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The ANS Globe

...e-news from the ANS International Committee

From the editors

The ANS Globe is the Bulletin of the American Nuclear Society's International Committee. *The ANS Globe* has as its mandate the dissemination of news of international interest to International Committee members and to others.

We would like to keep *The ANS Globe* current and relevant. Please send us your letters, articles, news and/or comments for consideration towards the next issue.

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From the Chair

Dear Friends,

Nuclear power is in the midst of yet another challenging year, and nuclear societies around the globe are again poised to play a leading role in response these tests. As the safest generation of reactors are being constructed around the world, cancellations and shutdowns for safety and financial reasons persist. The economy and electricity prices remain out of our control while the safety challenges are the direct responsibility of us all.

The latest, greatest challenge we face may be the recent falsification of safety-related equipment that led to reactor shutdowns and is causing a country-wide power shortage impacting every citizen and business in Korea. Equipment and engineering problems in the U.S. has led to reactor closures, delays or cancellations of new reactors and power uprates, leaving this country with only 100 reactors for the first time since the early 90s. Nuclear professionals all play a critical role in the promotion and execution of a safety culture that protects the public and instills confidence. This role is more important today than ever, as the new generation of safer reactor technologies seeks to build momentum for the future.

As reported by “Nuclear News”, the scope of the so-called *renaissance* has shrunk considerably. It will be up to us to ensure that the future of nuclear energy is safer, more reliable, and more competitive that it has been in the past.

Best Regards,
Corey McDaniel

The ANS International Committee's Web Page

Visit the enhanced ANS International Committee's Section on the ANS website, located at <http://www.ans.org/const/international>. It includes:

- Background information about the ANS International Committee
- Connections to ANS International Local Sections
- An overview of Society alliances with international organizations (INEA, INSC, and PNC), along with contact information
- Connections to 30 ANS Agreement Societies/Organizations, and
- Current/back issues of *The ANS Globe*, which features ANS International Committee activities and related items.

News from Sister Societies and International News

● **Austrian Local Section**

Dr. Andreas Kronenberg, contact for the ANS Austria Section, sent the following report.

The Institute of Nuclear Materials Management (INMM) organized the International Science and Engineering Fair 2013, which will have been over by the time of issue of this *ANS Globe*.

This International Science and Engineering Fair was held 2013 March 23 at the International Vienna School. The theme of the Fair was Energizing Future Generations.

In brief, the main rules of the Fair were:

- Each project may have up to three team members. A student may enter only one project; a student can be a team member of only one project;
- The project must be the work of the team members alone. Participants can obtain guidance from others, but the participants must do the work themselves;
- Projects involving human subjects, vertebrate animals, pathogenic agents, controlled substances, hazardous chemicals or devices, human/animal tissue or recombinant DNA must be approved by the Fair's Science Review Committee;
- All projects entered in the Fair must include a display. All project displays must be accompanied by a report. The text of the report should be less than 10,000 words in length.
- The report should be written in English. (Reports from the French, Japanese or Russian Schools may be submitted in French, Japanese or Russian respectively as long as they are accompanied by a summary in English.);
- An Awards Banquet will be held on the Wednesday following the Fair.

Dr. Kronenberg reports also that he was planning to get the historic table on which Hahn & Strassmann discovered fission (see picture), and hoped that it could be shown at

the IAEA HQ during the Board of Governors meeting (end of the year). It could be standing in the exhibition area where everyone works by.



[Canadian Nuclear Society \(CNS\) \(http://www.cns-snc.ca\)](http://www.cns-snc.ca)

The Canadian Nuclear Society is gearing up to hosting the 19th PBNC Conference (PBNC-2014), 2014 August 24-28, in Super Natural Vancouver, British Columbia, Canada - <http://www.pbnc2014.org>. The theme of PBNC-2014 is “Fulfilling the Promise of Nuclear Technology Around the Pacific Basin in the 21st Century”. The Call for Papers, the start of a Draft Program, and the registration and accommodation links are already posted on the Conference website.



The CNS is also planning several other major conferences scheduled for the next 2 years:

- 34th Annual Conference of the CNS and 37th Annual CNS/CNA Student Conference, 2013 June 9-12, Toronto, Ontario, Canada - <http://www.cns-snc.ca/events/2013conf/>
- Nuclear Education and Outreach Workshop 2013 (NEO-2013), 2013 August 19-20, Hamilton, Ontario, Canada - <http://www.cns-snc.ca/events/neo2013/>
- 12th International Conference on CANDU Fuel, 2013 September 15-18, Kingston, Ontario, Canada - <http://www.cns-snc.ca/events/12th-iccf/>
- 10th International Conference on CANDU Maintenance, 2014 May 25-27, Toronto, Ontario, Canada - <http://www.cns-snc.ca/events/cmc-2014/>
- 36th Annual Conference of the Canadian Nuclear Society and 39th CNS-CNA Student Conference, Saint John, NB, Canada, 2015 May 31-June 3 – www.cns-snc.ca

- **France**

The French Young Generation Group (www.sfenjg.org) is organising its “Atoms for the Future 2013” event, to be held October 21-24, 2013. This will include 2 days of visits to sites (e.g., the Dampierre NPP), and 2 days of lectures in Paris, e.g., on Comparison of Different Electricity Sources, Offer & Demand Equilibrium, Load Follow from the Operator Point of View, and others.

- **India**

The Indian Nuclear Society (INS) is organizing its annual conference (INSAC-2013) for December 16-18, 2013 at NPCIL auditorium, Mumbai. The theme of the conference will be “Societal Benefits of Radiation Technology”.

The ANS India Section is organizing its annual safety summit with INS for January 21-22, 2014 at IIT-Bombay, Menzes Center. The theme of the summit will be “Safety Standards for a Safer Supply Chain”.

Included below a few photos of the granting of the Eleventh Indian Nuclear Society Awards in November 2012.

High Technology Nuclear Related Areas

Shri R.K. Patil, Associate Director (C), E & I Group, BARC



Nuclear Science Education Award

Prof. H.S. Hans, Formerly of Punjab University, Chandigarh



INS Young Scientist/ Engineer Award

Shri Kumar Vaibhaw, NFC, Hyderabad



Ms. Shamim Siddiqui, RAPS-5&6, NPCIL



- [Morocco](#)

[Prof. Oum Keltoum Bouhelal](#), of the École Nationale de l'Industrie Minérale (ENIM) sends the following report:

2013:

Six representatives of Moroccan institutions in higher education in science and technology, including ENIM, were winners of the U.S. Department of State's Partnership for Nuclear Security (PNS/CRDF) competition titled "*Moroccan Nuclear Security Curriculum Development Study Tour and Train-the-Trainer Grant Competition*". The goal of this competition was to support ongoing efforts to develop a nuclear-security curriculum at Moroccan universities.

