

European Nuclear Education Network ENEN, Ten years of experience.

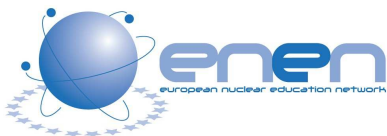
W. Ambrosini, J. Dies, P. Dieguez

IAEA, Vienna, May 2014.

Presented by:

Prof. PhD. Javier Dies

Professor Chair in Nuclear Engineering, UPC-Barcelona-Tech
Vice President European Nuclear Education Network Association



Javier.Dies@upc.edu

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

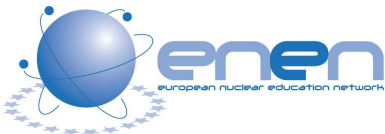
ENEN project in January 2002 – December 2003

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 2013

- 64 members: Universities, Research Centres, Industry located in 18 European Countries
- MoU concluded with:
 - IAEA
 - 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, Ispra, Italy
 - University Network of Excellence in Nuclear Engineering Canada
- Memberships/cooperation under discussion with

Signature of Practical Arrangements with IAEA



2009



2013

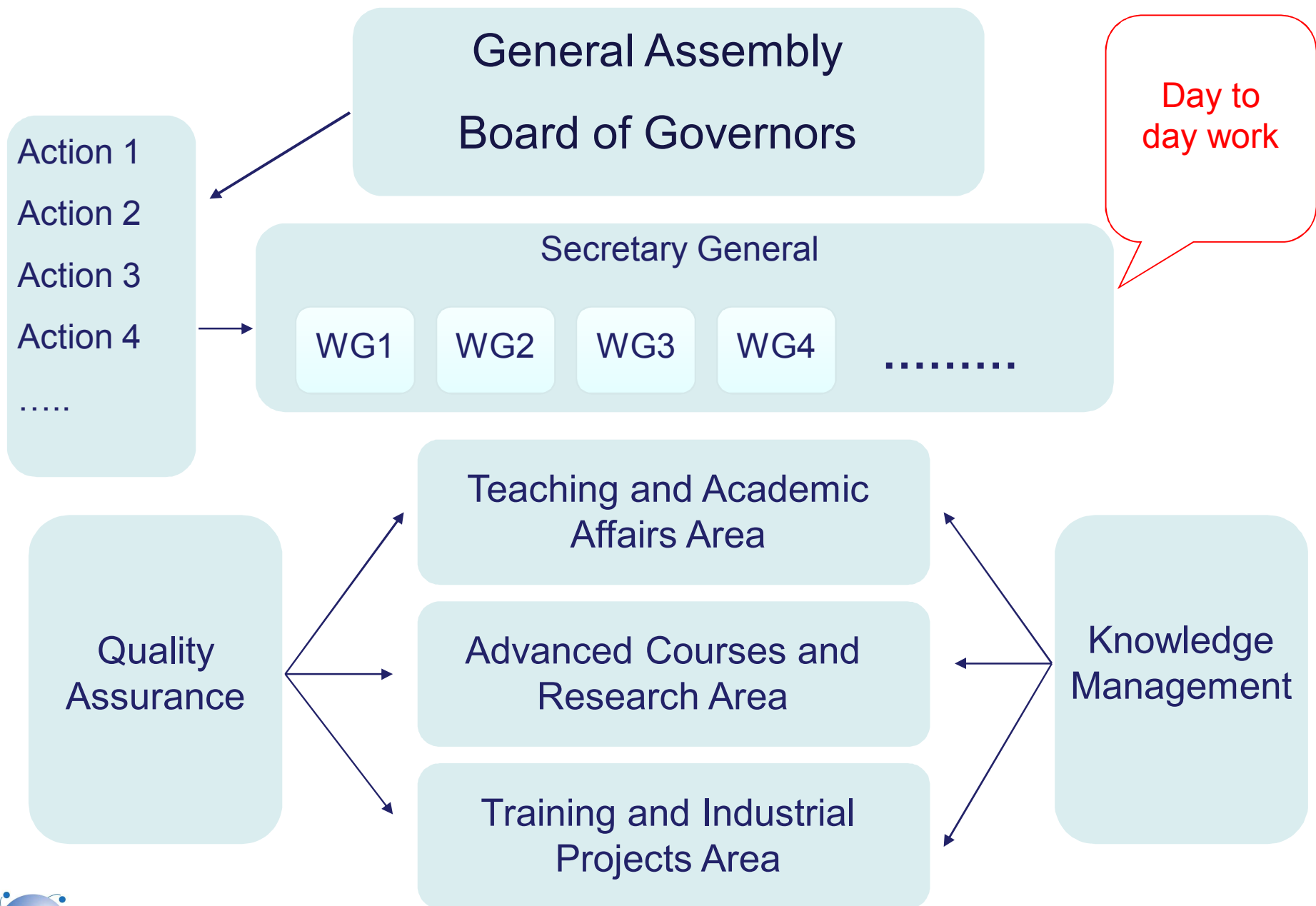
- “Promoting nuclear knowledge management, human resources development and capacity building in Europe through regional networking
- Sharing information and material in Europe between the IAEA and ENEN for the benefit of students and professionals
- Exploring opportunities to participate jointly in activities such as meetings, symposia, workshops
- Exploring opportunities for developing and sharing joint publications and material including e-learning contents”
- Other ...



