The European Nuclear Education Network – Activities and perspectives

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ENEN Association, President

Presented by Walter Ambrosini, University of Pisa, as temporary member of the ENEN Board

10th BNEN academic year – Mol September 26th, 2011
Plan:
1. ENEN presentation: History and development
2. Main achievements in each area of activity
3. Perspectives: Ongoing European projects
4. Conclusions
1. ENEN presentation: History and development
HISTORY and DEVELOPMENT

European Commission – EURATOM
5th Framework programme
ENEN project in January 2002 – December 2003

Following declarations and policies on phasing out nuclear power plants, nuclear sciences and disciplines are facing:

- decreasing interest and a reduced numbers of students
- no successors for retiring professors
- discontinuing nuclear related courses and closing faculties

The “European Nuclear Engineering Network” project:

- established the basis for conserving nuclear knowledge and expertise
- created a European Higher Education Area for nuclear disciplines
- facilitated the implementation of the Bologna declaration in the nuclear disciplines
HISTORY and DEVELOPMENT

In order to ensure the continuity of the achievements and results of the ENEN project:

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

The main objective is the preservation and further development of expertise in the nuclear fields by higher education and training

- Promote and further develop the collaboration in nuclear education and training of students, researchers and professionals
- Ensure the quality of nuclear education and training
- Increase the attractiveness for engagement in the nuclear fields for students, researchers and professionals
- Promote life-long learning and career development at post-graduate or equivalent level
It should be achieved by...

- Support to the Universities (exchange of students, lecturers, materials and information etc.)
- Making a bridge between the Universities and the End-users (industries, regulatory bodies, research centres, etc.)
ENEN Members in March 2011

- 60 members: Universities, Research Centres, Industry located in 18 European Countries
- MoU concluded with
  - IAEA for Asian Network (ANENT) and other items
  - European Nuclear Society
  - North West University, Potchefstroom, South Africa
  - Moscow Engineering Physics Institute, Russian Federation
  - Tokyo Institute of Technology, Japan
  - Japan Atomic Energy Agency, Japan
  - Kharkiv “Karazin” National University, Ukraine
  - Central Institute for Continuing Education and Training Russia
- Memberships/cooperation under discussion with
  - EC Joint Research Centre, Ispra, Italy
  - University Network of Excellence in Nuclear Engineering Canada
General Assembly
Board of Governors

Secretary General

Teaching and Academic Affairs Area
Advanced Courses and Research Area
Training and Industrial Projects Area

Knowledge Management

Quality Assurance

Action 1
Action 2
Action 3
Action 4

………

Day to day work

10th BNEN academic year – Mol September 26th, 2011
HISTORY and DEVELOPMENT

European Commission – EURATOM FP6

- 35 partners continued and expanded the ENEN activities started in FP 5
- ENEN established and implemented the European Master of Science in Nuclear Engineering
- ENEN expanded its activities from education to training
- ENEN organised and coordinated training sessions and pilot courses
- ENEN expanded its activities to Knowledge Management
ENEN-II project Oct. 2006 – March 2009

Consolidation of European Nuclear Education, Training and Knowledge Management
CENETNOM

Programme for Education, Training and Research on Underground Storage
PETRUS

Securing European Radiological Protection and Radioecology Competence to meet the Future Needs of Stakeholders
EURAC-II

Consolidation of European Nuclear Education, Training and Knowledge Management
ENEN-II
6th FP ENEN-II project in 2006-2009

Work packages

- WP1: Integration of the Nuclear E&T and End Users Networks - Networking
- WP2: Development, Harmonization and Consolidation of Academic Nuclear Education.
- WP3: Facilitating and Supporting Research
- WP4: Professional Training Programs
- WP5: Nuclear Knowledge Management
2. Main achievements in each area of activity
Master level: European MSc in Nuclear Engineering

- Established under the European Commission – EURATOM 5th FP ENEN project and 6th FP NEPTUNO project
- Common reference curricula and mutual recognition among ENEN members
- Promotes and facilitates mobility of students and teachers
- Definition and assessment of ENEN international exchange courses
- Implemented since 2005
- “ENEN Certificate” recognised among ENEN Members
Master level: European MSc in Nuclear Engineering

- List of topics
  - Reactor engineering
  - Reactor physics
  - Nuclear thermal hydraulics
  - Safety and reliability of nuclear facilities
  - Reactor engineering materials
  - Radiology and radiation protection
  - Nuclear fuel cycle and applied radiochemistry

- Requirements
  - 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 the ENEN Association
  - Master thesis
EMSNE Certificates 2009-10

Student receiving the ENEN EMSNE certificate during the ENYGF conference, Prague May 18th, 2011
Master level: New Master in Switzerland

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

• 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)

