Training Solutions to Support Embarking Countries in the Framework of Practical Arrangements with the IAEA: Lesson Learned in ROSATOM Central Institute for Continuing Education & Training

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Director, Dpt. of International Cooperation
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2. Training Solutions
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4. Conclusions
Obninsk- cradle of the NPP development

Central Institute for Continuing Education & Training
Since 1967
(SAEC “ROSATOM”)

2009- branch of National Research Nuclear University MEPhI
1985- Obninsk Institute for Nuclear Power Engineering
1953- branch of Moscow Engineering & Physics Institute
(Ministry of Education & Science)

The-First-in-the-World Nuclear Power Plant
27 June, 1954
Training complex in Obninsk (17980 sq m)

Available facilities: conference halls accommodating from 100 to 500 persons, lecture rooms for 100 and 220 persons, a classroom equipped for simultaneous interpretation and coffee break space, academic council room for 35 persons, 15 classrooms for 40-50 persons, 3 computer classes, two negotiation rooms, occupational and radiation safety room, 2 classrooms for training foreign staff

Hotel: accommodation of 416 persons ranging from economy to first class rooms. Free of charge internet, guarded parking lot

Recreational facilities: gymnasium, sauna, organization of sightseeing

Catering: cafeteria for 48 persons, restaurant for 40 persons, canteen for 200 persons and guest room for 25 persons
Rosatom CICE&T Lines of Activities

Development of technical competencies
(Corporation operational and support processes)

Development of specialized competencies
(national security)

Development of safety competencies
(management of safety of atomic energy use)

International Center for NPP Personnel Training
(educational and training support to international expansion of Russian nuclear technologies)

Consulting: developing and maintaining technical teaching aids, remote learning systems and training management systems; designing personnel training systems, development of industry standards and organizational maintenance documents, development of training materials, training trainers
Training Complex in St Petersburg

Available facilities: 3 conference rooms: one for 350 persons and two for 70 persons each, 12 classrooms: 1 room accommodating 90 persons, 3 rooms - 15 persons each and 8 rooms – for 20-45 persons, 6 computer classrooms having 118 working places connected to local network and Internet, communication terminal of Rosatom crisis center, exhibition premises covering general nuclear power issues, full-scale simulator for a floating NPP
Dormitory for 250 persons (151 rooms) ranging from economy class to luxury rooms
Catering: 200 places canteen with a guest room for 10 persons
Recreational facilities: gymnasium, organization of sightseeing
ROSATOM CICE&T Training Dynamics

Number of trainees (persons/yr)

ROSATOM CICE&T Staff

<table>
<thead>
<tr>
<th>Year</th>
<th>Obninsk</th>
<th>St.Pb</th>
<th>Total</th>
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<tr>
<td>2010</td>
<td>2674</td>
<td>2644</td>
<td>5318</td>
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<tr>
<td>2011</td>
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<td>2012</td>
<td>3576</td>
<td>3576</td>
<td>7152</td>
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<tr>
<td>2013</td>
<td>4210</td>
<td>4210</td>
<td>8420</td>
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http://www.scicet.ru
Distribution of training services by ROSATOMPOM divisions

- ROSENERGOATOM: 43%
- Nuclear Safety Dpt: 5%
- Nuclear Defense: 4%
- Mining: -8%
- Fuel Prod. Co: 7%
- NEC: 5%
- others: 18%
- R&D: 5%
- Rosatom HQ: 2%
- Atomstroyexport: 1%
- Maintenance: 2%

1. Introduction in ROSATOM CICE&T
Personnel for Nuclear Programme

- Nuclear Energy Program Implementing Organization (NEPIO) - 50 persons
- Regulatory body (RB) – 70 persons
- Operating organization (OO) – 150 persons

Total: 270 persons/country – training in Russia

NPP Staffing options (person/MW)

- Key personnel:
  - (1.1)
  - (0.7)
  - (0.49)
  - (0.37)
- Training in TC of recipient country – up to 900 persons
- Training in Russia
  - (operating personnel, mid-level and top managers):
    - up to 200 persons per 1 unit
    - up to 300 persons per 2 unit

