



ROSATOM

JOINT STOCK COMPANY «ATOMIC ENERGY POWER CORPORATION»

ROSATOM CENTRAL INSTITUTE
FOR CONTINUING EDUCATION AND TRAINING
(ROSATOM-CICE&T)



Russian support for developing nuclear infrastructure in newcomer countries

Vladimir ARTISIUK

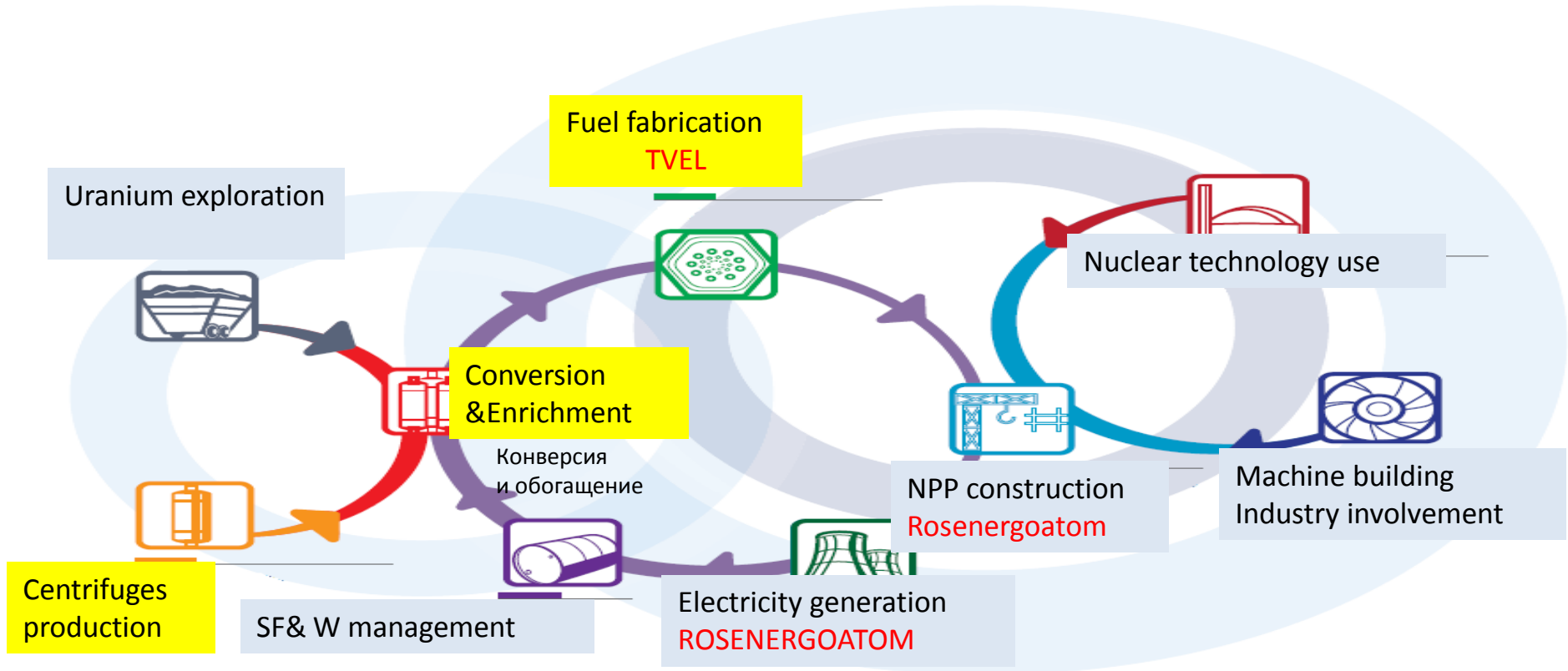
**ATOMEXPO-15
Moscow
2, June 2015**

1. Introduction
2. Meeting the Expectations of Embarking States
3. Training Solutions: Planning&Implementation
4. Training Practices (based on the results of 2014)
5. Conclusions

