development of the institute in terms of the human resource may be sustainable.

Other indicators with a positive trend are the number of researchers holding a PhD degree, and the number of PhD candidates, which both increased from 18 in 2007 to 24 in 2011 and from 21 in 2007 to 36 in 2011, respectively. However, based on the information obtained during the interviews, the time needed for the completion of the degree well exceeds 4 years for some of the researchers.

Although the number of researchers reaching the upper levels (1 and 2) increased from 14 in 2007 to 16 in 2011, it is still relatively small. Moreover, it is uncertain if, of these senior researchers, all could pass the new requirements, put forth by the governmental authorities in 2011, in order to reach level 2 and especially level 1 in research status.

The institute has been able to attract university graduates but, due to economic obstacles, they are mostly from the geographical region surrounding the institute. Such new recruits have been encouraged to pursue doctoral studies. A challenge for the near future is the recent change in the doctoral degree legislation, strongly encouraging the candidates to perform full time research at their PhD granting university. The conflicts that may occur between the requirements of the institute as a long-term employer and of the university as a short-term employer could result in some loss of workforce.

The ability to attract highly educated young researchers with extensive foreign experience, at internationally prestigious institutions, has not been proven. In fact, the recruitment of internationally recognized researchers is difficult given the overall social environment of the institute, and it may be an obstacle in reaching global competitiveness. On a positive note, the institute has been successful in retaining its research staff, many of whom have returned from periods of time, of various length, abroad. The young researchers are content with their career development opportunities through research visits, participation at conferences, etc. Also, new opportunities are opened by the infrastructure being built through the CRYO-HY project.

For the long term sustainability of the institute a clear policy should be developed to insure the availability of high level human resource. Competitive recruitment policies are strongly needed to attract internationally recognized researchers to strengthen the key areas of competence and become new drivers of research. A policy to attract dynamic and ambitious graduates from other regions and to better motivate all employees, through various rewards for outstanding accomplishments as well as disincentives for routine endeavors without ambition, is clearly necessary.

C2.3 The Ratio of R&D Staff / Administrative Staff (Subsection Score = 4) Out of the 216 staff members 190 are reported as research staff. Of these, 98 are researchers and 92 are auxiliary research staff, while administrative staff are 25. The last staff member appears to be a medical doctor. The ratio of researchers to administrators is 3.92. Given the technology related activities specific to the institute, the ratio of researchers to auxiliary staff is high, about 1.07, and has grown from 0.66 in 2007.

C3 Quality of Infrastructure and Rate of Exploitation (Section Score = 4)

In several fileds of investigation, the institute possesses an excellent research infrastructure, which is already employed in current projects and research activities. Of these, it's worth mentioning the "Experimental Pilot Plant for Deuterium and Tritium Separation", also called Tritium Removal Facility (TRF): a research site of national interest and designed to complete the technology for heavy water detritiation resulted from the CANDU-like reactors and to assess the equipment and tools involved in cryogenics and tritiated environments.

This pilot plant is registered at Romanian NCNAC (National Commission for Nuclear Activities Control) and at IAEA from Wien (International Atomic Energy Agency).

Similarly, with regard to the isotopic separation process, the following lines of activity were particularly well developed: concept schemes for various isotopic transfer processes, automation and control schemes for isotopic exchange installations from pilot installations and for various experimental stands, processing and interpretation of experimental data of isotopic separation processes and the determination of separation performances. For the management of radioactive waste obtained from tritiated water by the development of a tritium concentrator, the team participated in the development of the theoretical and experimental database on the identification of the best technologies for the treatment and conditioning of tritiated water waste resulting from CANDU type reactors, which were identified at NPP Cernavoda, and in the JET or ITER fusion reactors. Notably as well, the Cryogenic and Material Testing Laboratory is well equipped to conduct a wide range of experiments, such as: liquifiers (LINDE L5, PPH 100, PPG), toughness and tensile tests rig (Charpy F040 S1 and TC 300), furnaces, gas-chromatograph and quadro-pole mass spectrometer. It should be noted that most of the related items of equipment were purchased with the support of national and European projects.

Nevertheless, in certain other instances, it was apparent that a well-defined, clear-cut research ideas around some research infrastructure were absent. In other cases, research groups constituted as 'independent teams' lacked a truly competitive level of infrastructure, such that they were not enabled to become world-leaders in their assumed projects and tasks.

Therefore, it would be highly recommended that the future strategy for investments in the infrastructure of the institute will take into consideration: (i) the true mission and values of the institute, in areas where most of the expertise lies (ii) should further expansion in other research areas be considered, before engaging into spending money for R&D infrastructure, the Research Council must make sure that there will be a future for the institute in those areas, in terms of international competitiveness.

Subsection Scores: C3.1 = 4, C3.2 = 4

C4 Management Efficiency and Quality of Research Environment (Section Score = 4)

The management of the institute is ensured by a scientific council and the board of directors. Important decisions are taken by the management team and scientific council. This management arrangement seems sensible. The staff is subject to an internal annual evaluation by the team leaders on the basis of a filled evaluation form; this professional evaluation is accompanied by a psychological evaluation. Some mechanisms exist to motivate the researchers, in terms of variation of remuneration. The research staff interviewed reported no major administrative hurdles. Some specific procedures exist to evaluate the level of satisfaction of the staff regarding management and administration. The research staff communicated positive views regarding their work experience, career prospects and their relationship with management and no sign of demotivation due to administrative burden or interference has appeared. There is no evidence for possible issues related to professional ethics.