The program started with the visit from January 28 to February 14, 2013 of four US university leaders in nuclear security education programs: University of Tennessee (UT/INS- Institute for Nuclear Security) & Oak Ridge National Laboratory (ORNL & ORAU/Oak Ridge Associate Universities), North Carolina State University (NCSU/PULSTAR Nuclear Reactor Program), University of Texas – Austin (UT&A/NETL Nuclear Engineering Teaching Lab), University of Georgia (CITS-Center for International Trade and Security).

As second step of the PNS/CRDF program, the organization of a train-the-trainer workshop in each Moroccan institution gave an opportunity to present the outcomes of the study tour and discuss with Moroccan teachers about means to improve the teaching of nuclear security and build relevant knowledge in this field in the existing Moroccan institutions in higher education.

The ENIM workshop "*Nuclear Security Of Installations And Personnel- Education Materials Implementation*", held on May 15-16, 2013, addressed the relevance of the topics to be addressed, emphasizing the context and the objective of the workshop through the PNS/CRDF program and the fact that ENIM is a highly-ranked High Education Engineering School, and such an initiative could be easily achievable.

The distinguished invited speaker, Dr. Igor Khripunov, of CITS-University of Georgia, gave presentations on "Nuclear Security Summits: from Washington and Seoul to the Hague", "The Legal Framework for Nuclear Security", "Introduction to Nuclear Security", and "Radiological Events". The invited speakers from the Moroccan Center of Radiation Protection presented the Moroccan experience in regulatory control and risk assessments and how to prevent events. This was followed by the panel "Teaching Materials on Security and Risks at ENIM – Introducing Nuclear Security Concepts", the purpose being how to pedagogically include items on nuclear security issues related to technology, economy and the law into the existing ENIM education curricula. The valuable presentations and debate led to the following main recommendations: to include in a non-formal way nuclear-security concepts in specific existing courses (Nuclear Energy, Energy Management, Security & Environment Management, Risks Assessment) and to design a curriculum on Security in Engineering that includes a significant portion of nuclear security, with the support of specialists and international cooperation.

Thursday May 16, was devoted to the visit of the Nuclear Center of la Maâmora, CENM: the Safety & Security Department and the TRIGA Reactor Module, and the visit of the National Centre of Radioprotection, CNRP, both accompanied by extensive explanations and comments by the safety and security staff.

The workshop was sponsored by the Moroccan National Center for Scientific and Technical Research CNRST. At the end of the workshop, the participants expressed their satisfaction about its benefit and outcomes.



The Moroccan Group at the University of Georgia

2012:

ENIM co-organized with the CREDEN (French Centre for Research in Economics and Energy Law) the *7th International Symposium MONDER on "Energy Financing and Sustainability Challenges"*, May 28-30, 2012, Royal Mansour Hotel, Casablanca. The workshop was sponsored by the Moroccan Ministry of Energy & Mines MEMEE, the French IFP Energies Nouvelles, the CFE (French Energy Council), the Moroccan Ministry of Foreign Affairs MAEC, and the local agencies MASEN, SIE, CNRST, IRESEN. Topical sessions, on major challenges posed by the availability of energy resources, financing, and security of supply were animated by key speakers from the MONDER network (Europe, Latin America, Menas, Africa). The safety& security issues of developing nuclear power as an alternative to fossil energy, especially in newcomer countries, were widely discussed.

- [OECD Nuclear Energy Agency \(http://www.nea.fr\)](http://www.nea.fr)

[Nuclear Safety Defence in Depth](#)

At its 18-19 October meeting the NEA Steering Committee for Nuclear Energy held a policy debate on Nuclear Safety Defence-in-Depth. Speakers included [Dr. C.S. Kang](#),

Chairman of the Nuclear Safety and Security Commission (Republic of Korea), [Dr. M. Weightman](#), HM Chief Inspector, Nuclear Installations Inspectorate (United Kingdom), Commissioner [W.D. Magwood IV](#), Nuclear Regulatory Commission (United States) and [Mr. L. Stricker](#), Chairman of the World Association of Nuclear Operators (WANO). Participants in the debate recognised that the concept of defence-in-depth is valid, but that issues have been raised post-Fukushima regarding its implementation which needs to be further reviewed and improved. They stressed that responsibility for safety lies with the operator, but that the regulator has an important role to play in ensuring that the barriers in place to protect the public and the environment remain effective. The fundamental importance of a robust safety culture was also highlighted.

[Information Exchange on Occupational Exposure](#)

On 12-16 November, the NEA celebrated the 20th anniversary of the Information System on Occupational Exposure (ISOE) with a series of meetings in Paris. Launched by the NEA in 1992, the ISOE programme improves the management of occupational exposures at nuclear power plants through the collection and analysis of occupational exposure data and trends, and through the exchange of lessons learnt among utility and national regulatory authority experts. Since 1993, the International Atomic Energy Agency (IAEA) has co-sponsored the programme, thus allowing the participation of utilities and authorities from non-NEA member countries. Further information on the ISOE programme is online.

[Carbon Costs](#)

A new study just released by the OECD Nuclear Energy Agency (NEA) recommends that decision-makers should take full electricity system costs into account in energy choices and that such costs should be internalised according to a “generator pays” principle. The study, entitled *Nuclear Energy and Renewables: System Effects in Low-carbon Electricity Systems*, addresses the increasingly important interactions of variable renewables and dispatchable energy technologies, such as nuclear power, in terms of their effects on electricity systems.

System effects refer to the costs above plant-level costs to supply electricity at a given load and level of security of supply. This report focuses on “grid-level system costs”, the subset of system costs mediated by the electricity grid, which include a) the costs of extending and reinforcing transport and distribution grids as well as connecting new capacity, and b) the costs of increased short-term balancing and maintaining the long-term adequacy of electricity supply.

