

# Nuclear Disciplines in Response to Industry and Regulatory Needs through the European Nuclear Education Network Association

a report by

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The European Nuclear Education Network (ENEN), established as part of the EU Fifth Framework Programme (FP) project, was given a more permanent character by the foundation of the ENEN Association, a non-profit-making body pursuing an instructive and scientific aim. Its main objective is the preservation and the further development of higher education and expertise in the nuclear field. This objective is realised through co-operation between European universities involved in education and research in nuclear disciplines, nuclear research centres and the nuclear industry. This paper describes the history and structure of the ENEN Association and elaborates on the objectives and activities of its five committees during the first three years of its existence. Supported by the Fifth and Sixth FP of the European Community, the ENEN Association developed the European MSc in Nuclear Engineering (EMSNE). In particular, education and training courses have been developed and offered to provide the core curricula and optional fields of study for nuclear degrees in a European exchange structure. Pilot editions of courses and try-outs of training programmes have been successfully organised with the support of nuclear industries and international organisations, and there has been commendable interest, attendance and performance by the students.

## Mission, Objectives and Structure of the European Nuclear Education Network

The Management Committee comprises the Secretary General – appointed by the Board of Governors – and the Chairpersons of the five working committees, which are dedicated to specific tasks. The ENEN Association has two kinds of members. All members should have legal status in an EU Member State or candidate country. The effective members – primarily academics – provide high-level scientific education in the nuclear field in combination with research work, and use selective admission criteria. The associated members – such as universities involved in nuclear research, nuclear research centres, industries and regulatory bodies – have a long-term tradition of relations with effective members in the field of research, training or education and are committed to supporting the ENEN Association. The ENEN Association has 43 members, consisting of 37 universities and six research centres, of which 29 are effective members and 14 are associated members. With only a few members from the industry and with an overwhelming membership of universities, the ENEN Association is mainly orientated towards academic activities. Despite this, the training programmes and courses are well attended by young professionals from the nuclear industry.

The general goals of the ENEN Association, with respect to academia, are defined as follows:

- to develop a more harmonised approach for education in the nuclear sciences and nuclear engineering in Europe;
- to integrate European education and training in nuclear safety and radiation protection; and

- to achieve better co-operation and sharing of academic resources and capabilities at the national and international level.

With respect to end-users – such as nuclear industries, regulatory bodies and nuclear applications – goals are:

- to create a secure basis of skills and knowledge of value to the EU;
- to maintain an adequate supply of qualified human resources for the design, construction, operation and maintenance of nuclear infrastructures, industries and power plants; and
- to maintain the necessary competence and expertise for the continued safe use of nuclear energy and applications of radiation in industry and medicine.

The mission of the ENEN Association is the preservation and further development of higher education and expertise in the nuclear field. A first series of objectives is formulated as follows:

- to deliver a European MSc in nuclear engineering;
- to encourage and support PhD studies in nuclear engineering;
- to promote exchanges of students and teachers participating in ENEN;
- to establish a framework for mutual recognition;
- to foster and strengthen relations between universities, nuclear research laboratories, industries and regulatory bodies;
- to ensure the quality of nuclear engineering academic education, training and research; and
- to create incentives and increase career attractiveness for the enrolment of students and young academics in nuclear disciplines.

## Achievements of the European Nuclear Education Network 2003–2006

The ENEN Association has established and continues to monitor the equivalence of nuclear engineering education curricula at the ENEN member universities through its Teaching and Academic Affairs Committee (TAAC). A reference curriculum consisting of a core package of courses and optional substitute courses in nuclear disciplines has been designed and mutually recognised by the ENEN members. To promote this realisation, ENEN has established the EMSNE. ENEN has designed an information leaflet to attract applications for this qualification and developed the bylaws and procedures for handling and selecting the candidates and for awarding the EMSNE. ENEN also has the task of promoting student and faculty exchanges by encouraging and supporting the organisation of international exchange courses and high-quality nuclear engineering courses by ENEN members. In this framework, ENEN produced an information package on 10 established ENEN exchange courses, 23 proposed exchange courses and five MSc thesis projects at ENEN member institutions. All information on those courses is posted on the ENEN website (<http://www.enen-assoc.org>). In co-operation with the ENEN Quality Assurance Committee (QAC), the TAAC awards an



International ENEN Course Quality label. Other ENEN products related to the exchange courses are available on the website of the Sixth Framework project Nuclear European Platform of Training and University Organisations (NEPTUNO) – <http://www.sckcen.be/neptuno> – and include guidelines, best practices and do-it-yourself kits for the organisation of international ENEN exchange courses, with examples of flyers and application forms.

