



The European Nuclear Education Network: working areas and experience of cooperation

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ATOMEXPO 2015

**Round Table «Methods and mechanisms of international cooperation to support
E&T for sustainable nuclear power development»**

Moscow, Russian Federation, June 1st, 2015



General information on ENEN

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



THE ENEN ASSOCIATION

The European Nuclear Education Network is

***a non-profit international organization established on
22 September 2003 under the French Law of 1901***

***Its mission is the preservation and further development of expertise
in the nuclear fields by higher education and training through:***

- promotion of networking for education and training in Europe
- favouring borderless mobility of students and teachers
- providing attractiveness for young and motivated students
- leading relevant EU Projects for E&T and R&D among which EFTS
- qualifying itself as a reference institution for the cross-cutting issue of E&T in the nuclear fields: **a “bridge” academia ↔ stakeholders**

***ENEN presently involves Universities or University clusters,
Research Institutions, Industrial Bodies
and International Agencies or Societies***

ENEN Members

List of Members of ENEN

The following European institutions are members of ENEN with voting rights at the General Assembly:

1	Atominstytut der Oesterreichischen Universitaeten	ATI	Vienna	Austria
2	Belgian Nuclear Research Centre	SCK•CEN	Mol	Belgium
3	Ghent University	UG	Ghent	Belgium
4	Katholieke Universiteit Leuven	KUL	Leuven	Belgium
5	Université Catholique de Louvain	UCL	Louvain-la-Neuve	Belgium
6	Université de Liège	ULG	Liege	Belgium
7	Université Libre de Bruxelles	ULB	Brussels	Belgium
8	Vrije Universiteit Brussel	VUB	Brussels	Belgium
9	Westinghouse Electric Company	WEC	Brussels	Belgium
10	CV Rez	CVRez	Prague	Czech
11	Czech Technical University in Prague	CTU	Prague	Czech
12	Aalto University School of Science and Technology	AALTO	Helsinki	Finland
13	Lappeenranta University of Technology	LUT	Lappeenranta	Finland
14	AREVA	AREVA	Paris	France
15	CEA/INSTN Centre d'Etudes de Saclay	CEA/INSTN	Saclay	France
16	Centre National de la Recherche Scientifique	CNRS	Paris	France
17	Ecole des Mines de Nantes	EMN	Nantes	France
18	Institut National Polytechnique de Grenoble	INPG	Grenoble	France
19	Institut Régional Universitaire Polytechnique	IRUP	Saint Etienne	France
20	Institut Supérieur des Techniques de la Performance	ISTP	Saint Etienne	France
21	Université de Lorraine	ULR	Nancy	France
22	Institute of Nuclear Fuel Cycle, RWT Aachen University	INBK	Aachen	Germany
23	Karlsruhe Institute of Technology	KIT	Karlsruhe	Germany
24	Ruhr Universität Bochum	RUB	Bochum	Germany
25	Technische Universitaet Muenchen	TUM	Munchen	Germany
26	Universitaet Stuttgart	IKE	Stuttgart	Germany
27	J. W. Goethe Universität	IAPFU	Frankfurt	Germany

