

ENEN's Challenges

in response to the industry, regulatory
and research needs

Emilio Minguez - ENEN Association

1. ENEN Association - History and development,

1. Some Achievements in Education, Training and Knowledge Management areas

2. Ongoing European projects in 2011

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
- facilitated the implementation of the Bologna declaration in the nuclear disciplines
- **European Nuclear Education Network**, the “ENEN” Association on

22nd of September 2003



HISTORY and DEVELOPMENT

- ✓ FP6 **NEPTUNO project** in Jan. 2004 – June 2006

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

- ✓ FP6 **ENEN II project** Oct 2006 – March 2009

ENEN expanded its E & T activities to radiation protection, waste management and storage

ENEN - Objectives

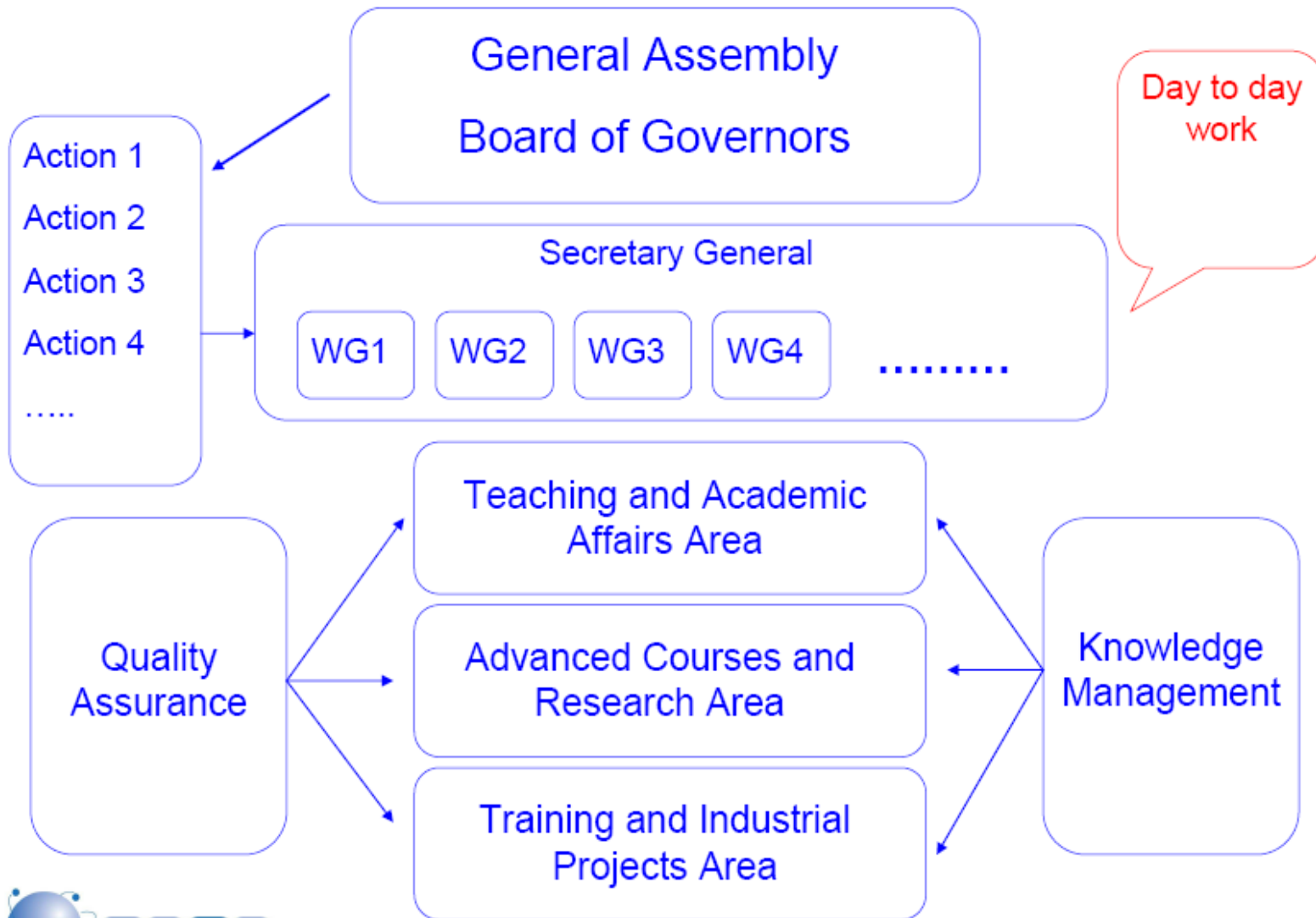
The main objective is the preservation and further development of expertise in the nuclear fields by *higher* education and training