2. Training Solution
Goal:
To build up a group of Russian Experts for providing assistance to embarking countries. To learn the essentials of the IAEA approach and recommendations and National nuclear power plans
To work out the guidelines for each infrastructure element
To establish interaction and understanding between Russian and their international counterparts on NI issues

Outcome:
Road map for each element of NI: structure, functions, forms
Training courses, E&T Services, Internship, On-the-job-training
Assistance in development of regulations, "strategies & plans", etc
Specific solutions: “Centers” based on Russian experience
Purpose:

to provide support for new entrants on how-to-become-the- knowledgeable- customer at each phase of nuclear power programme development

Targets:

• Nuclear infrastructure organizations;
• Organizations involved in the process of localization (service organizations, technical support organizations, universities, etc)

Products & Services:

• Workshops to provide information on nuclear power technologies & associated services in new-entrants (1-2 days);
• Short-term training courses for skilled national personnel (1 week-1 month);
• Middle-term courses for building specific competencies (1-6 months)
• Long-term training for key personnel (1-3 yrs)
• University education in Russia (2-6 years)
• Support of training localization (var)
Developing of Training Materials in Russian

1. Developer
2. Reviewer in-house
3. Final Methodological Control

Customer

www.scicet.ru
Developing of Training Materials in English

1. Customer
2. Translation
3. Translation Quality check: lexis, grammar
4. Translation Quality check: terminology
5. Final Methodological Control
6. Approved Training Materials in Russian

www.scicet.ru
Training Programme Description (1/2)

Course structure:

1. Course objectives
2. Course description
   • Prior level of competence required
   • Course modules
   • Modules and training objectives description
   • Requirements for the course implementation
3. Prerequisites
   • Work experience
   • Education
   • Additional training
   • Health requirements
4. Training evaluation
5. Competencies
Training Programme Description (2/2)

Curriculum

Appendix 1 – Curriculum

**RLP-11 “Radiation Safety and Health Protection”**

**Objective:** Describe major national and international standards and requirements in radiation safety for nuclear power industry. List basic principles of radiation safety. Describe the organization process of monitoring effective and equivalent doses of NPP personnel and public exposure. Name the ways of a determination and technical assurance of radiation protection at NPP.

**Category of training:** Specialists of nuclear power industry and managerial personnel of organizations developing programs on nuclear energy technology.

**Duration:** 72 hours, 2 weeks, 3 months.

**Media:** 8 hours/day.

<table>
<thead>
<tr>
<th>№</th>
<th>Modules</th>
<th>Total hours</th>
<th>Including full-time practice</th>
<th>Forms of control</th>
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<tbody>
<tr>
<td>1</td>
<td>Module PR-11.01 Isotopic radiation sources</td>
<td>1</td>
<td>4</td>
<td>Lecture, practice</td>
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<tr>
<td></td>
<td>Lesson PR-11.01.1 Characteristics of nuclides and nuclear transformations</td>
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<td>1</td>
<td>-</td>
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<tr>
<td></td>
<td>Lesson PR-11.01.2 Radiation spectra. Characteristics of radionuclides</td>
<td>-</td>
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<td>-</td>
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<tr>
<td></td>
<td>Lesson PR-11.01.3 Primary interactions of ionizing radiation. Nuclear energy transfer</td>
<td>-</td>
<td>2</td>
<td>-</td>
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<tr>
<td>2</td>
<td>Module PR-11.02 Biological effects of ionizing radiation and health effects</td>
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<td>3</td>
<td>1</td>
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<tr>
<td></td>
<td>Lesson PR-11.02.1 Modern view on biological effects of ionizing radiation. Health effects</td>
<td>-</td>
<td>1</td>
<td>0.5</td>
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<tr>
<td></td>
<td>Lesson PR-11.02.2 Acute and chronic radiation syndromes</td>
<td>-</td>
<td>1</td>
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<tr>
<td></td>
<td>Lesson PR-11.02.3 Biological effects of radionuclides acute and chronic exposure dose</td>
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<td>-</td>
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<tr>
<td></td>
<td>Module PR-11.03 Dose and assessment of risks associated with doses</td>
<td>8</td>
<td>5</td>
<td>3</td>
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<td>Lesson PR-11.03.1</td>
<td>-</td>
<td>0.5</td>
<td>1</td>
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</table>