ENEN Members

25	Technische Universitaet Muenchen	TUM	Munchen	Germany
26	Universitaet Stuttgart	IKE	Stuttgart	Germany
27	J. W. Goethe Universität	IAPFU	Frankfurt	Germany
28	Aristoteles University	AUTH	Thessaloniki	Greece
29	Budapest University of Technology and Economics	BME	Budapest	Hungary
30	Consorzio Interuniversitario per la Ricerca Tecnologica Nucleare	CIRTEN	Pisa	Italy
31	SOGIN	SOGIN	Rome	Italy
32	AGH-University of Science and Technology	AGH	Krakow	Poland
33	Instituto Superior Tecnico	IST	Lisbon	Portugal
34	National Institute "Horia Hulubei"	IFIN-HH	Bucharest	Romania
35	University Politehnica Bucharest	UPB	Bucharest	Romania
36	Slovak University of Technology in Bratislava	STU	Bratislava	Slovakia
37	Jozef Stefan Institute	JSI	Ljubljana	Slovenia
38	University of Ljubljana	UL	Ljubljana	Slovenia
39	Technical University of Catalonia - Barcelona Tech	UPC	Barcelona	Spain
40	TECNATOM	TECNATOM	San Sebastián de los Reyes	Spain
41	Universidad Nacional de Educacion a Distancia	UNED	Madrid	Spain
42	Universidad Politecnica de Madrid	UPM	Madrid	Spain
43	Chalmers University of Technology	CUT	Goteborg	Sweden
44	Royal Institute of Technology	KTH	Stockholm	Sweden
45	Uppsala Universitet	UU	Uppsala	Sweden