- 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

ENEN Members in March 2011

- 60 members
 - located in 18 European Countries
- MoU concluded with
 - IAEA for Asian Network (ANENT) and ongoing with 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
 - 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

ENEN Structure



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**



European Master of
Science in Nuclear
Engineering
ENEN Certification

Nuclear Education by
the European Nuclear Education Network



EMSNE Certificates Ceremony 2008



Student receiving the ENEN EMSNE certificate during ENS conference on E&T NESTet Budapest May 4-8, 2008

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



Professional Training Programs

INTERNATIONAL COURSE
NEUTRONICS FOR LIGHT WATER REACTORS
2011 – FRANCE




TU Delft



JUNE 27th – JULY 8th 2011



FIRST
INTERNATIONAL COURSE
NUCLEAR CRITICALITY-SAFETY
2011 FRANCE



January 17th to 28th 2011





Training Courses



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



Training Courses



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



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

**INTERNATIONAL COURSE
NUCLEAR MATERIALS FOR PRESSURIZED WATER REACTORS
2011 – FRANCE**





304L stainless steel microstructure © D. Eklöf/CEA
Intergranular rupture © C. Berthier/CEA
JANUS © P. Strappà/CEA

JUNE 6th – 10th, 2011





„Eugene Wigner” Training Course for Reactor Physics Experiments 2011



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

Organising institutions

Budapest University of Technology and Economics (BME) <i>Hungary</i>	
Slovak University of Technology in Bratislava (STUB) <i>Slovak Republic</i>	
Vienna University of Technology, Atominstytut (AI) <i>Austria</i>	
Czech Technical University in Prague (CTU) <i>Czech Republic</i>	

Special Events with End -Users

1. “Industry Views on International Cooperation in Nuclear Education and Training” in Prague, 6 March 2008 (EDF, E.ON, Suez-Tractebel, Westinghouse, FORATOM)
2. Post-FISA 2009 Workshop “Integration of nuclear education and training: common needs, EU vision and implementation instruments” in Prague, 25 June 2009 (Areva, EDF, Posiva, SCKCEN, CEA, EPFL, Russia, China, USA etc.)
3. “Needs and strategies on Education & Training for increasing Nuclear Power Production” in Ljubljana, Slovenia, 4 March 2010 (ENEL, EC JRC, IAEA, Safety Authority)
4. “Stakeholder´ views on borderless mobility and lifelong learning schemes in the EU” in Madrid, 3 March 2011 (ANAV, ENELA, TECNATOM, Westinghouse, ENSTTI)



Knowledge Management ENEN Website and Database

➤ ENEN Website

<http://www.enen-assoc.org>

➤ NEPTUNO Database (Aug 2004-)

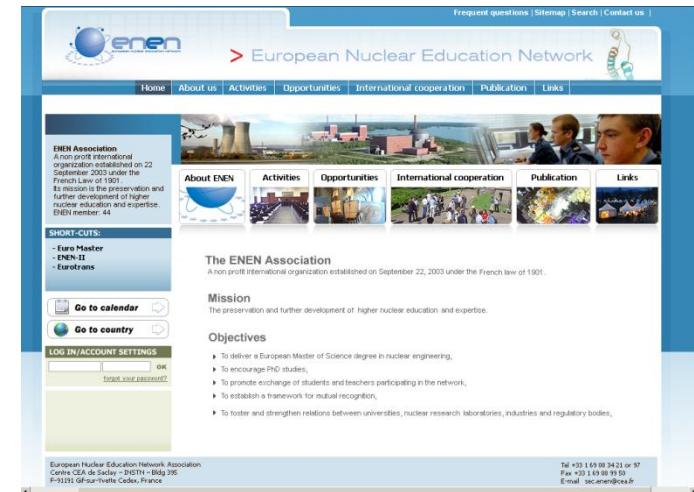
<http://www.neptuno-cs.de/>

E&T courses by ENEN Members

➤ A new ENEN Database

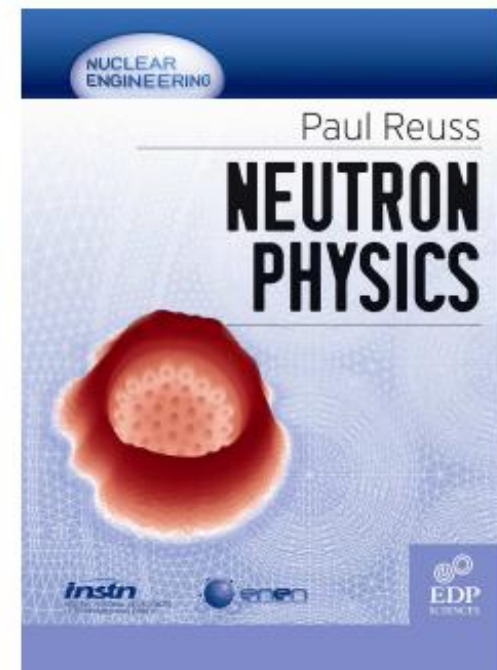
- E&T courses
- Master program
- PhD topics
- Opportunities (scholarship, fellowship, internship, job opportunities)