Signature of Cooperation Agreement with other IAEA's regional networks AFRA-NEST, ANENT and LANENT



in September 2013



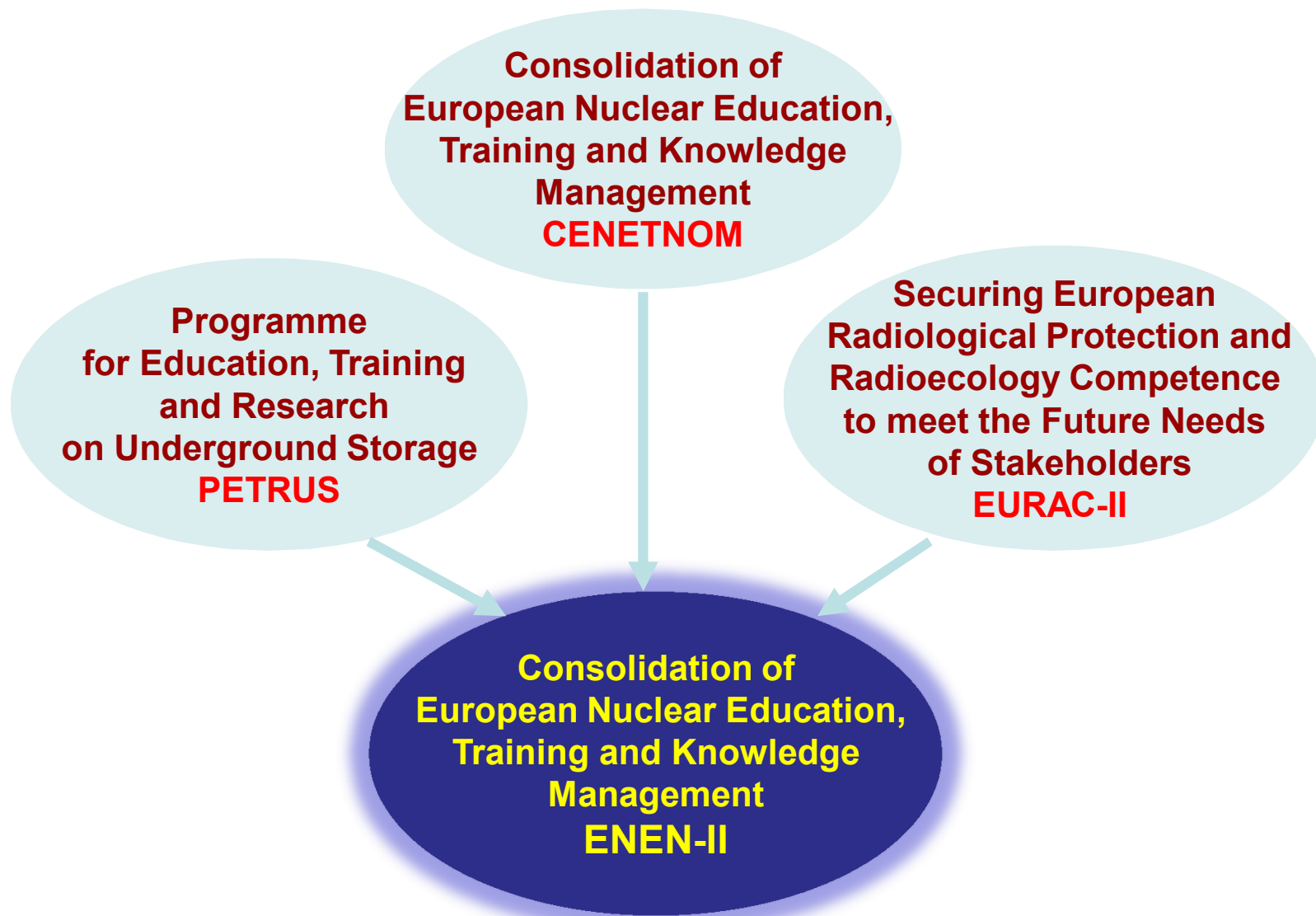
HISTORY and DEVELOPMENT

European Commission – EURATOM FP6

NEPTUNO project in Jan. 2004 – June 2006

- 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



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



