ENEN Association:
Networking activities in Education, Training and Knowledge Management in EU 27

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CEA/INSTN
ENEN’s President

The Present Status of Nuclear Energy

Picture taken from the Generation IV roadmap document – December 2002
• 439 nuclear power plants in operation with a total net installed capacity of 371.976 GW(e)
• 6 nuclear power plants in long term shutdown
• 35 nuclear power plants under construction

NUCLEAR POWER PLANTS UNDER CONSTRUCTION

<table>
<thead>
<tr>
<th>Country</th>
<th>Units</th>
<th>Total MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARGENTINA</td>
<td>1</td>
<td>692</td>
</tr>
<tr>
<td>BULGARIA</td>
<td>2</td>
<td>1906</td>
</tr>
<tr>
<td>CHINA</td>
<td>6</td>
<td>5220</td>
</tr>
<tr>
<td>FINLAND</td>
<td>1</td>
<td>1600</td>
</tr>
<tr>
<td>FRANCE</td>
<td>1</td>
<td>1600</td>
</tr>
<tr>
<td>INDIA</td>
<td>6</td>
<td>2910</td>
</tr>
<tr>
<td>IRAN</td>
<td>1</td>
<td>915</td>
</tr>
<tr>
<td>JAPAN</td>
<td>1</td>
<td>866</td>
</tr>
<tr>
<td>KOREA,</td>
<td>3</td>
<td>2880</td>
</tr>
<tr>
<td>PAKISTAN</td>
<td>1</td>
<td>300</td>
</tr>
<tr>
<td>RUSSIAN FEDERATION</td>
<td>7</td>
<td>4789</td>
</tr>
<tr>
<td>UKRAINE</td>
<td>2</td>
<td>1900</td>
</tr>
<tr>
<td>UNITED STATES</td>
<td>1</td>
<td>1165</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>35</strong></td>
<td><strong>29343</strong></td>
</tr>
</tbody>
</table>

Source: IAEA PRIS database
The Present Status of Nuclear Energy

1.6 billion Human Beings have no Electricity

Reactors Building:
- 35 units: 29,343 MWe

On order or planned:
- 94 units: 101,595 MWe

Nuclear Electricity:
- 2658 billion kWh 16%

Source: IAEA, October 2007

EUROPE 27: The Present Status

<table>
<thead>
<tr>
<th>Nuclear Energy Status in EU 27</th>
<th>NRR in Operation</th>
<th>Nuclear Share of Total Electricity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRANCE</td>
<td>59</td>
<td>76.8</td>
</tr>
<tr>
<td>LITUANIA</td>
<td>1</td>
<td>84.4</td>
</tr>
<tr>
<td>SLOVAKIA</td>
<td>5</td>
<td>54.3</td>
</tr>
<tr>
<td>BELGIUM</td>
<td>7</td>
<td>54.0</td>
</tr>
<tr>
<td>SWEDEN</td>
<td>10</td>
<td>46.1</td>
</tr>
<tr>
<td>SLOVENIA</td>
<td>1</td>
<td>41.6</td>
</tr>
<tr>
<td>HUNGARY</td>
<td>4</td>
<td>36.0</td>
</tr>
<tr>
<td>BULGARIA</td>
<td>2</td>
<td>32.1</td>
</tr>
<tr>
<td>CZECH REPUB.</td>
<td>6</td>
<td>30.2</td>
</tr>
<tr>
<td>FINLAND</td>
<td>4</td>
<td>28.9</td>
</tr>
<tr>
<td>GERMANY</td>
<td>17</td>
<td>25.9</td>
</tr>
<tr>
<td>SPAIN</td>
<td>8</td>
<td>17.4</td>
</tr>
<tr>
<td>UK</td>
<td>19</td>
<td>15.1</td>
</tr>
<tr>
<td>ROMANIA</td>
<td>2</td>
<td>13.0</td>
</tr>
<tr>
<td>NETHERLANDS</td>
<td>1</td>
<td>4.1</td>
</tr>
</tbody>
</table>

Source: IAEA PRIS database
A study conducted by OECD/NEA – July 2000

“Although the number of nuclear scientists and technologists may appear to be sufficient today in some countries, there are indicators that future expertise is at risk. In most countries, there are now fewer comprehensive, high quality nuclear technology programmes at universities than before. The ability of universities to attract top quality students, meet future staffing requirements of the nuclear industry, and conduct leading-edge research is becoming seriously compromised”.