The quality of research environment can be considered at various levels. First it may be observed that the geographical location of the institute in the vicinity of a large chemical plant in an isolated zone may represent a disavantage in terms of quality, intensity and frequency of contacts with other centres for academic research in Romania. Furthermore, and independently of the intrinsic quality of research infractuctures and working conditions, this particular geographical locality can also constitute an obstacle for the future recruitment of researchers of an international level. This difficulty would probably require some specific action, in particular in the direction of attracting talented young Romanian researchers who have reached an international scientific level after a few years of training abroad. As discussed at several instances in this report, an aggressive recruitment plan of future high level scientific leaders is one of the mandatory conditions to draw the research activity of the institute toward an internationally competitive level.

The working conditions in the laboratories are, on the whole, good to excellent and safety rules seem to be correctly observed. The staff appear satisfied with the working environment. The level of most of the technical equipment is sound and in most cases appropriate to the mission of the different teams.

One noticeable exception concerns the infrastucture related to basic research on catalysts. While research on catalytic systems is a central activity of the Institute and certainly constitutes the basis of future development of more ambitious fundamental research, the quantity and level of equipment devoted to this activity appears rather limited. In particular, infrastructure related to surface analysis, optical, electron and nearprobe microscopies and X-ray diffraction analysis are absent. This situation certainly represents a major obstacle to a progressive inflexion of research on catalysts from technology oriented R&D based on "trial and error" to more fundamental aspects that, on the longer term, will determine future progress. Similarly, the absence of such equipment (and of the the related scientific and technical expertise) casts some doubt on the credibility of future research activity on hydrogen production, photoelectrochemistry, photocatalysis, water electrolysis or catalysts for methane reforming or fuel cells.

The management has succeeded in maintaining a general atmosphere of good working conditions and solidarity, as suggested by the satisfaction expressed by the staff. The efficiency of the management should be also considered from the viewpoint of the quantity and quality of the research with regards to the usual criteria applied in the evaluation of scientific production. Efficient scientific management is expected to associate a good knowledge of the actual level of international research on the topics in which the teams intend to work, the capacity to identify niches where competitive research is possible being aware of existing resources in terms of manpower, scientific level, technical competences and equipment, the capacity to define ambitious (but realistic) goals involving some scientific risks. In this context the research work in the institute gives the impression of suffering from problems in scientific management. In fact, a quick search on the Web of Science shows that of the CVs of the scientific managers and team leaders contain, in general, a very low number of papers in international journals and low H-indices (1-4). This lack of scientific leadership probably represents an obstacle to the development of a working culture in which the quantity, quality and impact of scientific output would serve as the primary criterion for success rather than the ability to obtain funding from national programs. In some cases this later criterion seems to be the major motivation for the creation of a new research team. While this situation may originate from a quite different historical context, it is clear that it now represents a major obstacle to the "cultural change" necessary for a transition towards modern competitive research.

Subsection Scores: C4.1 = 3, C4.2 = 3, C4.3 = 4, C4.4 = 4, C4.5 = 3, C4.6 = 3, C4.7 = 4, C4.8 = 4, C4.9 = 4.

C5 Quality and Credibility of the Institutional Development Plan (Section Score = 3)

C5.1 Development Direction (Subsection Score = 2) Awareness of the need to develop a coherent and concrete institutional plan for the development of the institute is just beginning to emerge. Development seems to be largely driven by funding trends which results in a very dispersed research landscape. There is presently a lack of internal evaluation of strengths and weaknesses of the institute as a whole, as well as of individual research teams. As a result, some directions of development are unrealistic in terms of human resources and infrastructure. There is weak benchmarking of the present status, of goals to be achieved and of the national and international competitiveness of activities. As a result, there is no strategy to identify high impact areas for the development of the institute and no vision for the development of the institute is clearly defined. The evaluators find this lack of a concrete plan for the development of the institute to be one of the most threatening factors regarding long term competitiveness and viability.

C5.2 Stimulating New Ideas and Direction in R&D (Subsection Score = 2) Ideas are being developed at the individual investigator / group level, but they are not properly contextualized within global R&D landscape. As a result, some of the activities in novel areas have simply aimed at establishing generic activity rather than creating a focused research effort with a view to developing international competitiveness. The institute has succeeded, in isolated instances, to identify exciting areas, but failed to implement a SWOT-type analysis regarding the establishment of ambitious, yet realistic goals within these areas. This results in a high risk of misallocating available resources towards goals that have either been realized elsewhere or are too ambitious given the human resources and infrastructure of the institute. On the positive side, it should be noted that the institute is quite supportive of the ideas developed at the individual investigator level and there is a high staff satisfaction with the freedom of this approach.

C5.3 Recruitment Policy (Subsection Score = 3) There is an overall good attitude towards attracting younger scientists, particularly at the PhD level, but the recruitment criteria (excellence *vs* local availability) is unclear. Given the changes in the PhD programs in Romania, a novel strategy to recruit PhD students should be developed. The fraction of PhD holders in the staff is presently low and the overall competitiveness of the institute will in all likelihood correlate with the number of PI’s capable of carrying out high level research projects. The institute should therefore strive to increase the fraction of PhD’s in the workforce. In order to increase its competiveness in the long term, implementation of a specific recruitment strategy to attract high level research staff would be likely to have a strong impact on the relative performance of the institute. To this end, incentives or recruitment packages may be required to attract talented staff at a competitive level.

C5.4 Collaborations and Partnerships (Subsection Score = 4) There are over 20 projects in collaboration with foreign entities, many of which are prestigious research institutes or universities. Given the applied nature of several of the research programs, the institute has the potential to stimulate collaboration and partnership with economic bodies and industry to increase this form of non-R&D income.

