

**Report on the Scientific Committee for the
Evaluation of the Institute of Nuclear Technology and Radiation Protection (INTRP)
submitted to the Director of NCSR Demokritos**

The following scientific evaluation was prepared by a Committee composed of Prof. Marzio Marseguerra (Politecnico di Milano), Prof. Michel Giot (Université Catholique de Louvain), Dr. Michel Reocreux, (Institut de Radioprotection et de Sûreté Nucléaire - IRSN) and Prof. em. George Yadigaroglu (Swiss Federal Institute of Technology-Zurich - ETHZ).

The Committee has convened at the NCSR Demokritos on December 9 and 10, 2004 and evaluated the Institute of Nuclear Reactor Technology and Radiation Protection, following the instructions given to it by the Director of NCSR Demokritos. The evaluation is based on the written material provided to the Committee, including a “self assessment” prepared by the INTRP Director and Laboratories, as well as on fairly extensive visits to the various INTRP Laboratories and discussions with key staff members.

Activities of the Institute

The activities of the Institute are devoted to two main research areas:

Environment, health and safety:

- Radiation protection
- Environmental radioactivity
- Health physics and radiobiology
- Radioecology
- Environmental pollution
- Reliability and risk analysis of industrial installations

Energy systems and materials for components:

- Solar-thermal energy applications
- Hydrogen storage
- Materials characterization for Fusion

The Institute operates the Research Reactor with main activities in the characterization of materials (high-temperature rig, neutron diffractometry, elastic scattering and activation analysis) and to support the research in the two areas of emphasis of the Institute.

Overall Institute Evaluation

In relation to the total staff of the Institute and the number of permanently-employed Scientists (about 35), the Committee finds a very broad spectrum of activities.

The Institute has developed very positively the last decade. The motivation of the staff is very high. The Committee notes, overall, a very good level of scientific output and publications and very significant improvements in infrastructure. There is a satisfactory number of doctoral candidates working in the various laboratories, that could be still increased by enhanced collaborations with educational institutions, national and international.

However, the Committee notes that the activities of the laboratories depend very often on the particular interests and competences of single members and their capability to attract external funding. This results in some fragmentation and dispersion of the efforts.

As a consequence of the large number of projects, all laboratories complain about lack of personnel and some activities even face a possible collapse when key personnel leaves. The Committee recommends formal reinforcement of internal cooperation along priority lines. A detailed examination of programs and activities in relation to staff capabilities should be undertaken.

The Committee cannot but fully agree with the emphasis put by the Director on Research and Publications, which is in line with the goals and rules of the research environment in Greece. This should, however, not hamper the institutional goals, the development of the most promising areas of competence and programs, and a more visible institutional response to national needs. Possible consequences on program fragmentation should be carefully looked after.

The Committee believes that the Institute responds to societal needs; however, the government has not provided sufficient basic funding to achieve this, putting the institute in a precarious position in the international scene.

The Institute was nevertheless successful in obtaining funding from external sources, mainly EU programs and from Industry, including foreign sources (testifying to its international reputation). This enabled the Institute to finance staff positions, as well as infrastructure and equipment.

In agreement with the Direction and the staff of the Institute, the Committee recognizes, however, the danger coming from significant reliance in certain areas on EU program funding and the vulnerability of related Institute programs to unpredictable EU research policies and priorities.

The staff of the Institute has been successful in marketing some of its capabilities and know-how for commercial purposes corresponding to national needs; the Committee feels that some professional help in this direction could be valuable in further enhancing such enterprises.

The various positive remarks made above, in particular with respect to enhancement of scientific activities, “marketing” of institutional know-how, rehabilitation and extension of facilities and buildings, etc. reflect very positively on the management of the Institute. Further efforts are recommended in clustering and streamlining research programs and teams.

Following this general assessment applicable to all the laboratories, the Committee, makes the following remarks and recommendations regarding the different laboratories of the Institute.

Research Reactor Laboratory (RRL)

The RRL constitutes the core of the Institute and has the largest staff. The Committee notes with pleasure that the reactor safety has been reviewed by the IAEA positively (INSARR mission); that the facility is under refurbishment, its control system has been improved; and that its physical security has been drastically upgraded.

The Committee notes the utilization of the facility has been increased and appreciates the fact that new life has been given to the facility by the addition of new, scientific, up-to-date experimental activities that have been implemented or are planned for near-term implementation with substantial financial funding from Institute revenues.

However, the Committee notes that the full utilization of the new research equipment implies full-time operation of the reactor, but this in turn will necessitate additional operational staff in the future.