**European Master of
Science in Nuclear
Engineering**
ENEN Certification

Nuclear Education by
the European Nuclear Education Network



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).
- 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

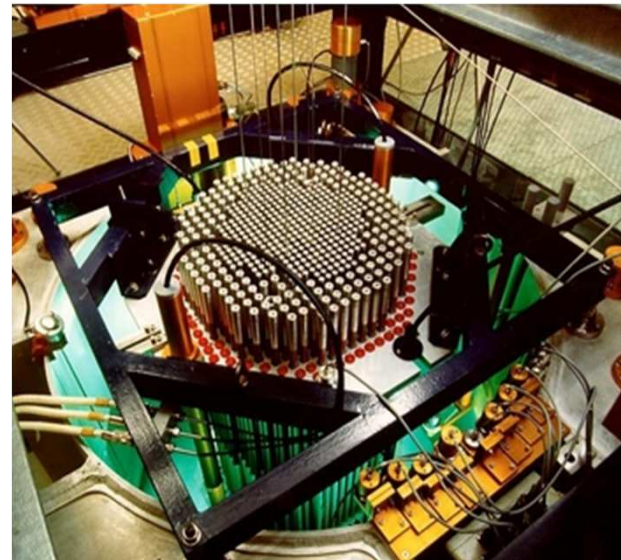


Students receiving the ENEN EMSNE certificate during the 56th General Conference of IAEA in Vienna, September 20th, 2012