C5.5. Scientific Communication and Major Projects (Subsection Score = 2) The institute is active in disseminating key knowledge both towards industrial end users and the academic community. Regarding the latter, it should aim at a higher visibility journals in which to publish research results and develop a strategy to disseminate information of key strengths of the institute that cannot be published in high level scientific journals. It is unlikely that this can succeed by simply setting numerical goals for the research staff. An internal institute-wide discussion as to how to plan projects would be helpful to increase the impact of the research results. The conference attendance of PhD students appeared to be good, but the number of invited talks and oral presentations was unclear and insufficiently documented.

C5.6 Critical Mass in Key Areas (Subsection Score = 3) The institute presently has critical mass in isotope-related research and related analytical capabilities but would benefit from a coordinated brain-storming activity to identify how to exploit the existing expertise and infrastructure in related research areas of global currency. Going beyond these fields, the institute lacks critical mass in several research teams and efforts are too dispersed across a number of projects, resulting in a limited likelihood of high impact results. Individual investigators should continue to be able to conduct interest-driven research outside those seen as of strategic importance, provided they muster the resources to support these activities. However, preference should be given to areas which are synergistic with existing research areas or have the potential to reach critical mass in the future. In the latter case, the institute should establish a procedure to identify such future projects and to decide how to support them towards reaching critical mass.

3 Discussion of Individual R&D Teams within the Institute

E1: Mathematical Modelling The mathematical modeling team is mostly concerned with fluid flow simulations modeling fuel cell performance. In a second application area the group assists experimental data acquisition and interpretation. The main focus is computational Fluid Dynamics (CFD) to provide a qualitative prediction of fluid flows in fuel cells with different designs based on mathematical models (PDE) governing the processes in fuel cells. The microscopic parameters for these models are taken from the literature, as equipment for in-situ measurements is locally not available. As a result new materials with as of yet uncharacterized microscopic parameters cannot be modeled. Adequate software tools and computational facilities for analysis of steady state flows are available and CFD analyses are used in iterative design of conceptual studies of new designs and detailed product development. To which degree there is quantitative agreement between the mathematical model and the simulated devices was not clear from the presentation. The methods were used in 3D simulations using the FLUENT software package for PEMFC fluid flow pattern optimization investigating three types of flow fields and establishing relative performance differences that have later been verified experimentally (*Intl. J. of Num. Methods for Heat & Fluid Flow, 17 , 2007 and* Intl. J. Hydrogen Energy, 36 , 10376, 2011).

The work is disseminated through posters, books and a limited number of ISI referenced publications. The group is adequately involved in national and international projects such as “Clean Hydrogen Production with Water Splitting Technologies”, coordinated by University of Ontario and involved in the promotion of the integration of Romanian research teams from the field of hydrogen based and fuel cells technologies into research programmes developed in the European technological platform for hydrogen – EuRoGrove. The group has participated in the generation of 2 patents (Hydrogen processor for the supply of fuel cells and Multifunctional constructive system for bipolar plates at PEM type fuel cells).

Regarding their main research area the group plans to extend its work to investigate dynamic behavior of PEMFC stacks moving towards non-steady state conditions and a more rigorous treatment of heat and water management at micro-scale level. However, it remained unclear how such work can be successful in the absence of local measurements of some key parameters of the fuel cell with some spatial resolutions. In addition it plans to develop computer models for analysis of the hydrogen production systems and expanding mathematical support for other renewable energy based technologies.

In summary the group provides valuable support for ongoing experimental efforts in the institute but presently lacks critical mass to become a driver of new research directions or to establish an independent research profile. Since expertise in CFD codes is available a critical analysis of possible challenging applications for such calculations in related research areas in collaboration with external, ideally international groups, would strengthen its research profile.

E2: Fuel Cell Physical and Electrochemical Processes

Mission: The stated objectives of this team are fourfold: to develop an understanding of the basic processes involved in fuel cell reactions; to develop new fuel cell catalysts and exchange membranes; to develop new fuel cell characterization methodologies and finally, to test and develop proton exchange membrane (PEM) fuel cells. The form of the output from the team is presumably to publish new findings and methods and engage in technology transfer where possible and appropriate.

Resources: There are 10 research active staff and 7 technicians in the team as claimed in the self-assessment document, although this seemed to differ from that claimed in the powerpoint presentation. They have access to a number of pieces of equipment allowing basic fabrication of coated polymer membranes and testing of their electrochemical properties. At the moment, while enough facilities are present to allow some basic characterization of the electrochemical properties of various membranes and catalysts, the materials-related growth and characterization facilities are insufficient for cutting edge research. In terms of funding, the team claims two new major national projects funded in the period (2007-2011) and several new or ongoing funded international collaborations. From the tabulated information on grant awards in the self-assessment document it was difficult to identify all the grants that were claimed by this team (PNCDI II 22-079/2008 did not appear to be listed, and its value was not apparent on website documents available), so definitive comments on the total level of funding cannot be made. Nevertheless, it was disappointing to note that one of the highlighted international grants given in their presentation was listed as having an award value of €3k.

Achievements: The team states that they have published 25 articles and 2 books in the period. Of the articles published, 6 are claimed as listed on ISI. By looking on the ISI database, it appears that a significant fraction of these 6 papers have arisen as a result of published conference proceedings. Other achievements include the team's involvement in international collaborations, for example winning a recent contract in a collaboration with Canadian teams, funded through the Ontario Research Fund.

Development Plan: The stated aims for future activity are largely to continue to develop R&D along the current themes. It is good that they have identified a shortcoming in materials characterization and seek to develop collaborations with international groups with electron microscopy.