From ENEN project to ENEN Association

5th Framework EC programme, January 2002

The “European Nuclear Engineering Network” project:

- establishes the basis for conserving nuclear knowledge and expertise
- creates a European Higher Education Area for nuclear disciplines
- initiates the implementation of the Bologna declaration in the nuclear disciplines
ENEN Association

“The European Higher Education Area” is formalised by creating the European Nuclear Education Network, the “ENEN” Association under the French law of 1901, on 22nd of September 2003

Effective members: Academic Institutions

Associated members: Research centres, industry, regulatory bodies

ENEN GENERAL GOALS

Towards the Universities
- To develop a more harmonised approach for education in the nuclear sciences and engineering in Europe.
- To integrate European education and training in nuclear safety and radiation protection
- To achieve a better cooperation and sharing of resources and capabilities at the national and international level

Towards the End-users (industries, regulatory bodies, applications)
- To create a secure basis of skills and knowledge of value to the EU
- To maintain an adequate supply of qualified human resources for design, construction, operation and maintenance of nuclear infrastructures and plants
- To maintain the necessary competence and expertise for the continued safe use of nuclear energy and applications of radiation in industry and medicine.
MISSION: the preservation and further development of higher nuclear education and expertise

- Deliver a European Master of Science in Nuclear Engineering
- Establish a framework for mutual recognition
- To encourage and support PhD studies
- Foster/strengthen the relationship with research laboratories, industry and regulatory bodies,
- Promote exchange of students and teachers
- Increase the number of students by providing incentives
Overview of ENEN Members

44 members

- 37 Universities
- 6 Research Centres
- 1 Industry
- located in 18 European countries

HISTORY and DEVELOPMENT


  The NEPTUNO project with 35 partners continues and expands the Network activities started in FP 5

  ENEN provided assistance for the organisation and coordination of training sessions and pilot courses

  Implemented the establishment of the EMSNE

  ENEN expanded its activities to training activities

  ENEN expanded its activities to Knowledge Management
Main achievements

- Architecture of the European Masters of Science in Nuclear Engineering – EMSNE:
  - Full Two Years Program – 120 ECTS,
  - At least 60 ECTS must be “purely nuclear”,
  - 20 ECTS must be obtained from a “foreign” institution, member of ENEN Association
  - Mandatory (common denominator in basic knowledge of nuclear engineering) and optional courses
  - Definition of each course’s curriculum - n° of ECTS
  - Master thesis
Main achievement
ENSNE – ENEN Certification

- Based on mutual recognition between universities members of ENEN A
- Promotes and facilitates mobility of students
- Promotes and facilitates mobility of teachers
- Definition and assesement of ENEN Exchange courses

International Exchange course

"Eugene Wigner" Training Course for Reactor Physics Experiments 2008 with special emphasis to enhance Research Reactor Safety

Organising institutions

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budapest University of Technology and Economics (BME)</td>
<td>Hungary</td>
</tr>
<tr>
<td>Slovak University of Technology in Bratislava (STUB)</td>
<td>Slovak Republic</td>
</tr>
<tr>
<td>Vienna University of Technology, Atominstitut (AI)</td>
<td>Austria</td>
</tr>
<tr>
<td>Czech Technical University in Prague (CTU)</td>
<td>Czech Republic</td>
</tr>
</tbody>
</table>
**International Exchange course**

**Introduction**

The 21-day course, entitled "Nuclear Reactor Theory," is organized by the Belgian Nuclear Energy Agency (BNEN). The course focuses on advanced topics in nuclear engineering and is open to students from various countries.

**Travel Information**

- **Location:** Belgium, approximately 100 km northeast of Brussels and about 50 km southeast of Antwerp.
- **Language:** English.
- **Participants:** 10-15 participants from different countries.
- **Fees:** EUR 500 (including accommodation and meals).
- **Dates:** September 2nd - September 15th, 2008.

**Application**

- **Eligibility:** Open to students and professionals with a background in nuclear engineering.
- **Deadline:** October 15, 2008.
- **Contact:** E-mail: info@bnen.be

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**Course on Nuclear Reactor Theory**

**Overview**

The course is designed to enhance the knowledge of students in nuclear reactor theory.

**Course Outline**

- **Module 1:** Fundamentals of Nuclear Reactor Theory
- **Module 2:** Advanced Topics in Nuclear Reactor Theory
- **Module 3:** Case Studies and Applications

**Registration & Information**

- **Contact:** E-mail: info@bnen.be
- **Website:** [BNEN](http://www.bnen.be)

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**BNEN**

- **Location:** Brussels, Belgium
- **Mission:** Promoting nuclear research and education.