The Director and the highly qualified staff of the Institute are aware of the opportunity to use the RRL as a regional research reactor (user lab and services) and the Committee recommends further exploration of ways to achieve this.

Laboratory of Health Physics and Environmental Hygiene (HPEH)

This laboratory covers the area of radio-biology that is completely absent in the Greek universities and requires cooperation in medicine, biology and physics. This research represents a buttonhole to be encouraged; the excellence of the laboratory in this area is recognized internationally; the laboratory belongs to the European network of excellence for leukemia.

In addition, the laboratory provides the Health Physics services to NCSR Demokritos and is the reference laboratory for the GAEC in biological dosimetry and the evaluation of absorbed doses in case of radiation accidents.

The services rendered to hospitals in hematology yielded substantial amounts of income, so that in the period 2001-2003, it has been possible to operate without matching funds.

In spite of the communicative enthusiasm of the head of the laboratory for the radio-biology research, there is a risk of discontinuation of this activity, as the head of the laboratory – that includes only three senior scientists – moves to new responsibilities. The decreasing number of publications is a sign in this direction. Maintaining the level of manpower available for scientific activity has to be considered.

Environmental Radioactivity Laboratory (ERL)

The laboratory has a long history and made valuable contributions in clarifying the potential health impacts due to radiological pollution and impacts from the Chernobyl accident and, more recently, from the depleted-uranium releases in the former Yugoslavia, as well as from certain other activities. A core business of the laboratory is the management of the 40-station network of environmental radioactivity monitoring throughout Greece that complements the monitoring network operated by the GAEC. It is also providing financially rewarding services to companies in certifying the radioactivity levels in import/export goods. The ERL is the laboratory that traditionally reports radiological monitoring to the EU.

The research activity is in the field of radioecology in relation to the dynamics of radionuclides in ecosystems (conducted in collaboration with universities), which could be profitably merged with partly overlapping activities of other laboratories (HPEH and EREL). The ERL has a significant activity in aerosol-related environmental problems that is enhanced by cooperation with other laboratories (RRL, SESL).

The aging of the personnel has to be considered. The facilities of the ERL are in need of refurbishment. The Committee welcomes the wish of the laboratory to get more involved in educational programs.

Environmental Research Laboratory (EREL)

The EREL uses its know-how and experience in Computational and Experimental Fluid Dynamics for the resolution of a diversity of environmental and energy-sector problems (e.g., hydrogen technology, atmospheric pollutant dispersion, simulation of underground reservoirs). It is a very dynamic and entrepreneurial young group that has international visibility and has been very successful in attracting projects and external funding, in particular EU funds and in publishing extensively in an impressive array of journals. One of their products, the computational package ADREA-HF has become accepted for use in the EU for safety assessment of hydrogen applications. The EREL also possesses state-of-the-art equipment for on-site and off-site pollutant measurements.

In spite of its excellence, the laboratory is threatened by the volatility of EU funding and programs.

System Reliability and Industrial Safety Laboratory (SRISL)

This laboratory has excellent international visibility and recognition and has been able to attract very important external funding (including funding from foreign governmental sources). It has provided very valuable services to two Greek ministries in relation to the Seveso directives and the risk assessment of very numerous industrial installations, namely chemical plants. The activity of the laboratory is strongly dependent on a few key persons, as illustrated in the past and more recently by the departure of one scientist. The Committee is recommending publication of the work of the laboratory in international journals and agrees with the future plans to apply the risk assessment and management technology to the integrity of vital infrastructures.

Solar and Other Energy Systems Laboratory (SESL)

The Committee was told that this relatively small, well-networked, laboratory was the largest one in Greece in the area of Solar Energy applications. This may reflect the point of view that solar heating applications are a “mature technology” where the remaining activity is mainly commercial performance testing (for which the laboratory is the accredited center in Greece). Other areas of interest for SESL, such as the reduction of the optical impact of solar heaters, solar cooling, desalination/distillation, drying of agricultural products and thermal storage need further R&D. In some of these areas, the highly educated staff of the laboratory could strive to develop in-depth research activities potentially leading to breakthroughs. The laboratory could also strive to make NCSR Demokritos an important energy center with a significant focus on renewable energies, an area where international financial and political support is certainly available.

Acknowledgments

The Committee appreciates the interesting, open and frank discussions it had with the Director of the Institute and the heads and staff of the laboratories. It is grateful for the information collected and presented. The hospitality extended to the Committee made its mission also very pleasant.

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Aghia Paraskevi Attikis, December 10, 2004