Some of the study’s key findings based on an analysis of six technologies – nuclear, coal, gas, onshore wind, offshore wind and solar – are the following:

- While all technologies generate system costs, those of dispatchable generators are at least an order of magnitude lower than those of variable renewables. **The study finds that including the system costs of variable renewables at the level of the electricity grid increases the total costs of electricity supply by up to one-third, depending on country, technology and penetration levels.** While grid-level system costs for dispatchable technologies are lower than USD 3 per MWh, they can reach up to USD 40 per MWh for onshore wind, up to USD 45 per MWh for offshore wind

and up to USD 80 per MWh for solar. In addition, **the greater the penetration of renewables, the higher the system costs.**

- Currently, such grid-level costs are absorbed – unacknowledged – by electricity consumers through higher network charges and by the producers of dispatchable electricity in the form of reduced margins and lower load factors. **Not accounting for system costs means adding implicit subsidies to already sizeable explicit subsidies for variable renewables.** As long as this situation continues, dispatchable technologies will increasingly not be replaced as they reach the end of their operating lifetimes, thereby **weakening security of supply.**
- Nuclear power will fare relatively better than coal or gas in the short run due to its low variable costs. In the long run, however, when new investment decisions need to be made, reduced load factors will disproportionately penalise technologies with high fixed costs such as nuclear. **In systems that currently use nuclear energy, the introduction of variable renewables is therefore likely to lead to an increase in overall carbon emissions due to the use of higher carbon-emitting technologies as back-up.**

The existence of sizeable system costs implies that significant changes will be needed to generate the flexibility required for an economically viable coexistence of nuclear energy and renewables in increasingly decarbonised electricity systems. Such changes may include more widespread use of carbon pricing, long-term contracts and capacity mechanisms in order to provide adequate incentives for investment.

[NEA High-Level Visit to the United States](#)

[NEA Director-General Luis Echávarri](#), [NEA Head of Nuclear Safety Javier Reig and Nancy Salgado](#) were in the United States from 11 to 15 March 2013 for a series of talks and high-level meetings, including the US Nuclear Regulatory Commission's (NRC) Regulatory Information Conference and the Policy Group meeting of the Multinational Design Evaluation Programme (MDEP), chaired for the first time by Dr. A. Macfarlane and for which the NEA acts as Technical Secretariat. In addition, Mr. Echávarri participated in a series of bilateral talks with members of the NRC, the US Department of Energy (DOE) and its Nuclear Energy Advisory Committee (NEAC), and the US Department of State. He also presented the latest NEA activities and objectives to the American Nuclear Society (ANS).



[Russia Participates for First Time in the Steering Committee for Nuclear Energy](#)

On 25-26 April 2013, Russia sent its first delegation to the meeting of the Steering Committee for Nuclear Energy, the highest decision-making body at the NEA in which all 31 member countries are represented. Meeting highlights included the approval of the text of a joint declaration on co-operation with the China Atomic Energy Authority, the adoption of a statement on the security of supply of medical radioisotopes and a policy debate on NEA actions in response to the Fukushima Daiichi nuclear power plant

accident. At the end of the first day, an event marking Russia's first participation was organised with Steering Committee members as well as Russian and OECD Ambassadors and high-level officials in attendance. Statements were delivered by [OECD Secretary-General Ángel Gurría](#), [Deputy Director-General of Rosatom Nikolay Spasskiy](#) and [NEA Director-General Luis Echávarri](#). Speakers emphasised the mutual benefit that Russia's accession to the NEA will bring.

- [Slovenia](#)

The Nuclear Society of Slovenia is in the process of organizing its 22nd International Conference Nuclear Energy for New Europe, to be held in Bled, Slovenia, September 9-12, 2013.

The conference typically attracts around 200 participants from more than 20 countries. This year the leading theme of the conference will be New Generation(s) for Better Future. The conference website URL is www.nss.si/nene2013/

- [Taiwan Local Section](#)

IC member [Dr. William Chao](#) sends the updated contact information for the Taiwan Local Section:

Chair: Dr. Chunkuan Shin, Prof. of Institute of Nuclear Engineering and Science, NTHU, Taiwan, R.O.C.

e-mail: ckshih@ess.nthu.edu.tw

and

Contact Person: Dr. Yung-Shin Tseng, Postdoctoral Fellow, Department of Engineering and System Science, NTHU, Taiwan, R.O.C.

e-mail: yungshintseng@gmail.com

- [USA](#)

- [Webinars on Actinide Chemistry](#)

[Dr. Patricia Paviet-Hartmann](#) of the Nuclear Science & Technology Directorate at the Idaho National Laboratory sends the following report: The National Analytical Management Program (NAMP,) U.S. Department of Energy Carlsbad Field Office, in collaboration with the U.S. Environmental Protection Agency invites all to attend presentations in the Actinide Chemistry Series, as part of the radiochemistry webinars being developed in cooperation with the Idaho National Laboratory, URS, and university partners. These webinars provide a basic understanding of actinides chemistry. Detailed discussion of real-world scenarios applying to the lectures' materials are incorporated. The most recent webinars in the series were:

- Dr. Alena Paulenova (OSU), Neptunium Chemistry, 2013 Jan. 31
- Dr. Alena Paulenova (OSU), Trivalent Actinides Chemistry (Americium and Curium), 2013 Feb. 28
- Dr. Bahman Parsa (Dept. of Health), Radium Chemistry, 2013 Mar. 28

For more information on these free events and on archived webinars, visit the NAMP website at <http://www.inl.gov/namp>.

News from ANS Divisions

To further the implementation of the Joint Protocol between the IC and the Professional Divisions Committee, we are pleased to include in the Globe some newsworthy Division items. While some items can be gleaned from the Divisions' web pages, please send us your most up-to-date and timely news to post in the *ANS Globe*!

Mathematics and Computation Division (MCD)

The Mathematics and Computation Division is looking ahead to its upcoming Topical Meeting in 2015:

- 2015 April 19-23: Mathematics and Computation 2015, Nashville, TN, USA - <http://www.ans.org/meetings>

Nuclear Criticality Safety Division (NCSD)

In the Winter 2012 Division Newsletter, NCSD Chair [Larry Wetzel](#) reports:

In spite of government travel restrictions, NCSD had a very successful meeting in San Diego. We had sessions starting Monday afternoon, and continuing every day through Thursday afternoon. We also had our annual awards banquet, which was held at Donovan's Prime Seafood. We had approximately 60 people in attendance at the dinner. We presented the best paper awards for the last two meetings. Our technical excellence award this year went to the Stephen D. Clement, for outstanding leadership of the NCERC team the completed first critical experiments of the DAF. The distinguished service award went to the Robert L. Frost, for outstanding leadership in division governance support and development of meeting programs and promotion of the NCSD Pioneer scholarship.