Strengths and Weaknesses: This group has quite significant experience in dealing with the electrochemical characterization of fuel cells, with relevant funded grants extending back for more than a decade. The equipment base for such characterization seems adequate for competitive research. However, although a limited materials coating capability exists for catalyst and membrane research, there is very little in the way of materials characterization or processing facilities and this will certainly hold the team back. Achievements, in terms of outputs, are quite modest: to publish only 6 ISI listed publications in 5 years, with a significant fraction being related to conference proceedings, is below par for internationally competitive research. This modest publication record does not seem to be excused by significant technology transfer. In summary, the team has several areas where they should look for improvement. Primarily, they need to focus on dramatically improved output, but will also need strategies to overcome infrastructural weaknesses in materials processing and characterization (a concern that the team is aware of) and a realistic focus on specific areas where they can make novel contributions at the internationally competitive and leading level.

E3: Renewable Energies Integration and Applications

Mission: The renewable energy integration team declares as its mission to experiment, develop, test and implement technologies for the production of energy by using renewable resources as primary sources, with or without the implication of hydrogen as an energy vector. The topics of research and development focus on technologies for i) the optimization of fuel cell stacks, ii) the production of high-purity hydrogen by catalytic reforming of methane as well as by photoelectrochemical and solar-driven thermo-chemical water splitting, iii) the control and optimization of power systems based on hydrogen technologies, and iv) the use of hydrogen for energy storage and transportation in integrated systems for the supply of electricity and heat, based on solar and photovoltaic panels, wind turbines, etc.

Resources: The infrastructure available consists of fuel cell test stations and hydrogen generators, used in common with Team E2, plus various renewable energy systems and characterization equipment already acquired or to be purchased within a year, and a peak power management system. The team is lead by an experienced researcher and contains a senior researcher, four doctoral students, and three technicians.

Achievements: The publication track of the team is modest with articles in small impact journals and low visibility proceedings. The team leader is coauthor for two patents registered nationally. Among the technical achievements of the group are the peak power management system already mentioned and the utility vehicle, which propelled by an electric motor whose accumulators are loaded permanently by a fuel cell system.
Development Plan: The goals for the future are very diverse, ranging from obtaining portable fuel cell systems and developing control systems for the operation of fuel cell stacks to hydrogen production installations for the catalytic reformation of methane gas, as well as developing a complex energy system that will use wind turbines and photovoltaic panels, and a complex system of thermal energy cogeneration based on fuel cells and optimized solar-thermal concentrators. The team has not provided convincing arguments that the goals for the future are realistic given its limited human resource and modest expertise, especially in photovoltaics, solar-thermal systems, etc. Some of the goals set by the team, for instance the design of a Solar Power Stirling Generator or of the Linear Fresnel Solar Thermal Boiler, seem closer to industrial design than to R&D.

The strength of the team resides in its engineering and technological capability. For instance, it can design, operate and control various energy systems and it can assemble and optimize fuel cell stacks. The group can sustain the research and development efforts of the other teams, working on interdisciplinary projects. However, the main weakness comes from the inability to identify the topics where it can compete internationally. The lack of long term focus and the tendency to approach hot topics in pursuit of badly needed national funding, without a thorough understanding of the state of the art in the field, leads to modest results when judged by international standards. Since industrial design does not qualify as R&D, the recommendation is that a spin-off company is created for such purposes. The R&D efforts can then concentrate on topics where the innovation is likely to lead to internationally valuable results, recognized for instance by European patents. A 3 year recovery of the team seems possible by finding a better focus. Recruitment of internationally recognized researchers is difficult given the overall social environment of the institute, but is a key aspect in reaching global competitiveness.

E4: Analysis of the Isotopic Separation Process This team is the main team of the ICIT TRF facility and deals with all processes inside the facility which also involve teams 5, 6, 7 and 8. The group comprises of five PhD level researchers and five engineers. The major activity of the team is focused on the catalyzed water-hydrogen isotopic exchange for the transfer of deuterium and tritium from the liquid phase to the gaseous phase, the purification of hydrogen-gas, ensuring the requirements for a further processing by cryogenic distillation of hydrogen isotopes mixtures. This activity is organized around several tasks namely:
(i) The modeling of the catalyzed water-hydrogen isotope exchange process in the isotopic exchange column with the development of a mathematic model for the description of the isotopic exchange of tritium and deuterium from water into gas, in a catalyzed isotope exchange column;
(ii) The development of a system for the extraction of tritium from the cryogenic distillation column of hydrogen isotopes. Calculation methods and the automation and control scheme were developed for the tritium concentrator based on the catalyzed isotope exchange and water electrolysis (CECE). An integrated system for the monitoring and control of instantaneous power consumption at the normal and abnormal operation of the tritium separation installations was developped in view of reducing energy losses during operation. The real-time monitoring of the tritium separation process and energy consumption led to the implementation of specific software.

The team is also involved in the optimization of a series of catalysts for isotopes exchange, by analyzing the effects of platinum concentrations, specific surface areas, sizes (diameter/length). They also investigate issues related to the behavior of materials used in the development of a detritiation plant in a hydrogen and hydrogen isotopes environment. Studies are also conducted on the behavior of tritium in materials used in the water detritiation plants in nuclear power plants for the purpose of protecting the staff and the environment. For the management of radioactive wastes obtained from tritiated water by the development of a tritium concentrator, the team is participating in a database for the identification of technologies for the treatment and conditioning of tritiated water wastes. The analysis of hydrogen isotope mixtures in liquid and gaseous phases is carried out by chromatographic, spectroscopic and mass spectrometry techniques.

The team is involved in international collaborations with leading international groups developing similar research activities for the inter-comparison of results and the improvement of analytical methods. In particular it is involved in an international collaboration in a consortium for the design of the Water Detritiation System plant and of the Highly Tritiated Water components of the ITER installation. On the other hand, some of the catalysts developed by the group were tested at the Karsruhe Institute of Technology and the results confirmed their efficiency in the detritiation process.