List of competencies

Appendix – 2 List of competencies included in the programme of the course RLP-11 “Radiation Safety and Health Protection”

- Knowledge on how to apply basic modern national and international standards and requirements for radiation safety in a nuclear power industry.
- Understanding of ALARA methodology during activities associated with radiation risks.
- Recognizing the principles of radiation safety at nuclear facilities.
- Processing the principles of the organization of control of effective and equivalent doses of NPP personnel and the public radiation.
- Administrative and technical assurance of radiation safety at NPPs.

Glossary

Appendix – 3 Glossary for the programme of the course RLP-11 “Radiation Safety and Health Protection”


# Training Courses’ Development in 2013 Ordered by “Rusatom Overseas”

<table>
<thead>
<tr>
<th>№</th>
<th>Course Title</th>
<th>Language</th>
<th>Duration</th>
<th>Training materials</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Radiation Safety and Health Protection</td>
<td></td>
<td>72 h</td>
<td>TP, HB, PPTs, LP</td>
</tr>
<tr>
<td>2</td>
<td>Specifics of WWER Design: Safety Issues</td>
<td></td>
<td>144 h</td>
<td>TP, HB, PPTs, LP</td>
</tr>
<tr>
<td>3</td>
<td>Safety Analysis for NPP with WWER Reactors</td>
<td></td>
<td>72 h</td>
<td>TP, HB, PPTs, LP</td>
</tr>
<tr>
<td>4</td>
<td>Policy on Decommissioning and Regulatory Control</td>
<td></td>
<td>36 h</td>
<td>TP, HB, PPTs, LP</td>
</tr>
<tr>
<td>5</td>
<td>NPP Safety Assessment Based on Preliminary Safety Analysis Report</td>
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<td>72 h</td>
<td>TP, HB, PPTs, LP</td>
</tr>
<tr>
<td>6</td>
<td>Financial Aspects of NPP Construction</td>
<td></td>
<td>72 h</td>
<td>TP, HB, PPTs, LP</td>
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<tr>
<td>7</td>
<td>Risk Assessment and Risk Management</td>
<td></td>
<td>36 h</td>
<td>TP, HB, PPTs, LP</td>
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</table>

2. Training Solution
2. Training Solution

NKM Issues in Training Course Development

WWER – THE LOWEST OCCUPATIONAL EXPOSURE LEVEL

<table>
<thead>
<tr>
<th>Reactor Type</th>
<th>2011 Average Annual Collective Dose</th>
<th>3-Year Rolling Average for 2009-2011</th>
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</thead>
<tbody>
<tr>
<td>WWER</td>
<td>0.51</td>
<td>0.54</td>
</tr>
<tr>
<td>PWR</td>
<td>0.65</td>
<td>0.69</td>
</tr>
<tr>
<td>BWR</td>
<td></td>
<td>1.18</td>
</tr>
<tr>
<td>PHWR/CANDU</td>
<td></td>
<td>1.18</td>
</tr>
<tr>
<td>All reactor types, incl. GCR and LWGR</td>
<td>0.76</td>
<td>0.82</td>
</tr>
</tbody>
</table>

Data from “Twenty-first Annual Report”

EXPERTS INVOLVEMENT and the course team

Solovyev A.A.  
Expert of the course  
Head of the training center “Nuclear and Radiation Safety” Rosatom CICE&T, former Deputy Director for Safety of Bushehr NPP

Vaizer V.I.  
The course reviewer  
Head of Radiation Safety department of A.L. Leipunsky Institute for Physics and Power Engineering, member of Radiation Safety Methodological Board of Rosatom

Filipyev I.S.  
The course developer  
Specialist of International Center for NPP Personnel Training, Rosatom CICE&T

Obninsk - 2014
Training in Cooperation with ENEN
(European Nuclear Education Network Association)

Engineering aspects of nuclear fuel fabrication: from mining to manufacturing fuel assemblies

Training dates: 21.05–16.05.2012.
Training language: English.
Trainees: Italy (2), Romania (4), Slovakia (2), IPPE (2), MEPhI (1), Total: 11 persons

Scope: the course aims to familiarize postgraduates and specialists from Europe with specific features of Russian technologies of nuclear fuel fabrication.