Radiation Protection and Shielding Division (RPSD)

In the Spring 2013 Division Newsletter, RPSD Chair [Nolan Hertel](#) reports:

ICRP Publication 103 provides an updated set of radiation protection recommendations that resulted in some modifications, principally to the tissue and radiation factors used in the computation of effective dose. ICRP Publication 116 provides a revised set of external dose conversion coefficient which reflect these changes. Given the global nature of our industry, it would seem that our domestic regulating organizations should move to adopt these changes sooner rather than later, so that a calculated mSv in the USA is the same as a mSv computed in other countries. Changes in operational quantities such as ambient dose equivalent also should be forthcoming from the ICRU in the next year or so. The 2014 topical meeting should provide an excellent forum to discuss the impact of these changes in the practice of shielding and radiation protection.

Although previously announced, let me personally congratulate Dr. Richard Faw for being the recipient of the 2012 Rockwell Award for his lifetime contributions to radiation protection and shielding. We hope to see Dick at the opening plenary session at the Atlanta meeting to accept the award.

Reactor Physics Division (RPD)

The Reactor Physics Division looks forward to two upcoming Topical Meetings:

- 2014 Sept. 28 – Oct. 3: Physics of Reactors 2014 (PHYSOR-2014), Kyoto, Japan – <http://www.physor2014.org>
- 2014 March 29 – April 1: Advances in Nuclear Fuel Management V, Hilton Head, SC, USA <http://www.ans.org/meetings>
- 19-23 April: Mathematics and Computation 2015, Nashville, TN, USA - <http://www.ans.org/meetings>

Highlights from the 2012 November Meeting in San Diego, CA

MOROCCO'S PROGRESS ON INITIATING A NUCLEAR POWER PROGRAM

Reproduced below is Prof. Oum Keltoum Bouhelal's presentation on Morocco's Progress in Initiating a Nuclear Power Program. Prof. Bouhelal is Professor at the ENIM Engineering School in Morocco; she is also the co-ordinator of the collaboration agreement between the ANS and AIGAM.

ANS Winter Meeting San Diego, November 11-14, 2012 International Committee (IC) Meeting

Morocco's Progress on Initiating a Nuclear Power Program

Pr O.K. Bouhelal
ENIM Engineering School
ANS-AIGAM Coordinator
bouhelal@enim.ac.ma

General overview on progress on initiating a nuclear power program

- Morocco has a fairly stable economy with a sustained growth over the past decades
- An ambitious social and economic program has been launched to develop all the sectors and attracts investors

Le Maroc est en mouvement accéléré pour assurer son essor économique



GENERAL INDICATORS - 2010

- Population: 32 millions
- GDP/Capita: 2800\$
- GDP growth rate: 4.7%
- Industrial sector presents about 30% of the GDP: food industry in the first rank followed by textiles industry

ENERGY SECTOR

Morocco has very limited local energy fossil resources and cannot stop recourse to imports

Local Resources:

- **Large deposits of oil shale:** studies shows the resource is not yet competitive

- **Phosphates** has a very large amount of uranium; Morocco is the first phosphates exporter worldwide ;

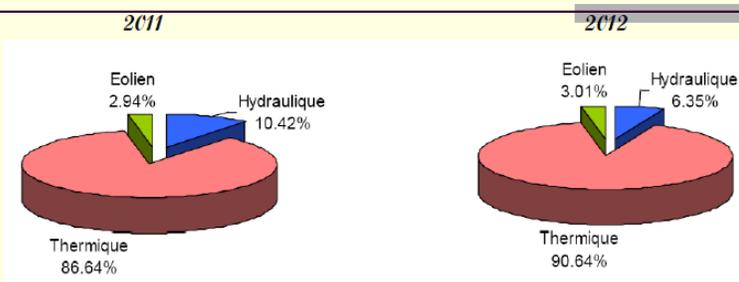
According to the recent IAEA studies , the estimated availability of uranium is of about 6,9 Millions tons:



Morocco has an important Renewable Energy potentials Ambitious program of Renewable Energy by 2010-2020 :

- **Wind energy** program expected to bring 2000MW
- **Solar Plan** involving five sites that will produce 2000MW
- **Energy Efficiency** : energy optimization through high performance technologies and processes expecting to reach 20% reduction of primary energy consumption
 - (high energy intensity)
- **Morocco efforts toward a mix energy between various types:**
consideration of the possibility to introduce 2 NPP of 1000MWe each by 2020-2030

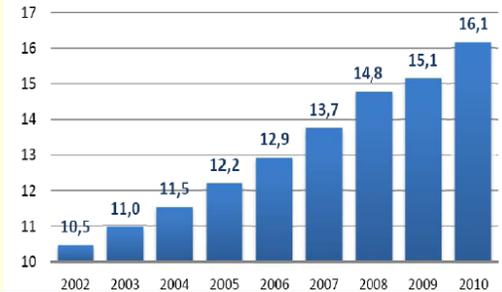
Distribution of Electricity Consumption -



- **Energy policy focus:**
- reduce fossil fuels dependance
- secure access to energy
- recourse to domestic resources

EVOLUTION OF PRIMARY ENERGY CONSUMPTION (MTEP)

- Primary Energy consumption growth rate: 4-5%
- 0.515Toe/Cap (2010)
- Primary energy consumption: 16.5 Mtoe
- Energy dependance: 97%
- Oil+coal: 90%;



Morocco is at the heart of the mediterranean energy hub



The country is crossed by the Maghreb Europe gas pipeline and the electrical interconnections with Spain and Algeria

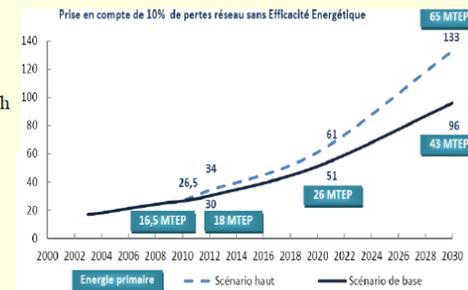
Capacity Exchange from the electrical Interconnections:
Morocco – Spain :1400MW
Morocco- Algeria: 1200MW

SCENARIO OF EVOLUTION OF THE NET ELECTRICITY DELIVERED AND PRIMARY ENERGY CONSUMPTION

Electricity Consumption

Growth Rate: 6-8 %

- 744KWh/Capita (2011)
- Electricity consumption: 27 TWh
- Installed Capacity : 6400MW



The expected nuclear power share of the Moroccan Mix Energy will not exceed 20%

PROGRESS IN INITIATING A MOROCCAN NUCLEAR PROGRAM

1. Moroccan Nuclear Capabilities and Experiences :a substantial part of nuclear activities and associated infrastructures are already in place:

- 1970-80 : Guidance and Promotion of Nuclear Applications:
 - creation of the CNESTEN, National Center for Nuclear Energy, Sciences and Techniques
- 1980-1994 : nuclear power program studies:
 - the public electricity company ONEE undertook the technical and economical FS for the first NPP with the technical assistance of the IAEA;
 - the site was selected and the studies are continuously updated

....the future



- 1990-2003: Construction of the Nuclear Centre of Mâamora as a nuclear learning and training platform
- 2003-2008 : Installation and commissioning of the research reactor TRIGA Mk2 - 2Mwth



Main Moroccan Nuclear Organizations

MEMEE: Ministry of Energy, Mines, Water and Environment

- Morocco has built a relationship of trust and cooperation, whether bilateral or multilateral relations
- the nuclear option is still valid in the National Energy Strategy of the mid-term even if the option is not clearly specified in the recent scenarios
- The main contribution of the MEMEE was the licensing of the TRIGA reactor :
 - issuance of the construction permit,
 - the commissioning license and the operating license
- all activities are prepared in accordance with the IAEA methodology and concepts

CNESTEN: with the TRIGA research reactor and laboratories, it is the technological platform for technical training in nuclear applications in various sectors of utilization - distinction as Training Center in the African Region (AFRA-TC/IAEA).

CNESTEN plays also the role of the national center for radioactive wastes management released by its own laboratories and industries and medical centres



The National Power & Water Utility, ONEE, in charge of the generation, transmission, and the distribution of the electricity in the country: ONEE will be the main player in the nuclear power project realization: long experience in BOT projects (coal, combined cycles, wind power plants through PPA agreements with the private electricity producers)

The Phosphates National Office OCP: resources of uranium in phosphates are an asset that could prove useful in the future if economically competitive processes are developed for its extraction



The Universities: they provide in their educational curricula courses of nuclear physics and nuclear reactors and are expected to provide later human resources to supply the qualified staff for the projected nuclear installation

The CNRP: National Center of Radiation Protection which is a Ministry of Health Department; CNRP is in charge of the control, the inspection and the authorization of the use of the radioactive sources

Legal and Safety Mechanisms Developed



- 1970: Nuclear Non-Proliferation Treaty (NPT)
- since 1975: Subscription to nuclear safeguards (IAEA) in effect
- Morocco has joined the global nuclear safety regime: accession to all international conventions and codes in this area
- Adopted international conventions on nuclear cooperation

Preparation of nuclear regulatory texts and the legislation on nuclear safety is in an approval stage

• National environment regulatory in effect: inclusion of the country in the international security and nuclear safety overseen by the IAEA, which has allowed Morocco to complete the regulatory framework and meet the standards security

• **Implementation of the Nuclear Law and the Creation of an Independent Regulatory Body are in an advanced stage**

THE MOROCCAN POWER DEVELOPMENT STRATEGY FOR THE INTRODUCTION OF 2 NPP BY 2020 -2030

Feasibility Study of the First NPP regularly updated with the cooperation of the IAEA

- PWR and BWR Models, proven and advanced;
- Power generation for electricity production and seawater desalination
- Financial evaluation program: BOT model
- Evaluation of Local Industry Participation
- Human Resources, Training Program

Long-term commitments to the nuclear energy option and the financing: the moroccan strategy regarding fuel procurement and radioactives wastes management has not yet been decided:

A CRED (Committee of Reflexion on Nuclear Power for Electricity Generation and Seawater Desalination) was set up recently and established a report related to the status of the milestones infrastructures development of the NPP projects as recommended by the IAEA guide.

Is Morocco Eligible for the Nuclear Power Option Regarding its geographical situation in the Mediterranean Basin



Energy Security and Supply in the Mediterranean Basin:

- Existence of various contrasts between the north and the south of the Mediterranean coast: energy policies reviewed for harmonization in regional and international frameworks

- Potential nuclear comers around the Mediterranean Sea: Morocco, Algeria, Tunisia, Libya, Egypt, Jordan, Turkey

- Reluctance of European Countries to develop nuclear energy whereas Europe is a big nuclear power area in the world: 158 NPP

- Nuclear power considered only in a high scenario of the Energy Transition process

- Creation of an International Enrichment Centre under international control to support the development of civilian nuclear power around the Mediterranean

- Benefit:

- Share of resources and knowledge with countries having a nuclear industry and experience
- Reduce the costs of the Energy Transition process and maintain the security of energy supply in the mediterranean region
- Build a relationship of cooperation and trust

Morocco's Recent Progress

- **Nuclear Safety and Security Program in cooperation with the IAEA:**
 - National Strategy of Waste Management enhanced ;
 - Radiological Impact and Socio-Economic Environment of the Site & Plans for Organizing Emergency in phase of update
 - the nuclear fuel cycle strategy of development
- **Morocco has joined the IFNEC in 2008 (International Framework for Nuclear Energy Cooperation)**
 - 3rd Meeting of the IFNEC, Marrakech 9 and 10, October 2012
 - 50 countries present
 - explore means to develop exchange of experiences among member countries, especially the nuclear new comers, regarding the financing of projects, the human resource and the infrastructures development.

THANK YOU FOR YOUR ATTENTION

Selected Presentations from CONTE2013

In this issue we start a new initiative: we include some papers or presentations on nuclear education and training. Here we attach two presentations from the Conference on Training and Education 2013 (CONTE-2013), which was held in Jacksonville, Florida, 2013 February 3-6. These papers are included with permission of the authors and of the American Nuclear Society.

The presentations are listed just below, with links to their actual location in Appendix A.

- [Developing a Nuclear E&T Program -- Cooperation between Newcomers and Experienced Nuclear Energy Countries a Success Story](#)”, by [Petre Ghitescu and Gabriel Lazaro Pavel](#), published in CONTE2013, Jacksonville, Florida, Feb. 3-6, 2013, p.10, copyright 2013 by the American Nuclear Society, LaGrange Park, Illinois
- [Cooperation Between European Union and Russian Universities in Nuclear Education & Training, by Petre Ghitescu](#), published in CONTE2013, Jacksonville, Florida, Feb. 3-6, 2013, p.114 and 115, copyright 2013 by the American Nuclear Society, LaGrange Park, Illinois

Societies with Collaboration Agreements with ANS

The following is a list of nuclear societies with collaboration agreements with the ANS, along with the corresponding website addresses. The Table contains also a few other entries of interest to ANS International Committee members.