46	Swiss Federal Institute of Technology Lausanne	EPFL	Lausanne	Switzerland
47	Swiss Federal Institute of Technology Zürich	ETH	Zurich	Switzerland
48	Delft University of Technology	DUT	Delft	The Netherlands
49	Imperial College London	ICL	London	United Kingdom
50	University of Birmingham	UB	Birmingham	United Kingdom
51	University of Central Lancashire	UCLAN	Preston	United Kingdom
52	University of Manchester	UM	Manchester	United Kingdom
53	Univesity of Hertfordshire	UH	Hatfield	United Kingdom

ENEN Members

The following institutions from outside Europe are considered ENEN Member, without voting rights at the General Assembly, by concluding a Memorandum of Understanding:

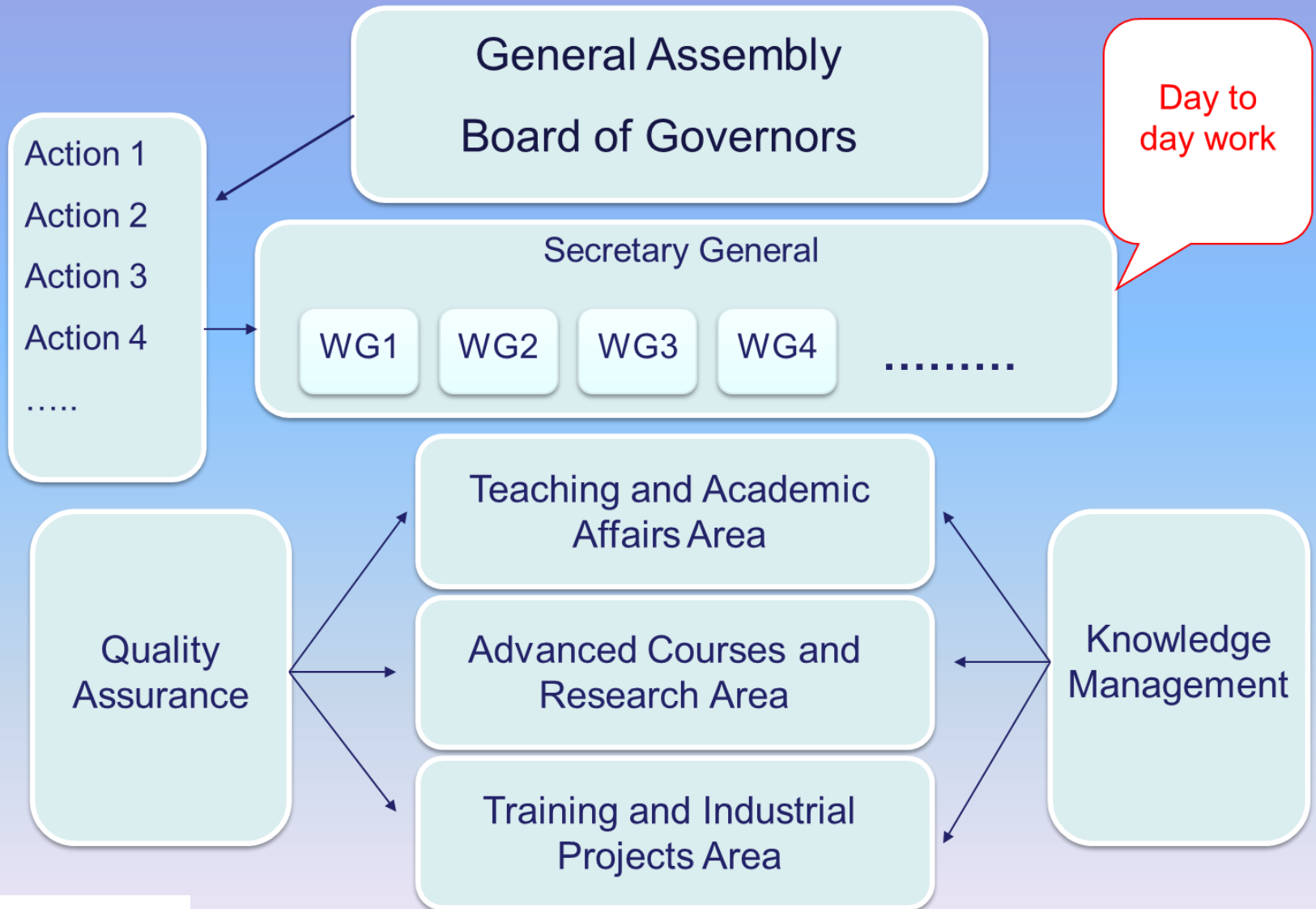
54	Japan Atomic Energy Agency	JAEA	Tokai	Japan
55	Tokyo Institute of Technology	TokyoTech	Tokyo	Japan
56	University of Fukui	FUKUI	Fukui	Japan
57	Central Institute for Continuing Education and Training	CICET	Obninsk	Russia
58	Moscow Engineering Physics Institute (State University)	MEPhI	Moscow	Russia
59	North West University	NWU	Potchefstroom	South Africa
60	Odessa National Polytechnic University	ONPU	Odessa	Ukraine
61	V. N. Karazin Kharkiv National University	KKNU	Kharkiv	Ukraine