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**NESTet Conference, Budapest May 5th, 2008**
EMSNE First Certificates

First three students receiving (Romania & France) the EMSNE certificates during ENC 2005, Versailles December

Main achievements – Advanced courses

- 17 Universities participates to IP EUROTRANS under the ENEN umbrella
- ENEN
  - Represents them at the EUROTRANS Coordination Committee
  - Provides links between research scientists and doctoral students (13 to 20 PhDs foreseen)
  - Organises / Facilitates lectures, scientific visits, joint experiments, specialised training courses (10)
Main achievements – Advanced courses

EUROTRANS Internal Training Courses

- ITC6 "Core design and reactor safety analysis" in Madrid, Spain, 2-5 April 2008
- ITC5 "Fuel and Structural Reactor Materials" in Pisa, Italy, 26-29 November 2007
- ITC4 "Particle Accelerator Technology" in Mol, Belgium, 10-11 May 2007
- ITC3 "ADS thermal-hydraulics: system codes and CFD codes, models and experimental validation" in Louvain-la-Neuve, Belgium, 21-23 March 2007
- ITC2 "Nuclear data for transmutation: status, needs and methods" in Santiago de Compostela, Spain, 7-10 June 2006
- ITC1 "ADS: objectives, context, concepts, challenges" in Stockholm, Sweden, 5-9 October 2005
Main achievements – Training courses

NESTet Conference, Budapest May 5th, 2008

ENEN Training Courses

NESTet Conference, Budapest May 5th, 2008
ENEN Association European & International relations

- Participates to the different activities of the IAEA
- MoU established with universities outside Europe: NWU in South Africa, Russia (MEPhl), Japan TIT under discussion….
- MoU established with JRC
- Founder member of World Nuclear University
- Exchanges with other E&T Networks, a MoU under discussion with ANENT, the Asian network
- Is represented in the 3rd WG of the European Nuclear Energy Forum (ENEF)
- Is represented in "The Sustainable Nuclear Energy Technology Platform" (SNE-TP), Board, Executive Committee and co-chair of 3rd WG
The Sustainable Nuclear Energy Technology Platform

Governments should regularly carry out assessments of both requirements for, and availability of, qualified human resources to match identified needs.

Governments, academia, industry and research organisations should collaborate both nationally and internationally to enhance nuclear education and availability of nuclear expertise, including financial support to universities and scholarships to students.

Governments, whether or not they choose to utilise nuclear power, should also encourage large, high-profile, international R&D programmes which attract students and young professionals to become the nuclear experts required for the future.
The Nuclear “Renaissance”

- ENEN is acting through education and training for the renewal of competencies
- In the framework of ENEN Association major education and some training institutions across Europe are working together
- ENEN provides education and training courses across the energy life cycle (design, build, operate, decommission and waste disposal)

The Nuclear “Renaissance”

- ENEN works with industry to attract more young students to the nuclear field, first objective to increase the number of graduates with the existing infrastructures and facilities (training reactors, simulators…)
- Courses organized when possible according to a modular structure, opened for the registration of young professionals
- On a national scope, ENEN members create or participate actively to clustering efforts
- ENEN members will offer increasing numbers of new programs linked to research and industry
Clustering in Belgium

- A consortium of 11 UK Universities and other Institutions providing postgraduate education in nuclear engineering, science and technology

- Funded by the UK Government through the EPSRC

NESTet Conference, Budapest May 5th, 2008

Clustering in United Kingdom

Nuclear Technology Education Consortium

- A consortium of 11 UK Universities and other Institutions providing postgraduate education in nuclear engineering, science and technology

- Funded by the UK Government through the EPSRC

NESTet Conference, Budapest May 5th, 2008
Alliance for Nuclear Competence

Nuclear Research and Education Cluster South-West (Baden-Württemberg)

- Forschungszentrum Karlsruhe GmbH
- EnBW Energie Baden-Württemberg AG
- Institut für Transurane
- Ruprecht-Karls-Universität Heidelberg
- Universität Karlsruhe (TH)
- Universität Stuttgart
- Hochschule Furtwangen University
- Hochschule Ulm
Clustering in Italy – CIRTEN

- **Consorzio Interuniversitario per la Ricerca TEcnologica Nucleare**
  - Constituted in 1994 by Politecnico di Milano, Politecnico di Torino and Università di Padova, Palermo, Pisa and Roma “La Sapienza”.
  - Purpose: to promote the scientific and technological research and coordinate the Universities in sectors like:
    - nuclear energy power and fuel cycle plants;
    - industrial/health applications of nuclear radiations;
    - energetic-environmental systems;
    - safety, physical and environmental protection problems.

Clustering in Switzerland

- A new program for a Master of Science degree in Nuclear Engineering
  - Starting September 2008
  - Offered jointly by the Swiss Federal Institutes of Technology, EPF Lausanne and ETH Zurich.
  - One semester course at each of the two university (Lausanne, Zurich),
  - Master's research project will generally be carried out at the Paul Scherrer Institute (PSI)
Clustering in France

Starting September 2008

• A new program for Master of Science degree in Nuclear Engineering

• Offered jointly by Paris XI – Orsay University and CEA-INSTN

• 8 modules’ course, over 7 months equivalent to 40 ECTS, courses are taught in English

• Master’s research project will generally be at University, CEA research centres or Industry equivalent to 20 ECTS

New ENEN Web Site - Home page

http://www.enen-assoc.org
CONTACT

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THANK YOU FOR YOUR ATTENTION