1. Introduction: Glance at “Rosatom”

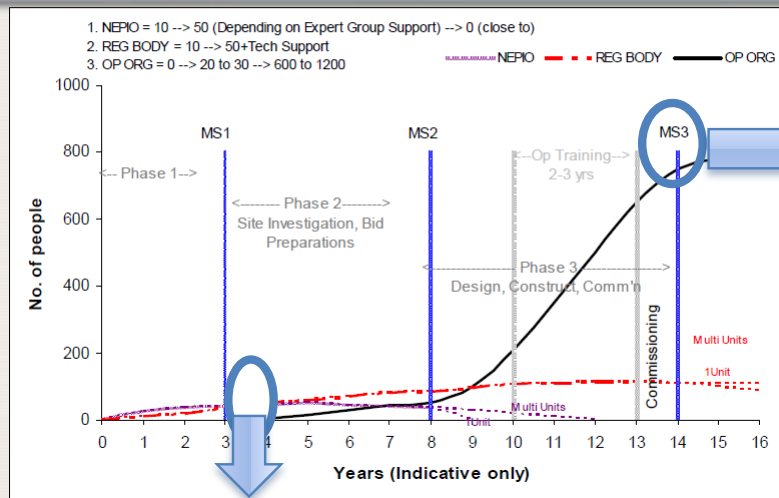
Responsible for implementing the Federal Nuclear Policy

Rosatom assistance to embarking states is based on its own experience



Essentials of HRD in Emerging Nuclear Countries

Phasing the Training Programme

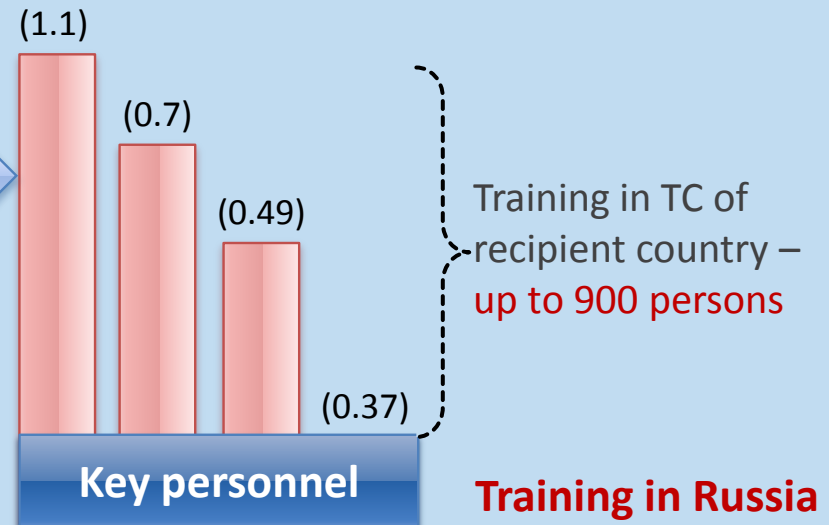


Personnel for Nuclear Programme

- 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)



(operating personnel, mid-level and top managers):

- up to 200 persons per 1 unit**
- up to 300 persons per 2 unit**

2. ROSATOM: Meeting the Expectations of Embarking States

Forming the Pool of Russian Experts to Support the Nuclear Infrastructure Development in Embarking States

■ Objectives:

- ❑ To build up a group of Russian Experts for providing assistance to embarking states.
- ❑ 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 Experts 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

Obninsk, ROSATOM-CICE&T 3-7.12.2012



Participants:

4 - international (Bangladesh, Belarus, Vietnam, IAEA)

22 – Russian experts

Objectives:

- To exchange views on the **priorities and needs**
- To reach **common understanding** in the organization of work
- To show by examples how NI functions are supported by **technical “centers” in vendor country**
- To initiate **interaction between WWER users** as a mechanism for newcomer to accumulate required competencies

Outcome:

- This is the first-of-a-kind Workshop organized in Russia that provided senior NEPIO managers with the info on
 - **Rosatom services** in the area of NI;
 - Selected **Russian experts** (their names, affiliation, work experience) who could support in the development of the **19 NI issues** considered in the IAEA NI guidance ;
 - **Russian experts** (their names, affiliation, work experience) in **specific areas** of
 - NPP construction and services at all the stages of NPP cycle;
 - Training for NPP construction and operation phases;
 - Russian computer codes for safety analysis
 - safety culture;
 - metrology;
 - psychophysical support of NPP personnel

Obninsk, ROSATOM-CICE&T, 1-5.12.2014



Participants:

17 - international (Bangladesh, Belarus, Jordan ,Turkey, IAEA)

24 – Russian experts

Workshop for NEPIO oriented to WWER Technology Conclusions & Recommendations

NEW!