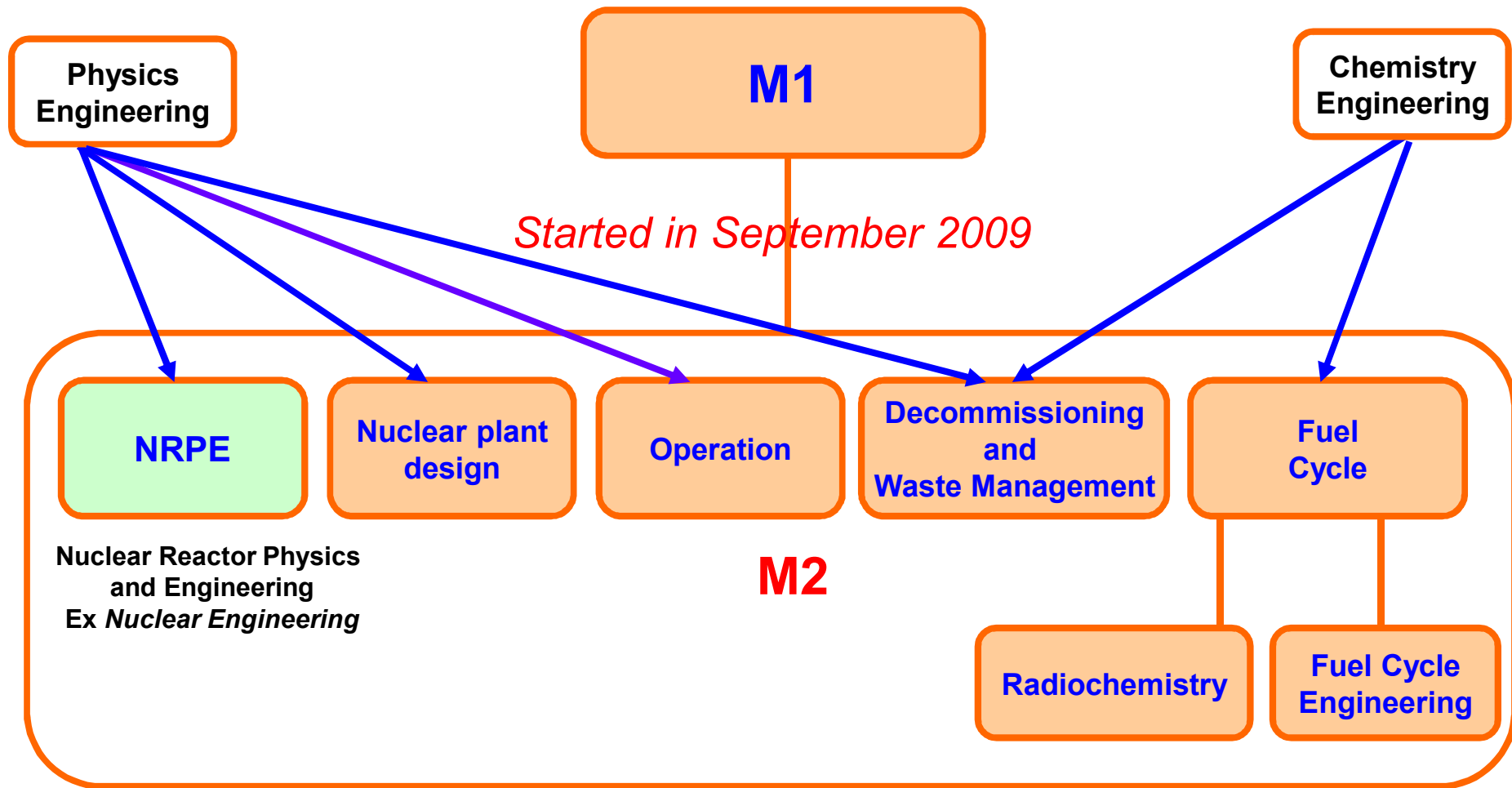
Master level: New Master in Switzerland

- 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

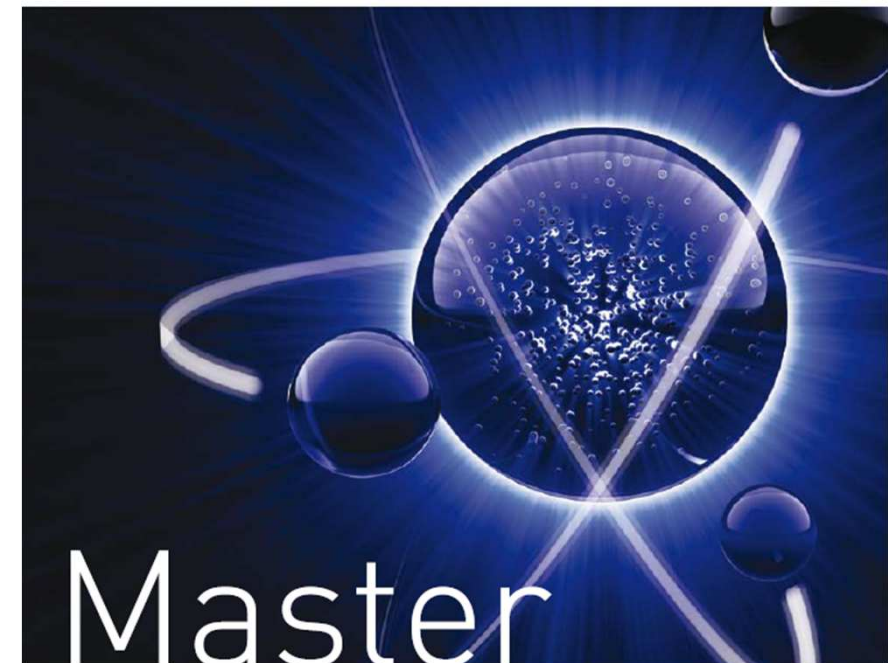


MASTER OF SCIENCES NUCLEAR ENERGY in France



Started in September 2011

1st Semestre	Fundamentals of Nuclear Engineering and Radiological Protection	Nuclear Power Plants	Fuel Cycle and Environmental Impact
2nd Semestre	Regulations and Safety	Management of Nuclear Power Plants	Elective Block
3rd Semestre	Internship and Master's Final Project		



Nuclear Engineering

1st Edition
2011-12



Escuela
de
Energía



European Master in Innovation in Nuclear Energy (EMINE)

- In the frame work of the European Institute of Technology –KIC InnoEnergy.
- **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)