Content: the course comprises lectures, practical assignments and technical tour of Mashinostroitelny Zavod, Electrostatl (Fuel company “TVEL”).

Duration: 36 academic hours (following the test the trainees were awarded ECTS grades)
Bilateral Cooperation with VN Organizations in 2012

Basic course on safety of nuclear technologies

- Training language: English
- Trainees: VAEA (3), VINATOM (2), VARANS (5)
- Total: 10 persons

Introductory course in simulator application for safety analysis

- Training language: English
- Trainees: VARANS (6)
- Total: 6 persons

Courses were developed in cooperation SEC “NRS”, IBRAE, GIDROPRESS and other Russian institutions
Signing Practical Arrangements Between ROSATOM Subsidiaries and the IAEA

19.09.2011

Objectives:

Rosenergoatom, CICE&T and IAEA reached understanding that enhancing interaction between them requires cooperation in the following areas:

• Exchange and dissemination of information, including release of joint publications;

• Mutual support in establishing training courses to develop human resources for countries embarking on the way of developing nuclear power;

Organizing joint missions to evaluate requests from recipient-countries

Left to right
V.G. Asmolov, First Deputy of General Director of Rosenergoatom;
A.V. Bychkov, Deputy Director General of the IAEA,
Yu.N. Seleznev, Rector of CICE&T

3. Cooperation with the IAEA
Short-term Training Courses for Bangladesh Nuclear Infrastructure Development in cooperation with IAEA

Establishing Nuclear Power: Siting, Reactor Design, Quality Assurance
15-26 April 2013

Project Management for NPP Construction
04-17 Dec. 2011

Project Management for NPP Construction
31 May– 07 June, 2011
Cooperation with the IAEA: Training Top Managers in Nuclear Power Program for Vietnam in 2011

5-18 June 2011

20-27 August 2011

02-15 October 2011

Course: Project Management for NPP under Construction

Course: Reactor physics for engineers

Course for NEPIO: Initialization of national nuclear power programmes

3. Cooperation with the IAEA
**Training activities in ROSATOM CICE&T provided in cooperation with TC IAEA**

<table>
<thead>
<tr>
<th>Year</th>
<th>Course</th>
<th>Trainees</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>1. Training Course for Top Managers of NEPIO: Start-up of nuclear power programme</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>2. Project Management for NPP Construction</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>3. Nuclear Engineering Infrastructure Development</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>4. Reactor Island: Physics and Equipment, for Engineers</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>5. NPP Planning and Pre-Operational Support</td>
<td>1</td>
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</table>

Total: 53 trainees

3. Cooperation with the IAEA
Professional (left) and educational (right) background of national nuclear infrastructure personnel visited Rosatom-CICE&T in 2011-2014

- **Top Level Manager**: 36%
- **Middle Level Manager**: 32%
- **Low Level Manager**: 10%
- **Specialist**: 22%

- **PhD**: 50%
- **Master**: 25%
- **Specialist**: 14%
- **Bachelor**: 11%
Lesson learned

Of highest priority is the investigation of NPP staffing options and associated competences of NPP personnel (both are very much vendor dependent).

This would help to facilitate self-evaluation of national nuclear infrastructure development and form the integrated work plan in the HRD area including training schemes of the key operating personnel in vendor country.

Related to this issue is the necessity to form the joint working group for elaboration on the HRD Roadmap
Thank You for Your Attention!
Welcome to Rosatom CICET

http://rosatom-cicet.ru/

http://rosatom-cicet.ru/?page_id=98