The results of the research activities are disseminated through various media including posters and oral presentations at international conferences and publications in national and international journals. Part of the results of the team have led to the preparation of doctoral theses, but the relevant details are lacking. The scientific production of the team involves 6 papers in low impact international journals (only one of them has an IF>1), one conference proceeding, two papers in Romanian journals and one book chapter. This modest scientific production should be probably considered in the frame of the global activity of the Institute and taking into account for the specificity of this type of research which probably involves a much smaller scientific community than those of other academic disciplines of chemistry and physics. Nevertheless, this situation suggests that a substantial effort should be made to draw the quality and quantity of the scientific results closer to international standards.

E5: Technological Laboratory

Mission: The primary function of this team is to develop a detailed understanding of how to remove tritium from waste-water associated with the nuclear industry, making such waste environmentally safe. Knowledge and improved process developments are then passed on to the National Cernavoda Nuclear Power Plant for implementation at a larger scale.

Resources: The team consists of 10 full time researchers and 11 technicians, as outlined in the self-assessment document. This team already has a small-scale tritium removal facility in place in which they can add controlled amounts of tritium to detritiated water and then accurately gauge their success in its removal and storage. Issues relating to process, catalysts and storage efficiency are all investigated and all the facilities needed for this work appear to be in place. Revenue primarily appears to come from Cernavoda. Assessing the levels of funding and investment in the group was neither easy nor transparent, but the test facilities inspected were impressive.

Achievements: The main achievements in this team relate to their apparently successful support of the Tritium Removal Facility in Cernavoda. Technology transfer is the key. Evidence for successful developments in process and in catalyst development was presented.

Development Plan: The team has a number of specific areas in the tritium removal process that they have identified for engineering improvements. In addition, they have developed a timeline for their work in the context of the work ongoing at Cernavoda to 2015 and beyond. What will happen after completion of the Cernavoda tritium removal facility is less clear.

Strengths and Weaknesses: This team has clear strength in its potential for technology transfer to the Cernavoda power plant. This nuclear facility is of national importance and so the role of the Valcea 'Technological Laboratory' is also presumably of significant national importance. A clearer and better-defined quantification of the impact of the team in developing the Cernavoda TRF would have been useful for this evaluation and is perhaps something that the team should develop more strongly so that they can make their case clearly in subsequent assessments. The team should also decide as to the importance of research publications, as this does not appear to be a strength – it could, however, be that publication of research is a minor component of the team's aspirations and that technology transfer is the overwhelming focus. This approach could be perfectly justified.

E6: Radiocarbon and Environmental Radioactive Isotopes

Mission: The team has a triple mission: i) radioprotection and monitoring of the environment around the tritium and deuterium separation pilot plant, ii) laboratory accreditation and elaboration of quality control methodologies for the national authorities, and iii) research projects focused on low level radioactivity measurements, focused on tritium and C-14. The first two roles do not qualify as R&D activities, based on the Frascati definitions; however, they are mandatory under Romanian regulations.

Resources: The infrastructure available consists of dosimetric equipment (liquid scintillation counters, gamma spectrometry systems, global alpha/beta counters, etc.) together with sample preparation facilities. The team is lead by an experienced researcher holding a PhD degree and consists of nine researchers, of which one has recently defended his doctoral thesis whereas six other are in various stages along their doctoral studies.

Achievements: So far the team has succeeded in fulfilling the first two goals, being the only Romanian laboratory with accreditation from RENAR for measurements of tritium activity in aqueous samples and, later on, to water samples extracted from biological and environmental samples. Furthermore, the team is the only Romanian Laboratory accredited by the Ministry of Health for the monitoring of the drinking water quality, for control, monitoring and sampling for tritium activity. The laboratory is accredited also by CNCAN for the measurements of high and environmental tritium activity, gamma analyses and global alpha-beta low activity sampling. The articles reported by the team are published in reputable journals, such as Fusion Sci. Techn., Fusion Eng. Des., Appl. Radiat. Isotopes, Radiocarbon, etc. Consequently, the group has some international visibility; however, the rate of publication and the number of citations is considerably smaller than the international average, indicating that there is still plenty of room for progress. Also, only few team members contribute to publications.

Development Plan: The research goals for the future are clear, well focused, but not very ambitious, concentrating on tritium and C-14 measurements. For instance, setting up a new procedure for electrolytic enrichment of the tritium in water samples would push farther the detection limit in liquid scintillation measurement systems. Also of interest is the study of tritium bound in organic compounds, where the radioactivity level is low and the measurements are difficult. Other goals are related to the monitoring of the environment, which involves essentially routine measurements and data collection, but only modest innovation in measurement techniques.

The strength of the team resides in its ability to perform well niche measurements, being one of the very few research groups active in the area of tritium detection. Moreover, the group responds well to mandatory tasks set forth by national authorities and can sustain the research and development efforts of the other teams in the institute, working on interdisciplinary projects. Also, the team members are motivated and generally content with their work. One clear weakness is related to the modest expectations and goals. Such modest expectations are also apparent from the relatively long time it takes the PhD students to complete their degrees. In 3 years the institute has the potential to be recognized as worldwide pioneer in tritium detection. It needs a better understanding of the state of the art in the field and recruitment and/or promotion of more determined and energetic young researchers. Also, a clearer separation between R&D and environmental or accreditation related responsibilities of the team members, could benefit all, and especially the ones with strong research focus, able to compete with their foreign peers.