European Master in Innovation in Nuclear Energy (EMINE)

- **30 Scholarships:**
 - 750 Euro/month, during 2 years.
 - Tuition fees

European Master in Innovation in Nuclear Energy (EMINE)

- **Academic partners:** Grenoble INP, UPC-Barcelona-Tech, Paristech, KTH, CEA
- **Industrial partners:** EDF, ENDESA, AREVA, Vattenfall
- Students from: France, Spain , USA, India, Lebanon, Argentina, China, Egypt, Indonesia, Italy, Mauritius, Ethiopia, Bangladesh. Montenegro, Germany, Poland.
 - <http://www.kic-innoenergy.com/emine/home/>

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

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

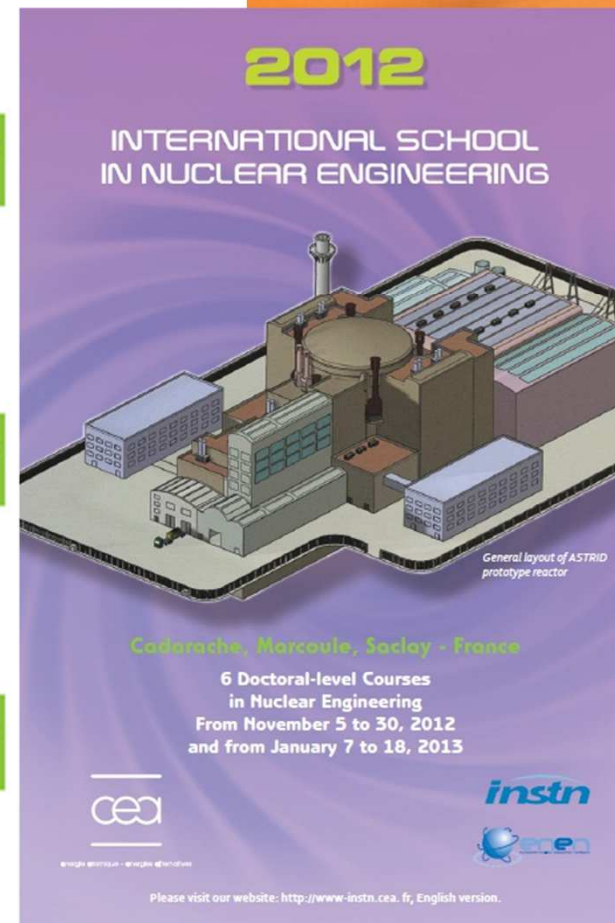
Nuclear Fuels for Light Water Reactors and Fast Reactors
Cadarache, November 26-30, 2012

