NUCLEAR EDUCATION AND TRAINING NETWORKS – LINKS WITH ANENT, ENEN AND NTEC

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Institution of Nuclear Engineers
VP European Nuclear Education Network
Chairman NTEC UK
OVERVIEW

• THE GLOBAL ENERGY ISSUES
• OVERVIEW OF ANENT
• WHAT IS ENEN
• THE UK CONSORTIUM – NTEC
• OPPORTUNITIES
• QUESTIONS
The Global Issues for the Future Energy Demand

B. Barre, France

Electricity Needs and Prospects

- India: 0.42 (11)
- Pakistan: 0.38 (10)
- China: 1.2 (6-7)
- Russia: 2 (34)
- Africa: 0.51 (1-2.3)
- USA: 5.11 (13.2)

Source: IAEA

To meet rising demands, countries and regions are projected to increase their installed electric power capacity by factors ranging from just over one in the US to eleven in India by 2020.

IAEA, March 2007
Next Generation Nuclear Energy

Nuclear Generation Forecasts 2003-2030
(IAEA July 2004)
ANENT

- Established in 2004 at the IAEA TM in Malaysia
- A regional partnership for “Knowledge Management” and capacity building in the peaceful use of nuclear technology
- The ANENT has 31 member institutions from 15 countries, and 6 collaborating organizations.

Flags:
- Australia
- Bangladesh*
- China
- India
- Indonesia
- Korea
- Lebanon*
- Malaysia
- Mongolia
- Pakistan
- The Philippines
- Sri Lanka
- Syria*
- Thailand
- Vietnam

Institutions:
- ARCCNM
- ASNM
- ENEN
- WNU
- MEPhI
- TOKYO TECH

* New members

International Atomic Energy Agency
ANENT Activities

Development of Cyber Educational Platform
Facilitation of HR Mobility
Promotion of Knowledge Management Practices in Education
Development of Reference Curricula
Liaison and Communication

Korea
Lebanon
Philippines
Vietnam
All

5 Group Activities

IAEA

Chairperson
Mr. R. R. Puri, India

Coordination Committee
ANENT Cyber Platform

Web-Portal for Information Exchange

Cyber Platform for Education and Training

Training Courses and Information Resources
ANENT Cyber Platform


Log in
ID and PW

ANENT Cyber Platform

Cyber Learning

ANENT Cyber Platform

Leaner
Lecturer
Course manager
General manager
ANENT Achievement

First E-training Course on Energy Planning

Five days in Nov 2007, KAERI, Korea
33 participants from 9 countries
China, India, Indonesia, Korea, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand

IYNC2008, Interlaken, Switzerland, 23 September 2008
To evaluate External Cost of Health and Environmental Impacts of Nuclear Power and other Energy Options

Training package was developed by PESS, IAEA
Training Course to Train the Trainers on Cyber Platform

Five-day course in July 2008
17 participants learned how to develop and operate the course using the ANENT Cyber Platform.
Ongoing Activity

Electronic Text-Book for the post-graduate Master Course programme on “Advanced Nuclear and Ionizing Radiations Technologies” (TNRI), Univ. of Pavia

1. Basic Nuclear Theory
2. Industrial Applications of Radiation Technologies
3. Radiochemistry and Radioisotopes Techniques
4. Radioprotection and Nuclear Decommissioning
1. Introduction to the Nuclear Energy
2. Neutron interaction
3. Fission process in a nuclear reactor
4. Neutron multiplication in a nuclear reactor
5. Neutron balance in an material medium
6. Criticality in multiplier medium
7. Reactor kinetics
8. Control rod effect
9. Soluble poisons
10. Burnable poisons
11. Reactivity temperature effects
12. Fission products poisoning
13. Neutron Sources
## Ongoing Activity

Fellowship programme to collect available E&T materials from IAEA and Member States

