The European Nuclear Education Network – Activities and perspectives

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President of ENEN
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
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.
CELEBRATING THE 10TH BIRTHDAY
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 2013

- 64 members: Universities, Research Centres, Industry located in 18 European Countries
- MoU concluded with:
  - IAEA for Asian Network (ANENT) in 2009, extended in Sept. 2013 to AFRA-NEST and LANENT
  - 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
  - EC Joint Research Centre
  - ...
General Assembly
Board of Governors

Secretary General

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

Quality Assurance

Knowledge Management

Day to day work
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
  - At least 5 years university education (3+2, 4+1, or 5).
  - 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

Students receiving the ENEN EMSNE certificate during the 57th General Conference of IAEA in Vienna, September 19th, 2013
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
- Decommissioning and Waste Management

M2
- NRPE
  - Nuclear Reactor Physics and Engineering
  - Ex Nuclear Engineering
- Nuclear plant design
- Operation
- Fuel Cycle
- Radiochemistry
- Fuel Cycle Engineering

Started in September 2009
**Started in September 2011**

<table>
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<tr>
<th>Semester</th>
<th>Course Title</th>
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<tr>
<td>1st</td>
<td>Fundamentals of Nuclear Engineering and Radiological Protection</td>
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<td>Nuclear Power Plants</td>
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<td>Fuel Cycle and Environmental Impact</td>
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<td>Management of Nuclear Power Plants</td>
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<td>3rd</td>
<td>Internship and Master’s Final Project</td>
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European Master in Innovation in Nuclear Energy (EMINE)

- In the framework of the European Institute of Technology – KIC InnoEnergy. **Academic partners:** Grenoble INP, UPC-Barcelona-Tech, ParisTech, KTH, CEA. **Industrial partners:** EDF, ENDESA, AREVA, Vattenfall
- **Duration:** 120 ECTS, two years. **Language:** English
- **Mobility track:**
  - First year: at UPC (Barcelona, Spain) or KTH (Stockholm, Sweden)
  - Second year: at Grenoble INP (Grenoble, France) or Paris (France)
- **20 Scholarships**
- Students from: France, Spain, USA, India, Lebanon, Argentina, China, Egypt, Indonesia, Italy, Mauritius, Ethiopia, Bangladesh. Montenegro, Germany, Poland.

www.kic-innoenergy.com/emine/home
PhD level – Advanced courses

- 17 Universities participated 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

Thermal Hydraulics and Safety
Saclay, November 5-9, 2012
Materials for Nuclear Reactors, Fuels and Structures
Saclay, November 12-16, 2012
Registration deadline: October 5, 2012

Reactor Core Physics: Deterministic and Monte Carlo Methods
Cadarache, November 19-23, 2012
Nuclear Fuels for Light Water Reactors and Fast Reactors
Cadarache, November 26-30, 2012
Registration deadline: October 5, 2012

Nuclear Fuel Cycle and Reprocessing
Marcoule, January 7-11, 2013
Nuclear Waste Management
Marcoule, January 14-18, 2013
Registration deadline: November 30, 2012
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 2nd, 2010
  - 5th PhD event, ICAPP 2011, Nice May 4th, 2011
  - 6th PhD event, Inter. Conf. Nuclear Energy for New Europe in Ljubljana, September 6th, 2012
  - 7th PhD event, 16th Inter. Conf. on Emerging Nuclear Energy Systems (ICENES), in Madrid, Spain, 28-29 May 2013.
Professional Training Programmes

ISaR Training Courses

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

ISaR 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.
Professional Training Programs

INTERNATIONAL COURSE
NEUTRONICS FOR LIGHT WATER REACTORS
2011 – FRANCE

JUNE 27TH – JULY 8TH 2011

TU Delft
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

- **The 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

Neutron physics
• 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.