E7: Cryogenics & European Projects Under a somewhat cryptic name the team gathers a wide range of facilities and projects spanning the department of Pilot Plant for cryogenic isotope separation; design of cryogenic equipment as well as participation in several competitive high visibility engineering projects in support of large European facilities. Its key competence is the operation of the pilot plant for heavy water detritiation (catalytic isotope exchange) and cryogenic distillation, one of the key competences of the institute with critical mass.

The group participates in the Tri-Pla-CA Consortium working on ITER Tritium Plant systems/ Atmosphere Detritiation Systems/Hot Cell Facilities. A shared use of test facilities supports of R&D work for ITER WDS and ISS. The group performed endurance tests of WDS components and developed Pt/PTFE/charcoal hydrophobic catalyst in the context of this project, but the specific technical achievements remained unclear from the presentation. The group is involved in the CERNAVODA TRF technology transfer project which was reported in the introduction of the teams E6-E8, but not broken down in team components. This technology transfer is one of the main achievements of the institute as a whole and its research component can be classified as "experimental design". A second set of projects revolved around design and upgrade of Gamma-Ray Cameras - Neutron Attenuators for the JET Project, which were won in European competion. However this work was mainly reported in the presentation of team E8.

The team comprises 4 Ph.D. level researchers, several Ph.D. students and technicians and is among the teams with the highest number of Ph.D's and Ph.D. students in the institute. It has been involved in 14 national and 8 international projects including EFDA/JET, EURATOM/EFDA consortia and published 15 ISI journal papers, 3 PhD Thesis and 2 books in the reporting period. It has participated in the training Programmes for "Fuel Cycle" (2007-2010) and "Tri-Toffy" (2009-2012) networks.

Overall team E7 appears to be a skilled technical support team with the main objective of running the pilot tritium separation plant which is a key objective. The team would benefit from reporting its activities in terms of funding source (i.e. national programs vs. grants) and objectives (i.e. R&D, experimental design, technology transfer). The team would further benefit from improving its self-representation in terms of reporting specific technological or engineering challenges and the measures that were taken towards their achievement, ideally in terms of quantitative improvements over the state-of-the-art.

In order to enhance the transparency of the research effort the institute should separate efforts performed in terms of national programs towards specific challenges and work-for-hire that cannot be associated with specific R&D objectives and the associated personal and report these activities separate from the R&D efforts. The institute should also more clearly designate auxiliary technical staff that supports but is not directly involved in R&D.

E8: Low Temperature Techniques

Mission: The research group was only recently established, its birth being triggered by a major development project financed mainly from European Structural Funds (the POSCCE "CRYO-HY"). The declared mission of the team is to: i) develop a low temperature production plant, ii) perform research on superconductors and their applications, iii) study various low-temperature sensors, iv) study and develop experimental models for superconducting magnetic energy storage and v) study the behaviour of electronic devices at low temperatures. Obviously, taking into consideration the Frascati definitions, not all these tasks qualify as R&D activities.

Resources: The low-temperature infrastructure is being built and "will be focused in particular on the investigation of liquefaction, of processes involving storage and transport of cryogenic fluids (hydrogen and helium, in particular), and on their direct application into the energetic area." The team is lead jointly by a PhD researcher, S. Soare, and one who has several relevant publications but seems not to be even a PhD candidate, M. Curuia. Of the other three members, all researchers, only one is holding a PhD degree.

Achievements: The team has been very active in international collaborations, with successful involvement, as coordinators, in two EURATOM projects, both of them with the Joint European Torus (JET) in Culham, UK, a major magnetic confinement plasma physics experiment. One of the projects deals with the plasma diagnostics upgrade (gamma-ray cameras neutron attenuators, GRC), whereas the second requires the design, manufacture and commissioning of a tandem collimators system for the tangential gamma-ray spectrometer (TCS). The articles reported by the team are published in reputable journals, such as Fusion Sci. Techn., Fusion Eng. Des., Nucl. Instrum. Meth., Vacuum, etc. Consequently, the group has clear international visibility and a borderline competitive rate of publication, given the small team.

Development Plan: The main goals for the future are related to the implementation of the CRYO-HY project. To design and install a low temperature production plant is a challenging task that does not qualify as a research goal. The other objectives are very diverse and vague, ranging from research on superconductors and their applications, low-temperature sensors, experimental models for superconducting magnetic energy storage, etc. The team has not provided convincing arguments that the goals for the future are realistic given its limited human resource and modest expertise, especially in superconductivity.

The strength of the team resides in its engineering capability. For instance, it can design complex systems involving superconducting magnets, cryogenics and high vacuum techniques, and lead international teams in solving high level equipment problems for major European research facilities. The main weakness comes from the poor development plan. It shows a lack of long term focus and the tendency to neglect the topics where the team excels, forcing the few researchers to dissipate on topics outside their field of expertise. Such a development plan may considerably affect the future competitiveness of a team already recognized at international level. The main recommendation is that the development plan is changed to better respond to the proven strengths of the team. In the next three years, the team can gain more by concentrating its resources on the niche topics with poor competition and a positive track record. The new infrastructure, provided through the CRYO-HY project can give a new momentum to the group, by strengthening its infrastructure. The team is dynamic and ambitious; it may have the appeal to attract motivated young researchers and gain from their innovative ideas.

E9: Isotopic Processes and Investigations – Mass Spectrometry

Mission: This team uses isotope analysis to develop insight into the potential impact of isotopes in the environment on health and also to verify the authenticity of different raw materials and foodstuffs. Indeed in the latter role, the team has been commissioned to perform authenticity requirements for EC export of goods in Romania, with wine and honey being highlighted.