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





ISaR

Training Courses

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





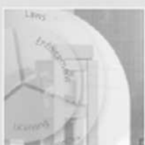



ISaR

Training Courses

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

Professional Training Programmes



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

CEA
instn
enen




©CEA/Casat R/H ©CEA ©CEA

TU Delft

JUNE 27th – JULY 8th 2011



FIRST
INTERNATIONAL COURSE
NUCLEAR CRITICALITY-SAFETY
2011 FRANCE



© CEA/Marcoule-DEN/A. Gornik/P. Dumas/ P. Stroppa

January 17th to 28th 2011

cea
instn
enen

Knowledge Management

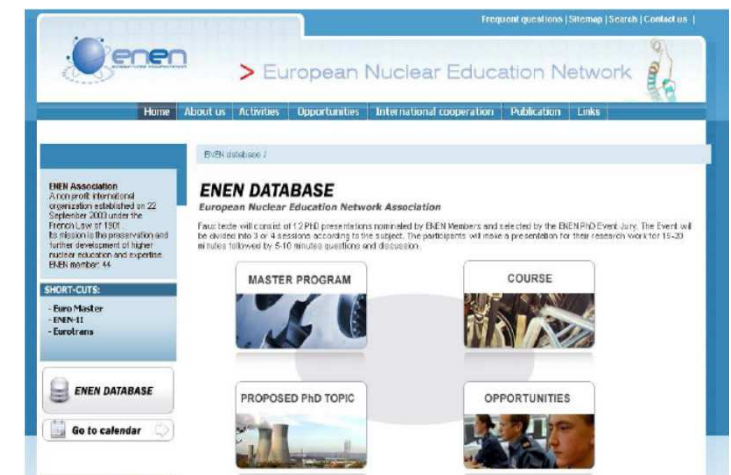
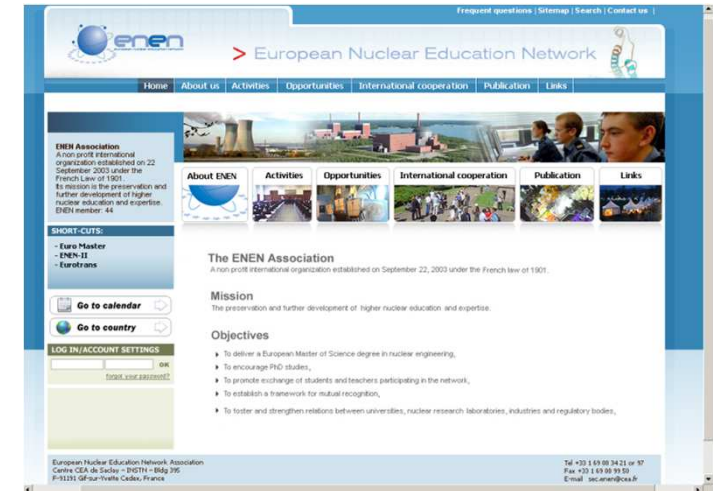
ENEN Website and Database

➤ ENEN Website

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

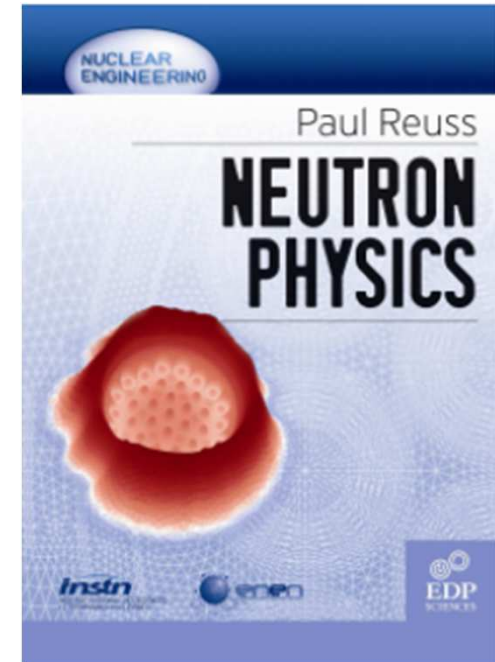
➤ A new ENEN Database

- E&T courses
 - Master program
 - PhD topics
 - Opportunities (scholarship, fellowship, internship, job opportunities)
- provided by ENEN Members and Partners*