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



INTRODUCTION TO NUCLEAR ENERGY

The nuclear fuel cycle

The nuclear fuel cycle deserves a special mention, because its possible variations and particularities are of special interest. The cycle is referred to the whole process followed since the Uranium mineral is extracted in the mines to when the radioactive waste coming from fission in power plants is correctly administered.

The image is a collage of six small photographs showing different stages of the nuclear fuel cycle. Top left: A landscape with a large open-pit mine. Top middle: A large yellow industrial tank. Top right: A tall, dark industrial chimney or stack. Bottom left: A large pile of yellow uranium ore. Bottom middle: A close-up of a reactor core with glowing orange and red components. Bottom right: A diagram of a nuclear reactor core with various components labeled. At the bottom left of the collage is a blue button labeled "Index". At the bottom right are two blue circular navigation arrows.

Figure 51, 52, 53, 54, 55, 56 and 57 - Images of the nuclear fuel cycle

Ongoing European projects in 2011

- Euratom Fission Training Schemes (EFTS)
 - ✓ ENEN III on Nuclear Engineering
 - ✓ ENETRAP II on Radiation Protection
 - ✓ PETRUS II on Waste Management and Disposal
 - ✓ TRASNUSAFE on Nuclear Safety Culture
- Bilateral cooperation
 - ✓ EUJEP (Japan)
 - ✓ ENEN-RU (Russian Federation)
 - ✓ ECNET (China)

EFTS projects

- Projects on Euratom Fission Training Schemes 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 (2010-)

*ECTS and European MSc for Education;
WHAT for Training?*

ENEN-III Project on Nuclear Engineering

- FP7 Euratom Fission Training Schemes (EFTS)
- Three-year project: 2009 – 2012
- ECVET (European Credit system for Vocational Educational and Training) to be applied in the nuclear field?
- Four training schemes, as pilot subjects
 - ✓ Basic Nuclear Topics for Non-Nuclear Engineer
 - ✓ Design Challenges for Generation III NPP
 - ✓ Construction Challenges for Generation III NPP
 - ✓ Design Challenges for Generation IV Reactors
- 19 Partners in 12 countries, coordinated by the ENEN

Bilateral cooperation ECNET Project (China) -1

- Objective: to define a common basis to allow effective cooperation between the European and Chinese networks for nuclear E&T
- 2-year
- 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) -2

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

Bilateral cooperation ENEN/Japan

- Education, Audiovisual and Culture Executive Agency (EACEA)
- Two-year project: 2010 – 2012
- Exchange of Master students and faculty staff between 8 EU and 3 Japanese organisations (JAEA, TokyoTech and Kyoto University)
- From EU to Japan
 - 30 students for total 154 weeks
 - 10 faculty staff for total 19 weeks
- From Japan to EU
 - ✓ 30 students for total 180 weeks
 - ✓ 8 faculty staff for total 8 weeks

Bilateral cooperation ENEN/Russia

- To define a common basis to allow effective cooperation between the European and Russian networks for nuclear E&T
- 2-year project : 2011- 2012
 - 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
- ✓ ROSATOM
- ✓ National Research Nuclear University
 - ✓ - MEPhI
 - ✓ - Obninsk Technical University
- ✓ Research Institute for Nuclear Reactor, Dimitrovgrad
- ✓ Centre Institute for Continuing Education and Training, Obninsk

Future directions and perspectives

ENEN started as:

- A network among mainly universities and research centres
- In EU countries only
- For mainly Education at Master level + PhD level
- Plus, some activities on Training for young professionals
- Subject: mainly on Nuclear Engineering

Future directions and perspectives

The recent ENEN:

- More and more collaboration with the industry (e.g. Events, EFTS projects)
- Cooperation beyond EU (e.g. MoU, cooperation between networks, bilateral projects)
- More activities on Training for young professionals (e.g. EFTS projects, EUR course)
- Subject: not only Nuclear Engineering, but cover all nuclear disciplines (e.g. Waster management, radiation protection – EFTS, ENEN Database)

For further coordination of nuclear E&T over Europe and contribute to Nuclear Knowledge Management at the international level.

Summary:

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

- ✓ Developement 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

CONTACT
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NETWORK ASSOCIATION

<http://www.enen-assoc.org>