Resources: In terms of manpower, this team consists of 7 full researchers and 7 technicians, as claimed in the self-assessment document, although this appeared to differ from numbers claimed in the powerpoint presentation given. The facilities available to the team were not assessed explicitly during the visit, but seem to be sufficient to allow a healthy number of ongoing programmes to be undertaken: 6 nationally funded programmes appear to have been granted in the period 2007-2011 as well as an international bilateral programme with the Republic of Moldova. The absolute levels of funding were not easy to establish with the information given to the assessment team and this kind of information should be explicitly given in future reviews.

Achievements: Between 2008 and 2012, the team claims 26 papers published in ISI listed journals, with a total summed impact factor of 10.7 and 6 citations. In addition, a book and book chapter have been produced. The average impact factor of journals in which the work has been published is therefore ~0.4 and the average number of citations is ~0.23 over the 5 year period (less than 0.05 citations per paper per annum). While a total of 26 papers in ISI journals is a reasonable number in the period, the impact factors of the journals targeted appear to be extremely modest and the citation rates indicate that the work has not been noticed or strongly acknowledged by the international research community. 2 patent applications have been made. Significantly, the laboratory has increased its levels of certified testing and calibration processes to allow for official status in the testing and authentification of foodstuffs.

Development Plan: The team plans to build upon its current activity in the near future: hoping to better understand the manner in which isotope fingerprint profiles relate to the environment in which the fingerprint arises; hoping to further increase the levels of official certification in testing procedures and to further develop international collaborations.

Strengths and Weaknesses: This laboratory has real strength in its value, at the national level, in the certification of foodstuff authenticity. While the team may see this as service activity, it is nevertheless rather valuable as they claim to be one of the few labs in Romania with this capability. Given the importance of foodstuff authenticity in the context of EC export regulations, this is a strength of the team. The team also has clearly been trying to make academic impact through the publication of articles and this should be applauded. The publication of 26 ISI journal articles is reasonable in the period, but the impact factors of the journals in which the work appears are very modest and the citation rates are very disappointing. The team needs to make sure that it is doing its best to identify a unique and valuable aspect of scientific research that could be recognized as globally unique and of significant importance if they wish to become internationally competitive in research.

E10: Organic Compound Chromatography The scientific activity of this group is focused on the identification and quantification of traces of organic compounds, in particular pesticides or other pollutants in the environment, agriculture and foods. In this context, projects focused on the establishment of analytical methods to determine false products in the wine industry, the control and monitoring methods on dioxins and furans in the environment, the definition of the aromatic profile of wines as an element of authentication or the determination of the mechanism whereby traces of toxic pollutants can reach the waters supplying large urban areas have been developped with support of several national research projects in various thematic fields for the Romanian economy.

The work carried out by the team is based on the development of analytical procedures based on gas-chromatograpy, HPLC and mass spectrometry/chromatography methods.

The team is composed essentially of young scientits with an average age of 36 years. and three of them including the team leader are in fact working in the frame of the preparation of their Ph-D thesis. The group also involves a technical supporting staff consisting of one engineer and two technicians.

Based on the results presented in the documents and oral presentation, the work of this group is essentielly oriented towards analytical methods and in view of the reported scientific production it is difficult to qualify this work as a research activity in the usual acception of the term. The number of publications in journals with "non zero" impact factors is very small and the most important papers of the group have been published in journals with very limited international audience such as the Asian Journal of Chemistry or Chemicke Listy.

Under these circumstances perhaps a careful re-consideration of the mission of this group in the frame of the general scientific policy of the Institute could be suitable in order to decide whether this team really has the vocation to develop original research at a competitive international level or if its mission would not be merely that of an analytical department working as a support to other groups of the institute?

On the other hand, if this team really intends to develop a research activity at an acceptable international level, it would perhaps be suitable to reconsider the management of the group by trying to recruit a scientific leader in the capacity to i) identify topics in which the team can have a chance to develop original research, ii) organize such a research and iii) supervise the work of other researchers. It is indeed rather difficult to imagine that a Ph-D student, even to most talented and hard-working one, can be in the capacity to efficiently ensure such difficult and time-consuming tasks while carrying out at the same time a personal research work in view of the preparation of a thesis. Furthermore the group should develop a more publication-oriented scientific activity, trying to increase the quantity and quality of the publications and raise their ambition towards some of the leading journals in their speciality like e.g. Analytical Chemistry or the Journal of Chromatography.

E11: Biomedical Sciences and Nanomaterials This team was created in 2007 as an initiative of the institute to enter the field of biomedical sciences and nano-technologies. This group is composed of young researchers with an average age of 33 and is mainly managed by two recently graduated PhD students with very different fields of competence.

The group leader has training in bioinformatics modelization of molecules and assemblies of biological interest while the other PhD student is working on production and characterization of natural compounds in view of analyzing their antioxidant and anti-proliferative activity potential. The group also comprises one physicist and some technical and administrative support

The major ambition of the team is related to the discovery and development of new therapeutic agents of the type of immuno-conjugates used for the specific tinting of certain oncopathies. This research axis is based on the applications of systemic biology in biochemical and pharmaceutical research in order to speed-up of the rational development of new medicine. Thus, by trying to understand the molecular bases of pathological physiology, of metabolic ways and concepts of pharmaco-dynamics, the team aims at identifying new therapeutic targets for specific medicine, to minimizing and/or eliminating the side effects of these new therapeutic agents before pre-clinical testing by means of computer-assisted design. The team aims also at developing new medicine based on natural compounds (naphtha-quinone and polyphenols) and at producing new therapeutic antiproliferative immuno-conjugates with an active substance similar to the quinine substance.