A typical example is the Eugene Wigner course, a three-week course on nuclear reactor physics including theory lectures and practical exercises at three different reactors, which has been organised four times since 2003 by a group of universities and research centres in central Europe, addressing nuclear engineers and young professionals. The Advanced Courses and Research Committee (AC&RC) ensures the link between the ENEN academic members and research centres in the European Community. It establishes exchanges with other networks and, through developing close relations with research centres, universities and industry, it identifies and disseminates topics for internships, theses and PhDs. The AC&RC also encourages and supports student mobility in this respect, and designs and organises advanced courses for students, PhD candidates and young professionals. In this context, ENEN is taking part in organising 10 advanced training courses for PhD students in the framework of the European Research Programme for the Transmutation of High Level Nuclear Waste in an Accelerator Driven System (EUROTRANS). EUROTRANS is a major project in the Sixth EU FP that develops a concept of transmutation of long-lived higher actinides in nuclear waste into short-lived products by accelerator irradiation. Four courses have been organised on the general aspects of transmutation concepts, nuclear data of relevance to transmutation, accelerator thermal hydraulics and accelerator and beam line design.

The Training and Industrial Projects Committee (TIPC) is dedicated to identifying and responding to industrial needs for continued professional development. TIPC organises continuous training sessions and courses on different subjects of common interest for ENEN associated members, regulatory bodies and nuclear industries. Together with the Knowledge Management Committee (KMC), it maintains and disseminates a database on third-cycle advanced courses and continued professional development sessions. It facilitates and supports professional training and the mobility of professionals and lecturers, assists in accessing large nuclear infrastructures and integrates European industrial and national projects. The training courses in the format of seminars organised by the ENEN Association – some of them in the framework of the NEPTUNO project – are open to students as well as to professionals. Seminars have been held on Nuclear Safety (in Saclay, France; Bratislava, Slovakia; and Munich, Germany: 2–3 weeks duration), Radioactive Waste (Saclay and Bucharest, one week), the Dismantling Experience of Nuclear Installations (Saclay, one week), the Nuclear Fuel Cycle (Saclay, two weeks) and new developments of nuclear energy in Europe (Helsinki, Finland, one week). Further seminars are planned for the autumn of 2007. The number of participants ranges from 12 to more than 50, including young professionals from nuclear industries, research centres and regulatory

bodies inside and outside the EU. The students have the opportunity to pass an examination on the contents of the seminar and to earn a corresponding number of European Community Course Credit Transfer System credits for their academic curriculum.

### Extension to Other Nuclear Disciplines

After the foundation of the ENEN Association as an outcome of the FP 5 ENEN project and the development of ENEN products (EMSNE certificate, exchange courses, E-learning concepts, databases, communication systems and visibility) under the FP 6 NEPTUNO project, it was found appropriate to expand the ENEN scope from the nuclear engineering field into other nuclear disciplines, such as radioprotection, radiochemistry and waste management. The ENEN Association also wishes to expand its activities from the academic and research environment into the industrial and regulatory fields, and to strengthen the membership of industrial partners and regulatory bodies. Moving out from basic and advanced academic education, the ENEN Association intends to define and harmonise professional training programmes directed to key functions in nuclear industries, regulatory bodies and nuclear applications and promote their international mutual recognition. The ENEN association further intends to continue its participation to EC framework projects, in particular in the European higher education and European research areas. A follow-up project with the title 'Consolidation of European Nuclear Education, Training and Knowledge Management' under the name of ENEN-II was accepted at the Sixth FP. This co-ordination action involves 25 ENEN members and 16 European partners in the fields of radioprotection, radiochemistry, radioecology and waste management and disposal. The project will consolidate, expand and extend the achievements of the ENEN and the NEPTUNO projects.

### Conclusion and Future Perspectives

The ENEN Association will develop a higher level of networking with nuclear-related organisations and industries at the European level, in particular within the nuclear disciplines of engineering, radiation protection, radioactive waste management and decommissioning. The network will include academic institutions, training organisations and end-user associations. This will enhance the adjustment of curricula and training packages to end-user needs, thereby improving employment and career opportunities and the qualifications of young professionals. At the worldwide and intercontinental levels, networking will enhance opportunities for European teachers and professionals to disseminate their expertise and produce added value by exporting outside Europe the leading position of the EU in nuclear power plant construction and other nuclear applications. Finally, the ENEN Association will strengthen its co-operation with the World Nuclear University and the regional nuclear education networks in Asia, North America and elsewhere, and continue to promote and support their activities. The ENEN Association, its structural bodies and working committees and their members endeavour to implement this challenging programme, which will significantly contribute to the development of higher education and expertise in the nuclear field within the EU as well as on a global level. ■

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