Started in September 2008
MASTER OF SCIENCES NUCLEAR ENERGY in France

M1

Physics Engineering

NRPE
Nuclear Reactor Physics and Engineering
Ex Nuclear Engineering

Nuclear plant design

Operation

Decommissioning and Waste Management

Fuel Cycle

M2

Chemistry Engineering

Radiochemistry

Fuel Cycle Engineering

Started in September 2008

NRPE

10th BNEN academic year – Mol September 26th, 2011
Started in September 2011

<table>
<thead>
<tr>
<th>1st Semester</th>
<th>2nd Semester</th>
<th>3rd Semester</th>
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<tbody>
<tr>
<td>Fundamentals of Nuclear Engineering and Radiological Protection</td>
<td>Nuclear Power Plants</td>
<td>Fuel Cycle and Environmental Impact</td>
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<tr>
<td>Regulations and Safety</td>
<td>Management of Nuclear Power Plants</td>
<td>Elective Block</td>
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<td>Internship and Master’s Final Project</td>
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PhD level – Advanced courses

- 17 Universities participates to IP EUROTRANS under the ENEN umbrella
- ENEN
  - Represented them at the EUROTRANS Coordination Committee
  - Provided links between research scientists and doctoral students
  - Organised 10 specialized internal training courses
### PhD level – Advanced courses

<table>
<thead>
<tr>
<th>Course 1</th>
<th>Reactor Core Physics: Deterministic and Monte Carlo Methods</th>
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<tbody>
<tr>
<td></td>
<td>Saclay, November 14-18, 2011</td>
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<tr>
<td>Course 2</td>
<td>Thermal Hydraulics and Safety for Light Water Reactors and Fast Reactors</td>
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<td>Grenoble, November 21-25, 2011</td>
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<tr>
<td>Course 3</td>
<td>Materials for Nuclear Reactors, Fuels and Structures</td>
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<td>Saclay, November 28-December 7, 2011</td>
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<tr>
<td>Course 4</td>
<td>Nuclear Fuels for Light Water Reactors and Fast Reactors</td>
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<td>Cadarache, December 5-9, 2011</td>
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<tr>
<td>Course 5</td>
<td>Nuclear Waste Management and Dismantling</td>
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<td>Saclay, December 12-16, 2011</td>
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PhD level: Annual ENEN PhD Event

- One-day event during an international conference
- 12-14 PhD students
- ENEN Prize
- ENEN Alumni
  - 1st at International Youth Conference on Energetics 2007 in Budapest, Hungary, 1 June 2007
  - 2nd at International Youth Nuclear Congress (IYNC) in Interlaken, Switzerland, 23 September 2008 in collaboration with the EC JRC
  - 3rd at International Youth Conference on Energetics 2009 in Budapest, Hungary, 4-7 June 2009
  - 4th PhD event, ENC 2010, Barcelona June 2\textsuperscript{nd}, 2010
  - 5th PhD event, ICAPP 2011, Nice May 4\textsuperscript{th}, 2011
Professional Training Programs

INTERNATIONAL COURSE
NEUTRONICS FOR LIGHT WATER REACTORS
2011 – FRANCE

JUNE 27th – JULY 8th, 2011

January 17th to 28th, 2011

10th BNEN academic year – Mol September 26th, 2011
Professional Training Programmes

Training Courses
Fundamentals of LWR Technology
Munich-Garching | October 11th - 15th, 2010

Training Courses
Safety Concepts and Safety Validation
Munich | July 18 - 22, 2011

SCK·CEN
Training course on
Preparedness and response for nuclear or radiological emergencies
17-21 October 2011, Mol, Belgium

What is the state-of-the-art in nuclear and radiological emergency management?

What are the challenges we face?

Be prepared for nuclear and radiological emergencies by attending this comprehensive training course and broaden your social network in the domain of radiological and nuclear emergency management.

A combination of theory, practice, tools and experience will help you and your organisation to:
- Be prepared for an emergency.
- Mitigate the crisis.
- Improve the overall response to nuclear or radiological emergencies.
"Eugene Wigner" Training Course for Reactor Physics Experiments 2011

- 21 days’ training course
- starting September 7th, 2011
- for students and young professionnals
- students can validate 6 ECTS

Organising institutions

<table>
<thead>
<tr>
<th>Budapest University of Technology and Economics (BME)</th>
<th>Hungary</th>
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<tr>
<td>Slovak University of Technology in Bratislava (STUB)</td>
<td>Slovak Republic</td>
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<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>
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Knowledge Management
ENEN Website and Database

- **ENEN Website**
  http://www.enen-assoc.org

- **NEPTUNO Database** (Aug 2004-)
  http://www.neptuno-cs.de/

- **E&T courses by ENEN Members**

- **A new ENEN Database**
  - E&T courses
  - Master program
  - PhD topics
  - Opportunities (scholarship, fellowship, internship, job opportunities)

*provided by ENEN Members and Partners*
Knowledge Management

ENEN publications

• First text book published under ENEN as a deliverable of ENEN II project
  – 18 chapters, 670 pages including exercises and solutions
  – mainly for students, young professionals and researchers

• CD-ROM including multimedia presentations for the general public
ENEN Event Annual pan-European Recruitment Event

- In Brussels
  - 4-5 December 2009
  - 3-4 December 2010
  - to be held on **2-3 Dec 2011**
- Supported by the EC and the ENEN
- Expected to participate in
  - European major industries
  - 200 students over EU and beyond
- Contents
  1. Workshop/panel discussion
  2. Interviews for job opportunities, internship and fellowships
3. Perspectives: Ongoing European projects
FP7: Euratom Fission Training Schemes (EFTS) projects