The following international institutions are considered ENEN Member, without voting rights at the General Assembly, by concluding a Memorandum of Understanding:

62	International Atomic Energy Agency	IAEA	Vienna	Austria
63	European Nuclear Society	ENS	Brussels	Belgium
64	University Network of Excellence in Nuclear Engineering	UNENE	Ontario	Canada
65	Joint Research Centre of the European Commission	JRC	Europe	Europe
66	World Nuclear University	WNU	London	United Kingdom

All these 66 institutions from 18 EU Countries + World benefit at different extents of the existence of ENEN and of its actions

ENEN Structure



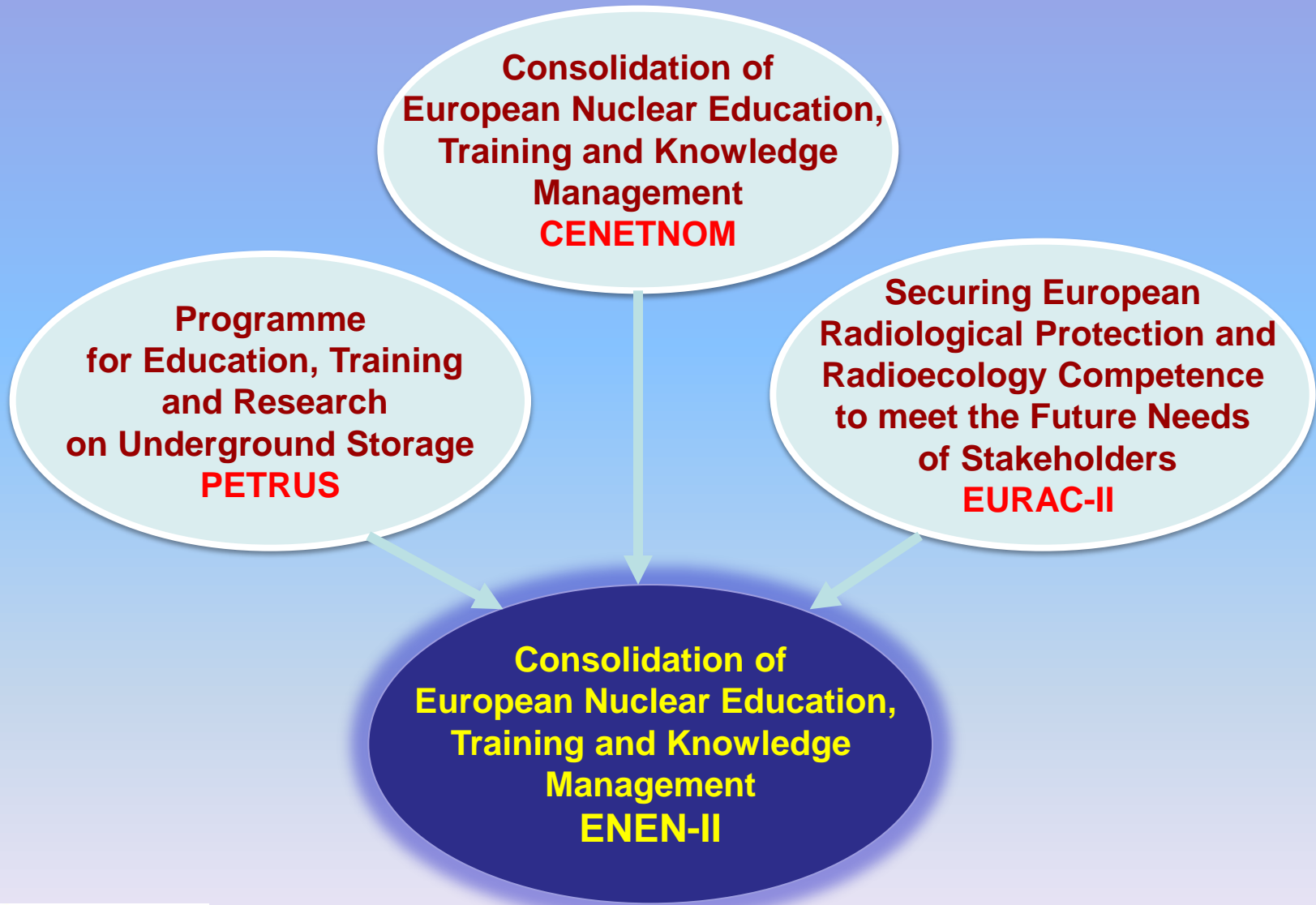
HISTORY and DEVELOPMENT

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

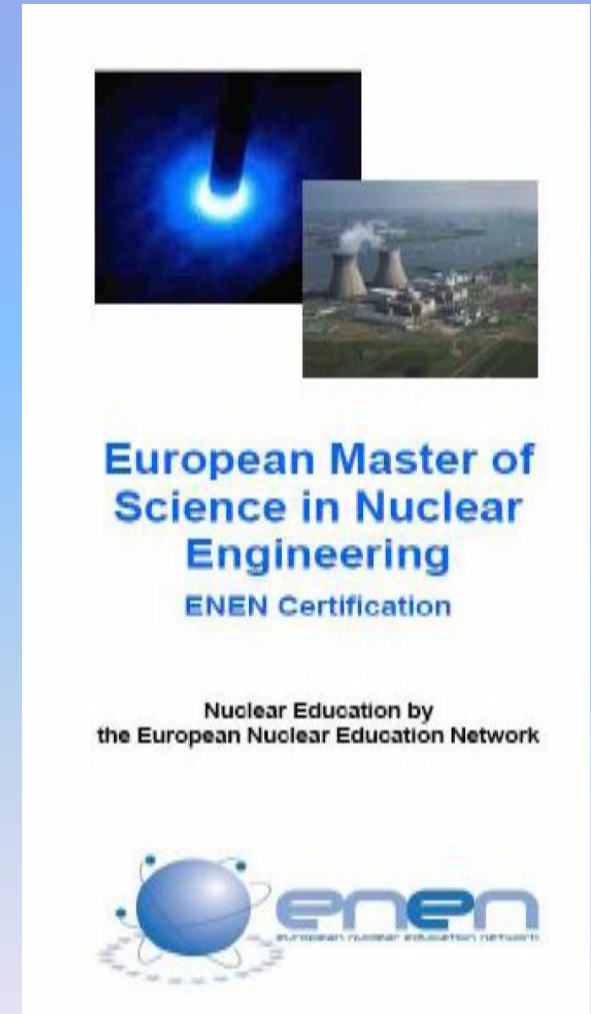
ENEN-II project Oct. 2006 – March 2009



MAIN ACHIEVEMENTS

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 300 ECTS at university level
- At least 60 ECTS must be “purely nuclear”
- 20 ECTS must be obtained from a “foreign” institution, member of the ENEN Association
- Master thesis