Society	Website or E-Mail Address
Asociación Argentina de Tecnología Nuclear	www.aatn.org.ar
Associação Brasileira de Energia Nuclear	www.aben.com.br
Association des Ingénieurs en génie atomique du Maroc	-
Atomic Energy Society of Japan	wwwsoc.nii.ac.jp/aesj/index-e.html

Australian Nuclear Association	www.nuclearaustralia.org.au
Bangladesh Nuclear Society	-
Bulgarian Nuclear Society	www.bgns.bg
Canadian Nuclear Society	www.cns-snc.ca
Chinese Nuclear Society	www.ns.org.cn
Croatian Nuclear Society	www.nuklearno-drustvo.hr/en/home.html
Czech Nuclear Society	www.csvts.cz/cns
European Nuclear Society	www.euronuclear.org
Hungarian Nuclear Society	www.kfki.hu/~hnucsoc/hns.htm
Indian Nuclear Society	www.indian-nuclear-society.org.in
Israel Nuclear Society	meins@tx.technion.ac.il
Korean Nuclear Society	www.nuclear.or.kr/e_introduce.php
Lithuanian Energy Institute	www.lei.lt
Malaysian Nuclear Society	www.nuklearmalaysia.org/index.php?id=18mnu=1
Nuclear Energy Society of Kazakhstan	www.nuclear.kz
Nuclear Energy Society of Russia	ns@kia.ru
Nuclear Energy Society of Slovenia	www.drustvo-js.si
Nuclear Energy Society of Thailand	www.nst.or.th
OECD/Nuclear Energy Agency	www.nea.fr
Polish Nuclear Society	www.ptn.nuclear.pl
Romanian Nuclear Energy Association	www.aren.ro
Romanian Society for Radiological Protection	www.srrp.ro
Slovak Nuclear Society	www.snus.sk
Sociedad Nuclear Española (SNE)	www.sne.es
Sociedad Nuclear Mexicana	www.sociedadnuclear.org.mx
Ukrainian Nuclear Society	www.ukrns.odessa.net
United Kingdom Nuclear Institute	www.nuclearinst.com/ibis/Nuclear%20Institute/Home
Women in Nuclear – Global	www.win-global.org
Affiliated National Societies	Website or E-Mail Address
Belgian Nuclear Society	www.bns-org.be
Associated Nuclear Organizations	Website or E-Mail Address
International Nuclear Societies Council	http://insc.ans.org
Pacific Nuclear Council	http://www.pacificnuclear.net/pnc/
Non-U.S. Local Sections	Website or E-Mail Address
Austrian Section	
French Section	http://local.ans.org/france/
India Section	http://local.ans.org/india/
Italian Section	
Japanese Section	

Latin American Section	www.las-ans.org.br
Korean Section	
Swiss Section	
Taiwan Section	u805301@taipower.com.tw

Calendar of Events

Some Upcoming International Conferences on Nuclear and Related Topics
(Please send us information about your upcoming conferences, for inclusion in this space.)

Legend:

☀ ANS Event

□ Non-ANS event co-sponsored by ANS

o For all other conferences, ANS is NOT a sponsor, nor are these conferences endorsed by ANS.

2013

- 5-9 May: Mathematics and Computation 2013, Sun Valley, ID, USA,
<http://www.mc2013.org> ☀
- 12-16 May: NURETH-15 (15th International Topical Meeting on Nuclear Reactor Thermalhydraulics), Pisa, Italy – <http://www.nureth15.org> □
- 27-29 May: 3rd Climate Change Technology Conference, Montréal, Québec, Canada – <http://www.CCTC2013.ca>
- 9-12 June: 34th Annual Conference of the Canadian Nuclear Society and 37th CNS/CNA Student Conference, Toronto, Ontario, Canada – <http://www.cns-snc.ca>
- 16-20 June: ANS Annual Meeting, Atlanta, GA – <http://www.ans.org/meetings> ☀
- 29 July-August 2: 2013 21st International Conference on Nuclear Engineering, Cheng Du, China - <http://www.asmeconferences.org/icone21/> <http://www.icone21.org>
- 11-15 August: 16th International Conference on Environmental Degradation of Materials in Nuclear Power Systems-Water Reactors, Asheville, NC, USA - <http://events.nace.org/conferences/ed2013/index.asp> □
- 8-13 September: 8th International Conference on Inertial Fusion Science and Applications – Nara, Japan □

- 9-13 September, 22nd International Conference Nuclear Energy for New Europe (NENE-2013), Bled, Slovenia, organized by Nuclear Society of Slovenia - www.nss.si/nene2013/ □
- 19-21 September: Chemistry of the Heaviest Elements (CHE 8), Takayama, Japan - <http://asrc.jaea.go.jp/soshiki/gr/schaedel-gr/CHE8/index.html>
- 22-26 September: International Topical Meeting on Probabilistic Safety Assessment and Analysis (PSA 2013), Columbia, SC, USA - <http://www.ans.org/meetings> ☀
- 22-26 September: Decommissioning Challenges Conference 2013, Avignon, France (organized by the French Nuclear Society)
- 22-27 September: APSORC 13, Kanazawa, Japan - <http://www.radiochem.org/apsorc13/>
- 29 September – 3 October: Global 2013, Salt Lake City, UT, USA – <http://www.global13.org> □
- 29 September – 3 October: Topical Meeting of ANS Nuclear Criticality Safety Division, Wilmington, NC – <http://www.ncsd2013.org> ☀
- 30 September – 2 October: International Nuclear Science, Technology and Engineering Conference (iNuSTEC2013), Kuala Lumpur, Malaysia – <http://www.nuklearmalaysia.org>
- 20-23 October: 63rd Canadian Chemical Engineering Conference, Fredericton, New Brunswick, Canada – <http://www.csche2013.ca>
- 27-31 October: International Conference on the Safety and Security of Radioactive Sources, Abu Dhabi, United Arab Emirates – organized by the IAEA – <http://www-pub.iaea.org/iaeameetings/43047/International-Conference-on-Safety-and-Security-of-Radioactive-Sources>
- 27-31 October: SNA + MC 2013, Joint International Meeting on Supercomputing in Nuclear Applications and Monte Carlo, Paris, France – <https://www.sfen.fr/SNA-and-MC-2013>
- 10-14 November: ANS Winter Meeting, Washington, DC, USA – <http://www.ans.org/meetings> ☀
- 27-29 November: India Nuclear Energy Exhibition and Summit, Mumbai, India



