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European Master of Science in Nuclear Engineering

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Abstract

The need to preserve, enhance or strengthen nuclear knowledge is worldwide recognised since a couple of years. Among others, "networking to maintain nuclear competence through education and training", was recommended in 2001 by an expert panel to the European Commission [EUR, 19150 EN, Strategic issues related to a 6th Euratom Framework Programme (2002–2006). Scientific and Technical Committee Euratom, pp. 14].

It appears that within the European University education and training framework, nuclear engineering is presently still sufficiently covered, although somewhat fragmented. However, it has been observed that several areas are at risk in the very near future including safety relevant fields such as reactor physics and nuclear thermal–hydraulics. Furthermore, in some countries deficiencies have been identified in areas such as the back-end of the nuclear fuel cycle, waste management and decommissioning.

To overcome these risks and deficiencies, it is of very high importance that European countries work more closely together. Harmonisation and improvement of the nuclear education and training have to take place at an international level in order to maintain the knowledge properly and to transfer it throughout Europe for the safe and economic design, operation and dismantling of present and future nuclear systems. To take up the challenges of offering top quality, new, attractive and relevant curricula, higher education institutions should cooperate with industry, regulatory bodies and research centres, and more appropriate funding from public and private sources. In addition, European nuclear education and training should benefit from links with international organisations like IAEA, OECD-NEA and others, and should include worldwide cooperation with academic institutions and research centres.

The first and central issue is to establish a European Master of Science in Nuclear Engineering. The concept envisaged is compatible with the projected harmonised European architecture for higher education defining bachelors and masters degrees.

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The basic goal is to guarantee a high quality nuclear education in Europe by means of stimulating student and instructor exchange, through mutual checks of the quality of the programs offered, by close collaboration with renowned nuclear-research groups at universities and laboratories. The concept for a nuclear master program consists of a solid basket of recommended basic nuclear science and engineering courses, but also contains advanced courses as well as practical training. Some of the advanced courses also serve as part of the curricula for doctoral programs.

A second important issue identified is Continued Professional Development. The design of corresponding training courses has to respond to the needs of industry and regulatory bodies, and a specific organisation has to be set up to manage the quality assessment and accreditation of the Continued Professional Development programs.

In order to achieve the important objectives and practical goals described above, the ENEN Association, a non-profit association under French law, was formed. This international association can be considered as a step towards the creation of a virtual European Nuclear University symbolising the active collaboration between various national institutions pursuing nuclear education.

Based on the concepts and strategy explained above, and with the full cooperation of the participating institutions, it may be stated that the intellectual erosion in the nuclear field can be reversed, and that high quality European education in nuclear sciences and technology can be guaranteed.

1. Introduction

The need to preserve, enhance or strengthen nuclear knowledge is worldwide recognised since a couple of years.

"Although the number of scientists and technologist may appear sufficient today in some countries, there are indicators, e.g. declining university enrolment, changing industry personnel profiles, dilution of university course content, and high retirement expectations, that future expertise is at risk." (OECD/NEA, 2000)

"Today, the priorities of the scientific community regarding basic research lie elsewhere than in nuclear sciences. Taken together, these circumstances create a significantly different situation from three to four decades ago, when much of the present competence base was in fact generated. In addition, many of the highly competent engineers and scientists, who helped create the present nuclear industry, and its regulatory structure, are approaching retirement age. These competence issues need to be addressed at community level and a well-designed community research and training program should play a role that is more important than ever before. This is an area where the concept of a European research area should be further explored." (EUR, 19150 EN)

"In September 2002, the (IAEA) General Conference noted that the need to preserve, enhance or strengthen nuclear knowledge arises irrespective of the future expansion in the applications of nuclear technologies, and requested the Director General to note the high level of interest of member states in the range of issues associated with preserving and enhancing nuclear knowledge in the process of preparing the Agency's program." (IAEA, 2003)

2. ENEN—European Nuclear Engineering Network

Within the 5th Euratom research and training program on nuclear energy (1998–2002), the European Commission supported a project on European nuclear engineering education. Twenty-two academic institutions and research laboratories participated (ENEN website).

Within the project, we defined the major elements for a European Master of Science in Nuclear Engineering, performed pilot sessions on nuclear engineering education, established the ENEN association and revitalised nuclear education and training in Europe. The project contributed towards farther reaching objectives, e.g. the conservation of nuclear knowledge and expertise, the creation of a European higher education area and the implementation of the Bologna declaration and the enlargement of the European Union.

2.1. European Master of Science in Nuclear Engineering

Based upon a year-long exchange of views between the partners of ENEN, consisting of a representative