Latest EMSNE Award Ceremony



Students receiving the ENEN EMSNE certificate during the during the 58th General Conference of IAEA in Vienna, September 25th , 2014

Promotion of Activities at ENEN Members

- *Master in Switzerland*
- *Master of Sciences Nuclear Energy in France*
- *Master in Nuclear Engineering at UPC Barcelona (EMINE)*
- *EMINE Master under KIC InnoEnergy (UPC, KTH, Grenoble, Paris)*
- *PhD Level Courses*
- *Training Courses*

PhD level: Annual ENEN PhD Event

- One-day event during an international conference
- 12-14 PhD students
- ENEN Prize and 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
 - 8th PhD event, 8th International Youth Congress, IYNC2014, Burgos, Spain from 9 – 10 July 2014
 - **9th ENEN PhD Prize & Event in the framework of the International Congress on Advances in Nuclear Power Plants (ICAPP) 2015 in Nice, France, 5-6 May 2015.**



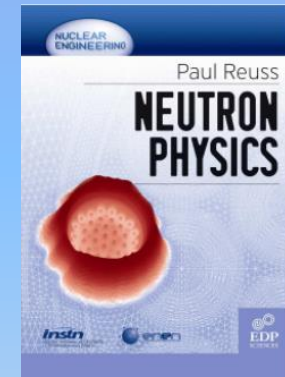
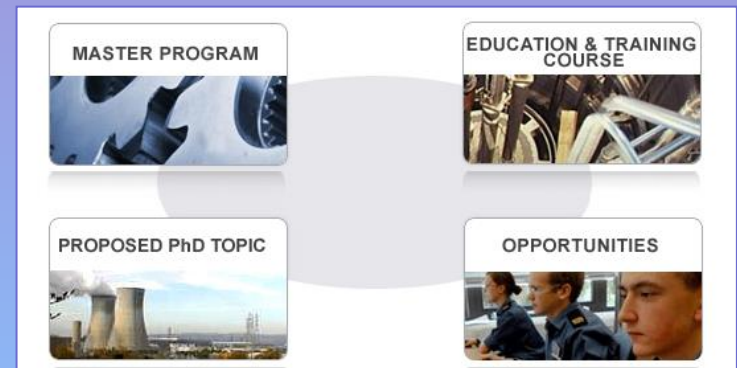
Knowledge Management ENEN publications and Database

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.



Further European Projects

FP7 European Fission Training Schemes

Common certificate for professionals at European level

Participation in TRASNUSAFE - Nuclear Safety Culture: addressing mainly the health physics sector (November 2010 - October 2014)

Coordination of ENEN III - Training schemes for Generation III and IV engineers: addressing mainly the nuclear systems suppliers (May 2009 – April 2013) – **Use of ECVET system**

Participation in ENETRAP II - European Network on E&T in Radiological Protection: addressing mainly the nuclear safety authorities (March 2009 - December 2012)

FP7 European Fission Training Schemes (cont'd)

Participation in PETRUS II and III - Implementing sustainable E&T programmes in the field of Radioactive Waste Disposal: focus on a “Competency-Based Curriculum” (January 2009 – January 2012, August 2013 – July 2016)

Single Beneficiary of NUSHARE – Project for sharing and growing **nuclear safety competence**: focus on 3 target groups (policy makers, nuclear regulatory authorities, industry) (January 2013 – December 2016)
– **TO BE DISCUSSED in the POST-FISA WORKSHOP #2**

Cooperation beyond EU (FP7)

Coordination of ENEN-RU and ENEN RU II - Cooperation with Russia in Nuclear Education, Training and Knowledge Management: focus on the mobility of teachers and students (November 2010 – October 2012) and (2014 – 2016)

Coordination of ECNET - Cooperation with China in Nuclear Education, Training and Knowledge Management: focus on the mobility of teachers and students (November 2010 – October 2012)