A second research axis is focused on the development of new meso-porous materials in the broad context of applications in catalytic remedy of ecosystems (oxidation of organic pollutants and photo-catalytic treatment of wastewater). After appropriate modification, such new mesoporous materials are also intended to be used as vectors for the controlled release of bioactive agents (medicine and potentially therapeutic substances).

During the 2007-2011 period, the group has successfully obtained national support for several research projects. Three national patents have been applied and the group has obtained some national awards.

The scientific production is extremely modest. While a total of twenty publications is claimed only three articles were published in journals magazines with impact factor over 0.2 and among them only one is related to a subject developed in the group (naphtoquinones). The team leader has co-authored three proceeding papers dealing with deuterium while no scientific production related to mesoporous materials could be identified.

A general impression is that the team members do not seem to be aware of the actual level of competition in the areas in which they intend to work. The objectives appear rather unrealistic and out of reach when one considers the size, equipment and reputation of the established academic and industrial research groups already working in these areas all over the world.

On the whole it is rather difficult to understand the scientific motivation at the origin of the creation of an isolated small group devoted to biomedical science in the scientific environment of an institute whose major and very specific activity involves isotope separation, catalysis, hydrogen and energy. Under these circumstances, perhaps the question of the continuation of work in research directions with very little or no chance to reach an acceptable international level should be posed. Based on the youth of this research team, a reorientation of their activity towards other topics in better coherence with the scientific culture and major orientations of the Institute might be beneficial for both the carreer of the researchers an the development of the Institute?

E12: Clean Energy & Environment Team 12 consists of seven scientists and two support personnel. All scientists are well-trained in the fields of renewable and clean energy environmental protection, waste recycling, development of new environmental materials, valorification of water, soil and natural resources by novel technical solutions, and so forth. They showed a marked interest for the continuous improvement of the human resource quality, by attracting young researchers to the group and promoting research scientist based on individual performance.

During 2008-2011 they coordinated four research projects and were partners in some other six. Notably, the output of the research done was materialized in a total number of 36 articles, and several papers were published in leading journals from the field. In addition, the team succeeded in having three patents granted, while eight others are still pending.

As for the future of their research, the team showed a consistent focus in their area of expertise, and plans to address issues like: conservation of energy, conversion of biomass and residues to obtain clean energy and bio-fuels, waste management, development of tests for the assessment of toxicity, development of novel materials, selective in the separation and purification of gases, catalysis for the recycling of solid waste, etc.

As a recommendation, it is suggested that an augmentation in the efforts toward technology and knowledge transfer to companies or other economic partners which could put in practice their fundamental research results, as well as creation of a spin-off company able to harness the practical aspects of their excellent R&D efforts.

E13: Technological and Business Incubator The declared mission of team E13 is to facilitate the initiation and development of new innovative enterprises, based on advanced technology, and to promote the cooperation between economic entities and the institute, to better implement on industrial scale the research results.With particular regard to their skills, the team is accredited as an entity of innovation and technological transfer with certificate no. 59/21.12.2011, being included in the National Network of Innovation and Technology Transfer entities by the National Authority for Scientific Research. Among the major objectives of team 13, one could mention: to ensure technical assistance and expert advice services on the application of technology, technological assessment and audit, to foster the competitiveness of businesses and to identify novel business opportunities, to attract investors to implement R&D results, and to provide assistance to inventors in order to protect their industrial property rights. So far, they succeeded in initiation and development of a number of new innovative enterprises, such as: GROUP MESSER (gases and gas mixtures); 2. ECOTESTGAS (industrial gases); 3. ECOPROTMED (R&D environmental sciences); 4. METINSTAL (construction and equipment); 5. MONTINDUS (termic isolation); 6. MECRO SYSTEM (import - export equipments and natural products - QLARIVIA); 7. DUNE NANOMAT CENTER (R&D in natural sciences and engineering); 8. ECO CARBON CONSULTING (R&D of renewable energy); 9. PARC ENERGETIC EOLIAN (renewable energy); 10. PROD ENERGY FOTOVOLTAIC (renewable energy); 11. HIDROCINETICA (renewable energy).

They managed to implement a number a national grants and attracted funds through structural funds, sectoral operational programmes: ‚INCREASE OF ECONOMIC COMPETITIVENESS’, ‚HUMAN RESOURCES DEVELOPMENT’, ‘Administrative Capacity Development’.

Notably, they succeeded in providing a good number of R&D-related services, including: (i) technological improvement of isotope separation processes, heavy water plant ROMAG PROD, 2007-2012 (ii) improvement of contact elements for mass exchange (high efficiency ordered packings) from upgrading heavy water tower – commissioning technical assistance, NPP Cernavoda, 2007-2008 (iii) environmental impact study around Cernavoda NPP for both aquatic and terestrial organisms, Cernavoda NPP, 2008-2012.

Overall technical considerations, observations, conclusions:

While the institute shows strengths in some aspects of technology transfer and academic research, the tangible output is not uniform and on average is well sub-optimal. Dramatic improvements could be made and a number of specific recommendations have been presented on pages 2 and 3 of this report. The evaluation team recommends that a reevaluation be undertaken after 3 years.

Proposed certification level: A- (numerical grade = 3.2)

Nr. crt.	Name, Surname	Signature
Evaluation TEAM		
1	Evaluator 1 - Jean RONCALI	
2	Evaluator 2 - John Martin GREGG	
3	Evaluator 3 - Mihai GIRTU	
4	Evaluator 4 - Tudor LUCHIAN	
5	Evaluator 5 - Wolfgang Wentzel	
Observers:		
1	Coordinating Authority	
2	CCCDI Representative	
3	ANCS Representative – **Letitia Clara STANILA**	

Proposed Certification level: A- (numerical grade = 3.2)

Date: 8th May 2012		