- ❑ National NI development requires a dedicated state programme with allocation of the necessary resources;
- ❑ Special role of NEPIO is to initiate, promote and control the development of such programme;
- ❑ Sustainable organizational structure of nuclear power programmes with clear responsibilities, authority, power and resources has to be established to support NPP introduction in newcomer countries;
- ❑ The format of the Workshop is useful for information exchange and sharing experience accumulated during NI development between vendor state (RF) and the countries oriented to WWER technology;
- ❑ Practical support provided by vendor state in developing the NI in the 19+ areas is an important prerequisite of the national infrastructure development;
- ❑ Training centres, emergency preparedness centres, information centres and crisis centres are obligatory for NPP operational support.
- ❑ IAEA is expected to facilitate through TC programme and establish interregional project to consider specifics WWER technology (safety, licensing process, nuclear fuel cycle, etc)

Obninsk, ROSATOM-
CICE&T, 1-5.12.2014



Identified Priority Issues for Development of NI

(Workshop for NEPIO oriented to WWER Technology, ROSATOM-CIAE&T, Obninsk, 01-05.12. 2014)

Total

- 1
• Human resources development
- 2
• Regulatory framework
- 3
• Nuclear safety
- 4
• Management
• Legislative framework
• Computer codes
- 5
• Safety culture
- 6
• Electrical grid
- 7
• Funding and financing
• Nuclear fuel cycle
- 8
• Environmental protection
- 9
• Safeguards
• Security and physical protection
- 10
• Radiation protection
• Radioactive waste
- 11
• Emergency planning
- 12
• Site and supporting facilities

Top-5 issues

- 1
• Human resources development
- 2
• Regulatory framework
- 3
• Nuclear safety
- 4
• Management
• Legislative framework
• *Computer codes*
- 5
• *Safety culture*



Expectations of the Newcomer Countries from the NPP Vendor

1/2

**Technical Meeting: Topical Issues
on Infrastructure Development:
Vienna, 9-12 February, 2010**



Group:1

NPP V

EXPERIENCE ,LESS and RECOMMENDATIONS

1. Vendor should provide a Vision to the New Comer
2. The new comer countries need additional information in terms of seminars, trainings & courses from vendors.
3. The information regarding Operators and Regulators should be provided by Vendors or the corresponding organisation of the country of the Vendor
4. The local professional institutes should be involved to impart knowledge as per vendors requirements
5. New Comer countries want proven technologies
6. The cost of NPP must be discussed per technical requirements of the country depending on what they actual want

Expectations of the Newcomer Countries from the NPP Vendor to Develop or Strengthen Particular NI Issue

Priorities:

Technology transfer

Expert missions

Personnel training

**Workshop for NEPIO:
Obninsk, 1-5 December, 2014**



Recommendations to the Russian side:

- Provide with trainings, fellowships, consultancy service in the area of HRD, Financing, Regulatory framework, Safety, Management, Computer codes, Safety culture, etc.;
- Assist in preparation of an action plan for cooperation;
- Arrange for a joint needs assessment mission to identify and prioritize the training needs.

How to Meet the Challenges

Challenges:

- Language barrier;
- Lack of competent human resources;
- Lack of availability of the training materials, software, tools and codes in English.

**Workshop for NEPIO:
Obninsk, 1-5 December, 2014**



Recommendations :

- Frequent meetings, workshops, visits etc.;
- Sharing knowledge and experience in various fields of NI development;
- Establishing working group in each milestone;
- Setting up a detailed structure on how to setup a nuclear programme in an embarking country;
- Providing train-the- trainers approach

3. Training Solutions: Planning&Implementation

ROSATOM Phase Based E&T Solutions

Purpose:

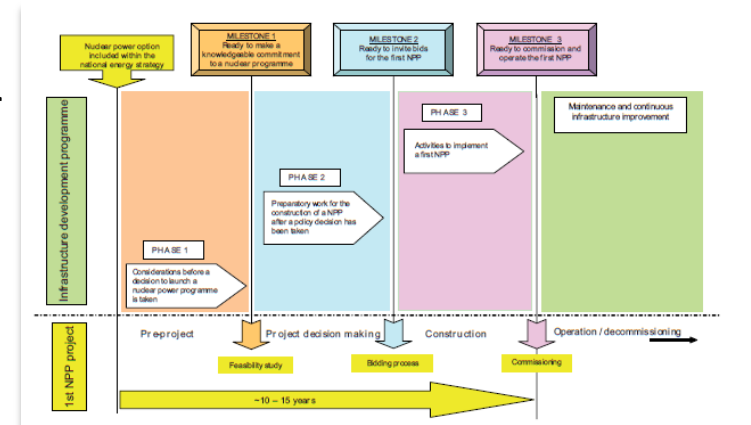
to provide support for embarking states on how-to-become-the-knowledgeable-customer at each phase of nuclear power programme development

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 embarking states **1-2 days**);
- ❑ Short-term training courses for skilled national personnel (**1 week - 1month**);
- ❑ Middle-term courses for building specific competencies (**1-6 months**)
- ❑ Long-term training for key personnel (**1-3 yrs**)
- ❑ University education in Russia (**2+ years**)
- ❑ Support of training localization (**var**)
- ❑ Consultancy (**var**)



Signing Practical Arrangements Between ROSATOM Subsidiaries and the IAEA

19.09.2011



Left to right

















V.G. Asmolov, First Deputy of General Director of Rosenergoatom;