Bilateral Cooperation between Industrialised Countries (EACEA)

EUJEP - Project (Japan), now renewed as EUJEP 2

Foster, organize and implement exchanges of European and Japanese Master level students with mutual recognition of credits



OTHER PROJECTS INVOLVING ENEN

- **FP6 EUROTRANS** Project *EUROpean Research Programme for the TRANSmutation of High Level Nuclear Waste in an Accelerator Driven System* (2005 – 2010)
- **FP7 CORONA and H2020 CORONA II** Establishment of Regional Center of Competence for VVER Technology and Nuclear Applications (2011 – 2014)
- **FP7 CINCH-II** - Cooperation in education and training In Nuclear Chemistry: focus on the European master's degree in nuclear and radiochemistry (June 2013 – May 2016)
- **FP7 EUTEMPE-RX** - EUropean Training and Education for Medical Physics Experts in Radiology: (September 2013 – August 2016)
- **FP7 GENTLE** - Graduate and Executive Nuclear Training and Lifelong Education (January 2013 – December 2017)
- **FP7 PELGRIMM**: PELlets versus GRanulates: Irradiation, Manufacturing & Modelling (2012 – 2015)

Acknowledgement by the EU Council (1-2 December 2008)



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.

Signature of Practical Arrangements with IAEA



2009



2013



HEARING AT THE EU PARLIAMENT

On February 12, 2014, ENEN was invited to participate in the hearing on the new nuclear safety directive, at the committee on industry, research and energy (ITRE), in the EU parliament

ENEN defended the support to the Education and Training in the nuclear field as a necessary contribution to assure the Nuclear Safety throughout Europe and beyond, together with the promotion of a healthy Nuclear Safety Culture

ENEN described the NUSHARE Project, as a service to the European citizens, aiming at enhancing and better spreading nuclear safety culture principles, in line with the emphasis on this aspect in the proposed amendments to the new “nuclear safety directive”.

<http://www.enen-assoc.org/en/about/the-10th-birthday-enen1.html>



A HORIZON 2020 PROPOSED PROJECT IN THE WAITING LIST

ANNETTE
**Advanced Networking for Nuclear Education and Training
and Transfer of Expertise**

Proposed logo:



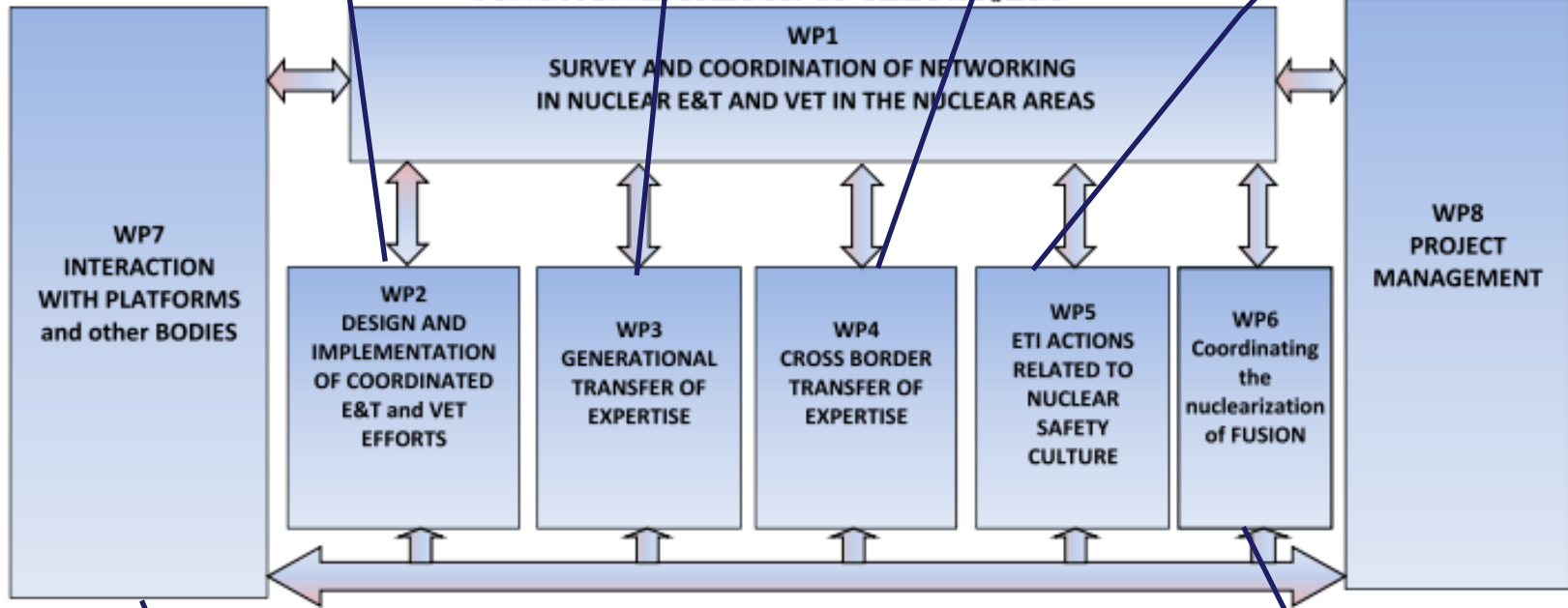
Master and Summer School for CPD

Production of teaching material

ECVET application in industry

Initiatives for NSC enhancement

FUNCTIONAL SKETCH OF THE PROJECT



Contacts with Platforms, etc.

FuseNet asked to join to coordinate «nuclearization»

A POSITIVE DYNAMICS ALREADY STARTED

- Joint E&T actions in NS&E, RP, WM and GD are envisaged
- The idea was proposed to **MELODI** and **IGD-TP**, receiving an early endorsement; **EHRO-N** also supported it and recently we received endorsements from **SNE-TP**, **FORATOM** and **ENS**, the **GENTLE** project, **ESARDA**, together with the **NUGENIA** label
- Colloquia with **IAEA** revealed **the large potential for extending this action beyond European borders in due time**
- The joining of **FuseNet** testifies for a further need of jointness in managing existing interfaces FUS-FISS

IMMEDIATE FRUITS OF THE POSITIVE DYNAMICS

- On February 12, 2015 in Culham, UK, signature of a MoU with



IMMEDIATE FRUITS OF THE POSITIVE DYNAMICS

- **The ENEN Honorary Membership in NUGENIA**



- **Just in these days we are filling this promising slot of activities with sound common actions**

Why we are here ...

**WITHIN ALL THIS COORDINATING EFFORT
RUSSIA AND EU NOW LOOK AT EACH OTHER**

ENEN-RU II PROJECT

***“Strengthening of Cooperation and Exchange
for Nuclear Education and Training
between the European Union and the Russian Federation”***

***The entire project consist of two parallel projects on the
EU side and the Russian side***



ENEN-RU II

Why such a project ?

- **Nuclear energy encourages mankind to develop unity of intents and cooperation: it is by nature “unifying” because it is so powerful**
- **As such, it stimulates to join into “win-win” actions**
- **Enhancing SAFETY and assuring the future nuclear workforce requires sharing resources in E&T and harmonising our views by learning from each other**

ENEN-RU II

Selected objectives

- **To establish the criteria for mutual recognition at BSc, MSc and training levels (WP1)**
- **To establish the ENEN-RU E&T Forum to discuss short and long term common strategies (WP2)**
- **To exchange students and teachers at MSc and PhD level, making use also of distant learning tools (WP3)**
- **To enable joint training activities (WP4)**
- **Further develop a database for E&T Facilities, Laboratories and Equipment (WP5)**

ENEN-RU II

A project to be made real...


- **Joining our efforts in mutual benefit is now possible**
 - ✓ **we have a sound bilateral frame of cooperation**
 - ✓ **distances are nowadays becoming immaterial for students and teachers**
 - ✓ **web-based means favour knowledge transfer**
 - ✓ **openness is a mutual benefit: we teach and learn at the same time**
 - ✓ **students and trainees will be eager to mix and share expertise**

***WE ARE BUILDING SOMETHING VALUABLE AND DURABLE.
LET'S CATCH THIS GREAT OPPORTUNITY !!!***



Спасибо за внимание !

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