Multimedia on Nuclear Reactor Physics
• Promoted and distributed by IAEA to 53 countries.
• About 800 slides.
• 4 languages.
• For education and training.
ENEN Event Annual pan-European Recruitment Event

- In Brussels, since December 2009 a two days event
- Supported by the EC and the ENEN
- Expected to participate:
  - 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 (2009-2013)
  - ENETRAP II on Radiation Protection (2009-2012)
  - PETRUS II on Waste Management and Disposal (2009-2012)
  - 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 (prolonged one year)
- 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, CIRITEN, DUT, UPB, UL, JSI, TECNATOM, UPM, UPC
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), STUB (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
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*
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.
Recent developments

GENTLE Project: Graduate and Executive Nuclear Training and Lifelong Education

- It is an Euratom Fission Training Schemes (EFTS) in 'Nuclear Fission, Safety and Radiation Protection'
- GENTLE focuses on two E&T domains:
  
  (a) the education of students by means of student research projects and internships in the nuclear laboratories, and intersemester courses on special topics that are generally not part of the academic curriculum,

  (b) the high-level training of young professionals by an Executive master course (60 ECTS) on Nuclear Energy, accredited by one of the participating academic institutions.

- 12 Participants; ENEN involved as a supporting organisation
PETRUS-III Project: Implementing sustainable E&T programmes in the field of Radioactive Waste Disposal

- It is an Euratom Fission Training Schemes (EFTS) in 'Nuclear Fission, Safety and Radiation Protection'

- In line with the Lisbon strategy and 2020 perspective “Petrus” initiative coordinates since 2005 universities, WMOs, training organisations and research institutes efforts to develop cooperative approach to education and training (E&T) in the geological disposal with the purpose of expanding this cooperation under PETRUS III.

- PETRUS III project aims at continuation of the European Cooperation in this area

- 20 Participants including ENEN
Recent developments

NUSHARE Project

- The NUSHARE project (NUclear culture SHARing amongst the EU Member States) originated as a Euratom education and training (E&T) initiative proposed by Commissioner Mrs Máire Geoghegan Quinn after the Great East Japan Earthquake on 11 March 2011.

- It is a "Support action" of 4 years, launched under the modified Euratom work programme 2012 (adopted on 25 June 2012) through a "grant to named beneficiary", the ENEN Association and started early in 2013.

- Very ambitious goal: The objective of NUSHARE is to develop and implement training and informing activities with the aim to share and grow, across EU Member States, the safety culture in nuclear installations. Security aspects (in particular, proliferation resistance and physical protection) will also be treated.

- ENEN is the single beneficiary: 3 third partners (INSTN, UPM, TECNATOM) and one subcontractor (ENSTTI11)
Recent developments

NUSHARE Project (cont’d)

• To achieve the main objective of the project, and to ensure its long term impact on a safe and secure application of nuclear energy in the EU member states, a timely, broad, result driven and quality focused approach is proposed.

• All EU Member States with nuclear installations on their territory, for power generation or for medical purposes, shall be involved.

• Three Target Groups (TG) of citizens at higher education level are targeted in the project:
  – TG1: Policy and decision makers at the level of governments, emergency management teams, including international organizations;
  – TG2: Staff of Nuclear Regulatory Authorities and Technical Safety Organisations;
  – TG3: Managers and operators in the nuclear industry, system suppliers and energy providers.
Recent developments

NUSHARE Project (cont’d)

- **First phase** – estimated duration up to 12 months / action program and “NUSHARE Catalogue”
  - Appropriate preparation and communication with invited stakeholders (at least one per Member State), coming also from non-EU countries or organizations, existing education and training initiatives
  - The result shall be published as a coherent set of training schemes in a “NUSHARE training catalogue”

- **Second phase** – estimated duration up to 3 years / execution of the proposed action program

- The Project is characterised by a high degree of visibility also for the involvement of “stakeholder” organisations and policy makers

- The contribution of all the Members of ENEN and of other Organisations is needed
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.)
- Larger visibility expected in the near future with latest developments: need for a tighter cooperation within ENEN
THANK YOU FOR YOUR ATTENTION!

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