- Starting in 2009/2010
- The objective is to establish a common certificate for professionals at the European level
  - ENEN III on Nuclear Engineering (2009-)
  - ENETRAP II on Radiation Protection (2009-)
  - PETRUS II on Waste Management and Disposal (2009-)
  - TRASNUSAFE on Nuclear Safety Culture (2011-)

**ECTS and European MSc for Education; for Training: establish a common certificate for professionals at European level**
ENEN-III Project on Nuclear Engineering

➢ Three-year project: 2009 - 2012
➢ Four training schemes as pilot subjects
  ▪ Basic Nuclear Topics for Non-Nuclear Engineers
  ▪ Design Challenges for Generation III NPP
  ▪ Construction Challenges for Generation III NPP
  ▪ Design Challenges for Generation IV Reactors
➢ Coordinated by the ENEN Association
➢ 19 Partners in 12 countries
  ENEN, SCKCEN, UCL, AALTO, LUT, INSTN,
  AREVA, ISAR, BME, CIRNEN, DUT, UPB, UL,
  JSI, TECNATOM, UPM, UPC, (HMS SULTAN)
Bilateral cooperation-EUJEP Project (Japan)

- **Objective**: Foster, organize and implement exchanges of European and Japanese Master level students with mutual recognition of credits.

- **Partners**:
  - EU: ENEN (F), INSTN (F), EMN (F), UPB (RO), SUTB (SK)
  - JAPAN: TokyoTech, Kyoto University, JAEA

- **Planned Mobility of students**:
  - EU: 30 students for a total of 154 months
  - Japan: 30 students for a total of 180 months

- **Planned mobility of faculty staff**
  - EU: 10 faculty staff for a total of 19 weeks
  - Japan: 8 faculty staff for a total of 8 weeks
Bilateral cooperation ENEN-RU Project (Russian Fed.)

- Objective: to define a common basis to allow effective cooperation between the European and Russian networks for nuclear E&T
- 2-years project
- Kick-off meeting on 26-27 May 2011

WP1: Bologna process and ECTS in Russia
WP2: Needs of cooperation in the long term
WP3: Pilot items for Education
WP4: Pilot items for Training
WP5: E&T facilities, laboratories and equipments
WP6: Knowledge dissemination
WP7: Project management
Bilateral cooperation ENEN-RU Project (Russian Fed.)

- **Partners on the Russian side**
  - ROSATOM
  - National Research Nuclear University
  - MEPhI
  - Obninsk Technical University
  - Research Institute for Nuclear Reactor, Dimitrovgrad
  - Centre Institute for Continuing Education and Training, Obninsk

- **Partners on the EU side**
  - ENEN, SCKCEN, CTU, REZ, IKE, UPB, SUTB, TECNATOM

- **All ENEN Members will have an opportunity to contribute under the ENEN umbrella**
Bilateral cooperation ECNET Project (China)

- **Objective:** to define a common basis to allow effective cooperation between the European and Chinese networks for nuclear E&T
- **2-years project**
- **Kick-off meeting in March 2011**
- **Partners:**
  - **EU:** ENEN (F), SCKCEN (B), INSTN (F), INPL (F), KIT (G), CIRTEN (I), UPM (E), ICL (UK)
  - **China:** Tsinghua U, North China Electric Power U, South-West U of Science and Technology, Harbin Engineering U, Shanghai Jiao Tong U, China National Nuclear Corp/Graduate School and Xi’an Jiao Tong U
Bilateral cooperation ECNET Project (China)

Work packages:

Needs and strategies of long-term cooperation

WP1: In Nuclear Engineering
WP2: In Radiation Protection
WP3: In Waste Management and Disposal
WP4: Recognition of credit systems
WP5: E&T facilities, laboratories and equipments
WP6: Project management
EU Council, 1-2 December 2008

Adopted the conclusions which refers explicitly to the ENEN and to other FP6/FP7 initiatives originated by the ENEN

- The Council welcomes the existence within the European Union of coordinated teaching and training leading to qualifications in the nuclear field, provided notably by the ENEN.
- The Council hopes that, with the help of the EU, ENEN and its members will continue to develop the coordination of nuclear education and training in Europe.
- The Council insists that the appropriate conditions must be created for mutual recognition of nuclear professional qualifications throughout the European Union.
- The Council encourages the Member States and the Commission to establish a "review of professional qualifications and skills" in the nuclear field for the European Union, which would give an overall picture of the current situation and enable appropriate solutions to be identified and implemented.
4. Conclusions
Conclusions:

Networking between European Universities based on mutual recognition (ECTS Bologna system) enabled:

- Development of new academic programmes at a Master level
- Mobility of students to hosting universities, members of ENEN
- Mobility of Professors to teach in other Universities, when needed
- Maintain the quality of the educational programmes
- Joint and successful organisation of activities in the fields of: Education, Training and Knowledge Management
- The establishment of bridges between the Universities and the End-users (industries, regulatory bodies, research centres, etc.)
THANK YOU FOR YOUR ATTENTION

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