<table>
<thead>
<tr>
<th>Programme Code</th>
<th>Number</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAS4021</td>
<td>A 2</td>
<td>KHNP Training Course on Mechanical Equipment</td>
</tr>
<tr>
<td>RAS4021</td>
<td>A 2</td>
<td>KOICA/IAEA TC ON NUCLEAR POWER PLANNING AND PROJECT MANAGEMENT FOR MIDDLE LEVEL MANAGERS IN DEVELOPING COUNTRIES</td>
</tr>
<tr>
<td>RAS4021</td>
<td>A 2</td>
<td>Regional Training Course on Advanced Technology for Modernization of Instrumentation and Control in Nuclear Power Plants</td>
</tr>
<tr>
<td>RAS4021</td>
<td>A 2</td>
<td>Regional Training Course on Supporting and Strengthening Management of Steam Generator Maintenance</td>
</tr>
<tr>
<td>RAS4021</td>
<td>A 2</td>
<td>National Workshop on NPP Power Upgrading</td>
</tr>
<tr>
<td>RAS4021</td>
<td>A 2</td>
<td>KNPEI Special Training Course Water Chemistry in collaboration with KNPEI</td>
</tr>
</tbody>
</table>
Ongoing Activities

• E-training on EP for West Asia
• Set-up of the ANENT backup server at the IAEA
• Cooperation with ENEN Association
• Electronic lecture on NKM
• Training course to train the trainers on the Cyber Platform
• Development of Reference Curricula in nuclear power engineering
Future Plans

- Collect more E&T materials
- Standardize and develop e-training materials and reference curricula
- Plan and implement E-training courses
- Strengthen the ANENT servers at KAERI and IAEA
- Expand cooperation and networking
- **Future “Cyber University”**
Future “Cyber University”

INFORMATION RESOURCES
Comprehensive, supporting materials
All resources from IAEA and Member States
• Training materials
• National reports …

CYBER PLATFORM
Ways to teach
Managed and operated by IT specialists

NUCLEAR DISCIPLINES
Reference Curricula
in nuclear power engineering and
in Non-power applications, etc.
Cooperation with Collaborating members

“Cyber University”
E-training courses
E-training packages
Electronic lectures and database
On-line Educators, Mentors, and Tutors
European Nuclear Education Network

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:
  - establishes the basis for conserving nuclear knowledge and expertise
  - creates a European Higher Education Area for nuclear disciplines
  - facilitates the implementation of the Bologna declaration in the nuclear disciplines
On 22 September 2003, the European Nuclear Higher Education Area is formalised by creating the European Nuclear Education Network Association under the French law of 1901.

January 2004 – December 2005, EU FP6 funding supports the NEPTUNO project

- European MSc in certification in nuclear engineering
- Expands activities from education to training
- Organised training courses
- Starts activities in Knowledge Management
October 2006 – March 2009, ENEN-II funded under EU FP6.

- **Consolidation:** By implementing the education and training modules proposed and developed in the past few years and tested during the pilot sessions.....etc

- **Extension:** By moving outside the academic education area into professional and even vocational training....etc

- **Expansion:** By moving beyond the disciplines related to nuclear engineering for power plant design, construction and operation, into a broader area including nuclear engineering and other disciplines in support of reactor safety, radiation protection, radioactive waste management, radiochemistry, radioecology, decommissioning and industrial applications of nuclear technologies....etc

- A new data base of nuclear courses.....due in 2009
ENEN Achievements 3

- In 2009 EU FP7 funding will support ENEN-III project
- The objective is to establish a Training Scheme which covers the structuring, organisation, coordination and implementation of training in cooperation with local, national and international training organisations, to provide training courses and sessions at the required level for professionals in nuclear organisations or their contractors and subcontractors.
ENEN-III Overview

WP1 TRAINING FRAMEWORK
- To set up the framework and the training scheme
- To set up the accreditation structure for mutual recognition
- To launch the training passport concept

WP2 QUALIFICATION PROGRAMME
- To establish the qualification programmes
- To run the qualification programme

WP3 SKILLS DEVELOPMENT
- To establish the training programme for developing the required skills
- To run the training sessions for developing the required skills

WP4 INTERNSHIPS & INCREASING AUTONOMY
- To increase the autonomy of trainees
- To create schemes and procedures confronting the trainees to different policies and cultures of employers in various EU countries

WP5 RESPONSIBILITY & AUTONOMOUS ACTIVITIES
- To acquire responsibility, self-confidence and autonomy through on-the-job training
- To get acquainted with employer environment, policy, culture and with professional counterparts

WP6 PROJECT MANAGEMENT
- Coordination and management of the project
- Knowledge Management