2014

- 13-15 February: Radiation Safety in Medicine, Baton Rouge, LA - <http://www.ans.org/meetings>
- 12-14 May: The Third International Conference on Physics and Technology of Reactors and Applications (PHYTRA3), Tetouan, Morocco.
- 25-27 May: 10th International CNS Conference on CANDU Maintenance, Toronto, Ontario, Canada (CMC-2014) - <http://www.cns-snc.ca/events/cmc-2014/>
- 15-19 June: ANS Annual Meeting, Reno, NV, USA – <http://www.ans.org/meetings> ☀
- 24-28 August: 19th Pacific Basin Nuclear Conference (PBNC-2014), Vancouver, British Columbia, Canada (organised by Canadian Nuclear Society) - <http://www.cns-snc.ca/events/pbnc-2014/>
- 24-28 August: 8th International Conference on Isotopes (8ICI), Chicago, IL, USA
- 28 September- 3 October: Physics of Reactors 2014 (PHYSOR-2014), Kyoto, Japan – <http://www.physor2014.org> □
- 26-31 October: Nuclear Plant Chemistry Conference 2014 (NPC 2014), Sapporo, Japan – <http://www.npc2014.net>



- 9-13 November: ANS Winter Meeting, Anaheim, CA, USA – <http://www.ans.org/meetings> ☀

2015

- 1-4 February: Conference on Nuclear Training and Education (CONTE15), Jacksonville, FL, USA - <http://www.ans.org/meetings>
- 22-26 February: 9th International Topical Meeting on Nuclear Plant Instrumentation, Control, and Human Machine Interface Technologies (NPIC&HMIT 2015), Charlotte, NC, USA - <http://www.ans.org/meetings>
- 29 March – 1 April: Advances in Nuclear Fuel Management V, Hilton Head, SC,

USA - <http://www.ans.org/meetings> 

- 19-23 April: Mathematics and Computation 2015, Nashville, TN, USA - <http://www.ans.org/meetings>
- 26-30 April: 2015 International Topical meeting on Probabilistic Safety Assessment & Analysis (PSA 2015), Sun Valley, ID, USA – <http://www.new.ans.org/meetings/> 
- May 31-June 3: 36th Annual Conference of the Canadian Nuclear Society and 39th CNS-CNA Student Conference, Saint John, NB, Canada – www.cns-snc.ca
- 7-11 June: ANS Annual Meeting, San Antonio, TX, USA – <http://www.ans.org/meetings> 
- 30 August – 4 September: 16th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-16), Chicago, IL, USA - <http://www.ans.org/meetings>
- 13-17 September: International Conference on Nuclear Criticality Safety (ICNS2015), Charlotte, NC, USA - <http://www.ans.org/meetings>
- 8-12 November: ANS Winter Meeting, Washington, DC, USA – <http://www.ans.org/meetings> 

2016

- 12-16 June: ANS Annual Meeting, New Orleans, LA, USA – <http://www.ans.org/meetings> 
- 13-17 November: ANS Winter Meeting, San Diego, CA, USA – <http://www.ans.org/meetings> 

2017

- 11-15 June: ANS Annual Meeting, San Francisco, CA, USA – <http://www.ans.org/meetings> 
- 12-16 November: ANS Winter Meeting, Washington, DC, USA – <http://www.ans.org/meetings> 

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*Co-Editors of *ANS Globe*

Appendix A: Selected Presentations from CONTE2013

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Developing a Nuclear E&T Program – Cooperation between Newcomers and Experienced Nuclear Energy Countries a Success Story?

Petre Ghitescu, Gabriel Lazaro Pavel

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INTRODUCTION

Present paper aims to analyze the important outcomes to be achieved through joint collaboration between experts from countries that have different levels of knowledge regarding Education and Training programs needed by nuclear energy option. Teachers or trainers coming from well-developed nuclear program countries should play a significant role in training the trainers from countries with a smaller or inexistent nuclear program and infrastructure.

NEEDS AND REQUIREMENTS FOR COOPERATION

States who wish to start and develop a nuclear program are considered to be newcomers. They clearly should benefit from the cooperation with experienced states and each of the parties has some expectations as a result of their collaboration. One key aspect the newcomers are looking for is the expertise record and visibility at international level. Building a successful nuclear energy program is based on correct and in-time shaping of E&T needs, taking into consideration key aspects as: national and international existing regulations, research infrastructure, education & training capabilities and language barriers to be tackled. Regulatory framework of a newcomer is shaped according to existing international requirements and recommendations promoted by international bodies, and regional and national authorities. Bilateral, regional and interregional agreements and programs between experienced states and newcomers are the basis of efficient knowledge transfer. Support and guidance by AIEA in developing the infrastructure and knowledge for nuclear education and training programs should be considered.

Knowledge and expertise put together in common by governments, scientists, trainers and researchers can lead to a success story in

developing a nuclear program but each one of the parties expect a balanced cost/effort outcome. The role of internal and external factors should be on-time evaluated taking into consideration the specific of each country, even the cultural one.

An example of international cooperation between states with long experience in nuclear education, training and research and states with less visibility is the EURATOM project NEWLANCER-New MEMBER STATES Linking for an AdvANced Cohesion in Euratom Research. In this project the cooperation at national and international level in different research and E&T areas aims to strengthen the capabilities of each partner/EU member state.

Newcomers need well-structured, mutually agreed, tailored programs when considering even the beginning of bid procedures. Recent types of nuclear unit agreements, like Emirates with South Korea, Russia with Turkey, Vietnam with Russia and with Westinghouse as well as expected bids in near future in Poland, Czech Republic etc., underline key aspects related to cooperation in knowledge transfer, education and training planning and timing, personnel recruitment. Curricula designated for future personal education and training are fitted to the actual situation of high education in newcomers states. Special programs were created in order to accommodate specific problems regarding curricular content and schedule. Learning outcomes for specific training schemes and modules are defined and beneficiaries should adapt their organization to the provider's requirements. An example of E&T program provided by Russian part to the Vietnamese part is given.

NETWORKING AT NATIONAL LEVEL

A first step in improvement and strengthening of E&T capabilities is networking at national level. Several projects (REFIN-Romanian Network of Excellence in Nuclear Physics and Engineering, NEWLANCER) developed an efficient, flexible

and modern training system in the nuclear education area, which answers the requirements of nuclear industry (NPP, regulatory bodies, subcontractors, dismantling, radioprotection, waste management) and redundant with the perspectives of the EU and regional research initiatives.

Starting from the information about the present status in the mentioned nuclear area in Romania and in EU, these projects developed a data base on the project web-site, and proposed a global strategy for E&T in order to harmonize the curricula by guidelines and self-evaluation reports.