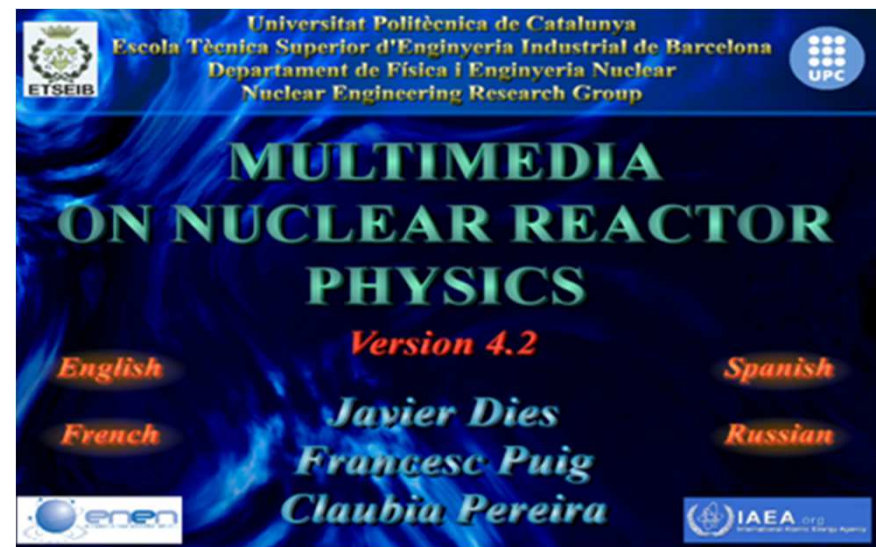


Knowledge Management ENEN publications

- **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



Ci CAREERS
INTERNATIONAL

Energy Excellence Event

Careers in nuclear, oil & gas

30 Nov - 1 Dec 2012 in Brussels

www.careersinternational.com

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, CIRTEN, 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

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***

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.

FP7 European Fission Training Schemes (cont'd)

Single Beneficiary of NUSHARE – Project for sharing and growing nuclear safety competence **from January 2013 to December 2016**

Focus on 3 target groups:

1) Policy Makers 2) Nuclear Regulatory Authorities 3) Industry

First phase: estimated duration: 16 months, Development of concepts and basic programmes (NUSHARE ETI Catalogue and Action Programme)

- **Stakeholders' Meeting** (Brussels, March 13-14, 2014) (see below)
- **Special Event**, with the aim of informing the public and the media about the NUSHARE Education, Training and Information programmes

Second phase: estimated duration up to 3 years
Execution of the proposed action program,
including pilot courses and actual course delivery



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

CONTACT
EUROPEAN NUCLEAR EDUCATION
NETWORK ASSOCIATION

Tel +33 1 6908 9757

Fax +33 1 6908 9950

Email sec.enen@cea.fr

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

4. Benefits for Members

Benefits participating in EU projects

- ENEN-II
- ENEN-III
- ENEN-RU , Cooperation with Russia
- Cooperation with China ECNET
- EACEA EUJEP project EU - Japan Exchange
- PETRUS –II
- ENETRAP
- NUSHARE

Beneficies of ENEN

- You attend to ENEN meeting you know:
 - professors around Europe in nuclear engineering.
 - Stake holders in nuclear education
 - You can share nuclear education material.
 - You can organize a course in collaboration.
 - You can invite a professor for a conference about one nuclear topic.
 - You can chose a international professor in order to evaluate professors in your university.
 - You can start new educational and researches projects because you know future partners candidates.

Beneficies of ENEN

- I learned in ENEN that is very important to collaborate Universities and Industries and stakeholders.
 - developing a master program in nuclear engineering.
 - in the academic board industries, academics, others
 - lectures from the industry.
 - technical visits
 - use full scope nuclear power plant simulators
 - funding part of the program.
 - contracting the nuclear engineers produced.
 - Organizing the internships.

Benefits from ENEN

- Using ENEN data base I can do diffusion of:
 - Your university Masters
 - Your training courses.
- ENEN data base 100.000 visitors/month

Benefits from ENEN

- Benchmarking nuclear engineering curriculum for:
 - Nuclear engineering masters programs
 - Nuclear engineering majors programs.
 - Some times universities professors want to do lectures about what they like, not about what is needed in nuclear engineering program.