WP7 COLLABORATION WITH OTHER TRAINING NETWORKS
- Mapping of E&T activities across ENEN-III, SNETP, ENEF and HLG
- Arrange common Workshop on E&T with SNETP, ENEF and HLG
ENEN – Networks within a Network

Starting September 2008

Forschungszentrum Karlsruhe GmbH
EnBW Energie Baden-Württemberg AG
Institut für Transurane
Ruprecht-Karls-Universität Heidelberg
Universität Karlsruhe (TH)
Universität Stuttgart
Hochschule Furtwangen University
Hochschule Ulm

Nuclear Technology Education Consortium

- A consortium of 11 UK Universities and other Institutions providing postgraduate education in nuclear engineering, science and technology
- Funded by the UK Government through the EPSRC
ENEN – Global Cooperation
The UK Postgraduate Skills Initiative

The UK nuclear skills pyramid

- National Nuclear Laboratory
- Nuclear Engineering Doctorate Scheme (University consortium)
- Research programmes (EPSRC: KNOO)
- Imperial College
- Lancaster University
- National Skills Academy Nuclear

Degrees:
- PhD
- MSc
- Undergraduate Degrees
- Foundation Degrees
- Schools, NVQs, Apprenticeships

EngD

KNOO

Keeping the Nuclear Option Open
<table>
<thead>
<tr>
<th>Institution</th>
<th>Initiatives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Birmingham City</strong></td>
<td>Physics &amp; Technology of Reactors, Waste Management &amp; Decommissioning</td>
</tr>
<tr>
<td><strong>Imperial</strong></td>
<td>Reactors, Chemical Engineering</td>
</tr>
<tr>
<td><strong>Lancaster</strong></td>
<td>Safety Engineering, Decommissioning Engineering, Robotics, Environmental Sci.</td>
</tr>
<tr>
<td><strong>Leeds</strong></td>
<td>Nuclear Process Engineering, Particle Science</td>
</tr>
<tr>
<td><strong>Liverpool</strong></td>
<td>Radiometrics, Decommissioning &amp; Environment</td>
</tr>
<tr>
<td><strong>Manchester</strong></td>
<td>Nuclear Physics, Materials, Radiochemistry, Nuclear Engineering</td>
</tr>
<tr>
<td><strong>Sheffield</strong></td>
<td>Waste Management &amp; Storage, Waste Immobilization</td>
</tr>
<tr>
<td><strong>HMS Sultan</strong></td>
<td>Criticality Safety, Safety Management, Thermal Hydraulics</td>
</tr>
<tr>
<td><strong>UHI</strong></td>
<td>Decommissioning &amp; Environmental Remediation</td>
</tr>
<tr>
<td><strong>Westlakes</strong></td>
<td>Modelling Pathways in Environment, Environmental Decision Making</td>
</tr>
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</table>
Covers a broader range of nuclear subjects than can be offered by any partner individually.

Students register with one university but access entire range of course modules offered by consortium.

“Short course” or e-learning format. Full time or Part time – ideal for those already employed in the industry.

Course modules may be taken as part of a degree programme or individually for professional development.
Programme Structure

Full time: 12 months
Part time: 3 years

Entry Point

One Module

Three Additional Core Modules

Four Additional Elective Modules

Project & Dissertation

M.Sc.

Postgraduate Diploma

Postgraduate Certificate

CPD
Government backing for new build of reactors

International collaborations such as GenIV and GNEP

Replacement of Royal Navy’s Astute propulsion reactors

National Nuclear Laboratory

Decomm. and clean-up

Operation and life extension of existing plant

Waste Disposal and possible repository

Fusion programme and ITER

Nuclear education & training
Steering Committee
Course Directors of NTEC’s Partner Institutions
All Policy Decisions

External Advisory Board

Cooperation Centre
Dalton Nuclear Institute
Delivery planning, Presentation, Marketing
Distance learning, QA

Birmingham
City
Imperial
Lancaster
Leeds
Liverpool
Manchester
Sheffield
UHI
HMS Sultan
Westlakes
Further information

www.ntec.ac.uk (online application)

Full-time (1 year)  Employer sponsorship using upskilling scheme

Part-time (3 year)

CPD (1 week per course)
How do we pull all the variables together?