Therefore were implemented pilot modern training courses of “Radioactive Waste Management” and “Numerical and Experimental Methods in Reactor Physics”, were delivered handbooks and multimedia support for these courses in order to strengthen and better use the existing research infrastructure for R&D among the network partners. At the same time were introduced advanced learning technologies, recommendations for Systematic Approach to Training, e-learning and distance-learning platforms.

These projects showed that:

- From technical point of view, networking improves the quality of training in nuclear field, the competence of trainers and students, and permits the efficient use of the facilities and of the research infrastructures;
- The use of modern training and knowledge management methods helps the harmonization with similar education systems in view of integration with other countries with direct effects on increasing economical competitiveness, while fulfilling the sustainable development criteria.

NETWORKING AT INTERNATIONAL LEVEL

The main objective of networking is to create a multi-level regional network having a mission to enhance cohesion and interact with the European and national authorities in order to strengthen future participation in European research (structure as showed in figure 1).

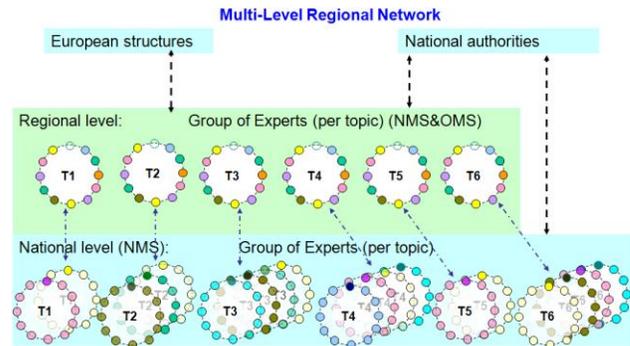


Fig. 1 Multi-Level regional network

The first step in building the multi-level regional network consists in creation of national expert groups in each participating country on the main nuclear topics (Generation III and IV, nuclear safety and environmental issues, radioactive waste management, radioprotection, education and training, etc.) according to the existing competence.

In the second step, the national expert groups involved in the project will join building an advanced cohesion at regional level. Each national expert group will have a representative for the regional level, will provide the national input and forwarding back the proposals raised during the regional seminars.

Such projects as ENEN, ENEN-II, ENEN-III, NEPTUNO, TRASNUSAFE, EURECA!, ENEN-RU, EUJEP underlined the results of efficient international cooperation. Most of them represent the continuation of a good collaboration experience between important European E&T and Research institutions that begun almost a decade ago.

**Cooperation Between European Union and Russian Universities in Nuclear
Education & Training, by Petre Ghitescu**
(Powerpoint Presentation)

Cooperation between European Union and Russian Universities in Nuclear Education and Training

Petre GHITESCU

University Politehnica
Bucharest



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The European Nuclear Education Network Association (ENEN)

- A non-profit organization established in September 2003, located in Saclay-France
- For the continuity of achievements obtained through the past EURATOM-EC projects on nuclear E&T
- Leading role in promoting nuclear education and training in European Union (EU) countries



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ENEN Objectives

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

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 centre, universities etc.)
- Actively participating in reshaping nuclear education and training



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ENEN Achievements

- Developed tools for mutual recognition of courses and curricula
- Established the European Master in Nuclear Engineering (EMSNE)
- Proposed new education and training schemes based on the European Credit System for Vocational Training (ECVET)
- Projects of cooperation with countries outside EU as Russia, China, Japan and Canada were started in 2010-11 to open and extend cooperation in education and training on a common basis.



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THE ENEN- RUSSIA PROJECT ENEN-RU 2010-2012

- Coordinated from EU side by ENEN
- EU partners: Czech Technical University, University of Manchester, University Politehnica Bucharest, Slovak Technical University, Politecnico di Torino and Rez Research Centre
- Coordinated from Russian side by Nuclear Research Nuclear University (NRNU-MEPHI)
- Russian partners: NRNU-MEPHI is a bundle of Russian Federation universities from Moscow, Obninsk, Tomsk, Omsk etc.



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ENEN-RU OBJECTIVES

- To stress the current status of implementation of Bologna process and implementation of European Credit Transfer System (ECTS) in Russia,
- To propose pilot E&T courses and exchange students,
- To create a database of existing research infrastructure and facilities,
- To make recommendations on further cooperation in E&T.



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COMPATIBILITY OF DIFFERENT E&T APPROACHES

EU approach is based on:

- Bologna process and European Higher Education Area,
- Credit Transfer and Accumulation System (ECTS) and
- The existing Diploma Supplement (which permits mobility of students and mutual recognition),
- Learning outcomes for BS and MS graduates in Nuclear Engineering, and
- EMSNE



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COMPATIBILITY OF DIFFERENT E&T APPROACHES (contd.)

For the Russian partners was provided information regarding:

- The actual system of Nuclear Education in Russia and its evolution in the next future,
- The credit system,
- The existing experience in international cooperation in education (mutual recognition, double degree etc.),
- Nuclear education and training delivered to countries acquiring Russian technology.



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ENEN-RU TOOLS

- Use of IAEA approach to nuclear competence based on learning outcomes,
- For BS and MS graduates were defined specific requirements regarding knowledge, skills and competencies to be acquired during E&T process,
- Common workshops,
- Participation in Atomexpo International Forum in Moscow in 2012,
- Pilot courses in Russia and Czech Republic (in English), with the participation of international students.



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ENEN-RU COOPERATION OUTCOMES

- The learning outcomes are shaped after the industry needs for workforce,
- International cooperation requires development of new teaching packages, easily mutually recognizable,
- Exchange of students should be based on "Learning Agreements" which stipulate the courses to be taken, the work load (in ECTS and/or in hours), thus facilitating the recognition of the academic activity



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ENEN-RU COOPERATION OUTCOMES

- How to consider and weigh the teaching requirements and the learning outcomes for a certain program?
- Need for bilateral or multilateral agreements to establish an equivalency between work load expressed in ECTS credits or in hours of teaching (course, seminary and other applications)
- Free and quick access to data bases containing information about the existing courses required.



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CONCLUSIONS

- Main providers of education and training are concentrated in countries with a rich experience in nuclear energy but with low perspectives of new nuclear units
- The newcomers have limited E&T infrastructure and capabilities.
- Cooperation in E&T at international level has to play a major role.
- Regional and international cooperation and exchange should be facilitated not only by the providers from industry, but also by national and international bodies.



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CONCLUSIONS (contd.)

- Future cooperation should address the analysis of different curricula, course topics and learning outcomes.
- Formalization of procedures of mutual recognition.
- The cooperation should be promoted at the level of E&T networks
- Funding schemes involving governmental support, industry, research projects, MoU.



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Thank You !

More info:

www.enen-assoc.org



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