A.V. Bychkov, Deputy Director General of the IAEA,

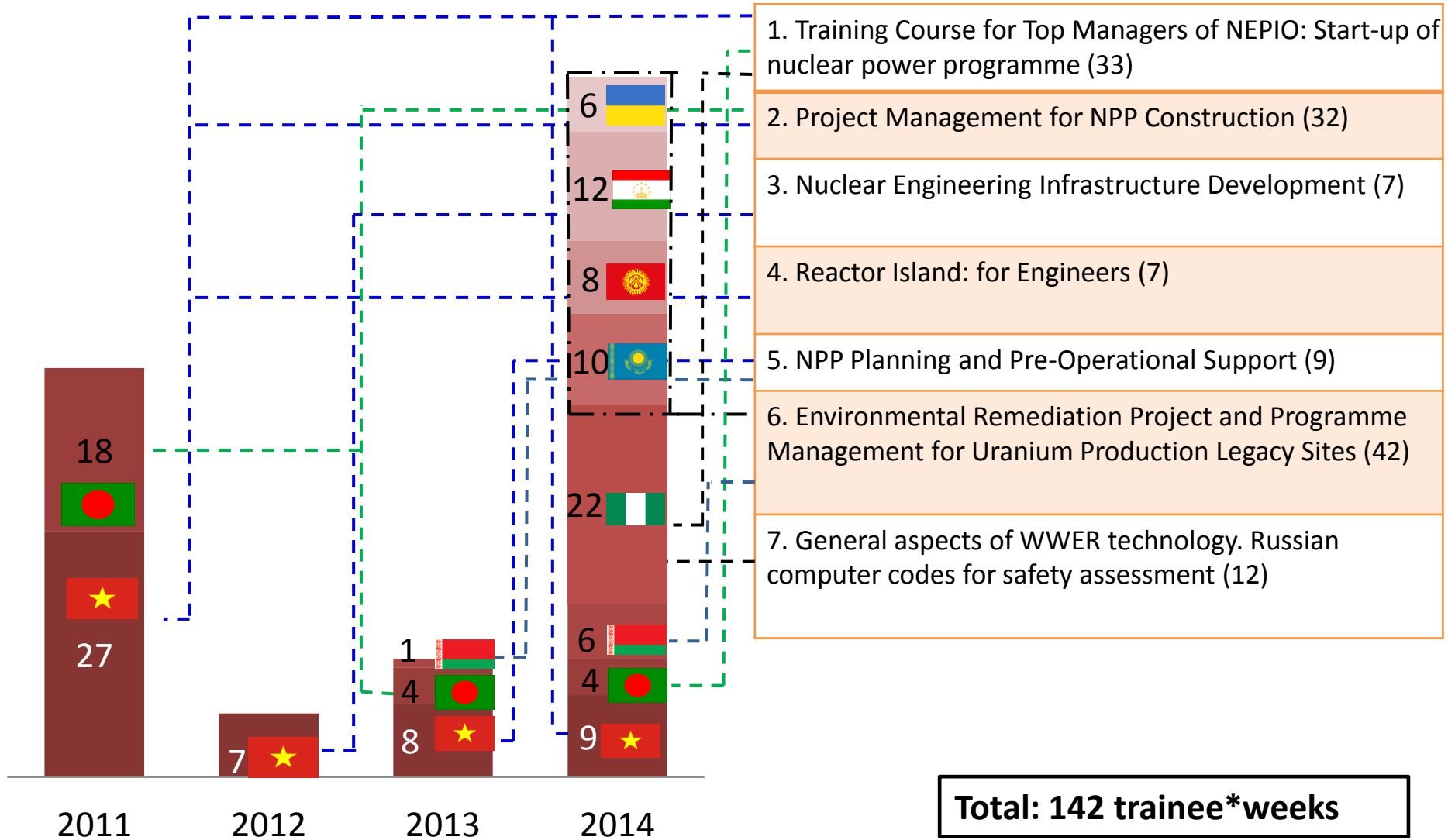
Yu.N. Seleznev, Rector of CICE&T

- 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

Training Courses Available in ROSATOM-CICE&T (developed in 2010-2013)

No	Course Title	Language	Duration	Training materials
1	Preparation of the bid i		144 h	TP, HB, PPTs, LP
2	Site selection and qualif		72 h	TP, HB, PPTs, LP
3	Characteristics and desi safety margins		36 h	TP, HB, PPTs, LP
4	Security and physical pr relationship with safety		72 h	TP, HB, PPTs, LP
5	Training Course for Top nuclear power program		36 h	TP, HB, PPTs, LP
6	Nuclear waste management		36 h	TP, HB, PPTs, LP
7	Project Management for NPP Construction		100 h	TP, HB, PPTs, LP
8	Nuclear power plants with nuclea power in Russia		540 h	TP, HB, PPTs, LP
9	Reactor Island: Physics and Equip circuit for Engineers		72 h	TP, HB, PPTs, LP
10	Thermo Hydraulics, engineering a secondary circuit (Turbine Island)		156 h	TP, HB, PPTs, LP
11	Basic course on safety of nuclear technology		72 h	TP, HB, PPTs, LP
12	Nuclear fuel fabrication		72 h	TP, HB, PPTs, LP
13	Computer simulation to assess nuclear safety		72 h	TP, HB, PPTs, LP
14	Radiation Safety and Health Protection		72 h	TP, HB, PPTs, LP
15	Specifics of WWER Design: Safety Issues		144 h	TP, HB, PPTs, LP
16	Safety analysis for NPP with WWER reactors		72 h	TP, HB, PPTs, LP
17	Policy on Decommissioning and Regulatory Control		36 h	TP, HB, PPTs, LP
18	PP Safety Assessment based on Preliminary Safety Analysis Report		72 h	TP, HB, PPTs, LP
19	Financial Aspects of NPP Construction		36 h	TP, HB, PPTs, LP
20	Risks Assessment and Risk Management		36 h	TP, HB, PPTs, LP

Training of Specialists for National NI ROSATOM-CICE&T In Cooperation with IAEA



Format of Bilateral cooperation on NI

RF-BELarus NI Working Group



IGA on peaceful use of atomic energy
28.05.2009

IGA on NPP Construction 15.03.2011

First meeting of the Joint Working Group on NI
23-25.05.2013,
Second meeting of the JWG on NI,
23 .10.2014

National Nuclear Power Programme
(NPP includes NPP)

NPP
management

NPP
regulation

JWG NI Working Format:
Planning, discussions, visits



2-years Joint work plan
on NI

Format of Bilateral cooperation on NI

RF-BGD NI Working Group



IGA on peaceful use of atomic energy
21.05.2010



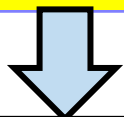
IGA on NPP Construction 02.11.2011



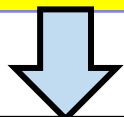
Joint Coordination Committee(JCC)
22-23.07.2014



**First Joint Working Group
on Nuclear Infrastructure Meeting**
10-13.10.2014



**NPP
management**



**NPP
regulation**

JWG NI Working Format:
Planning, discussions, visits



**3-years Joint work plan
on NI**

4. ROSATOM-CICE&T Training Practices (based on the results of 2014)



8-week IAEA's fellowship (11 May- 19 July)

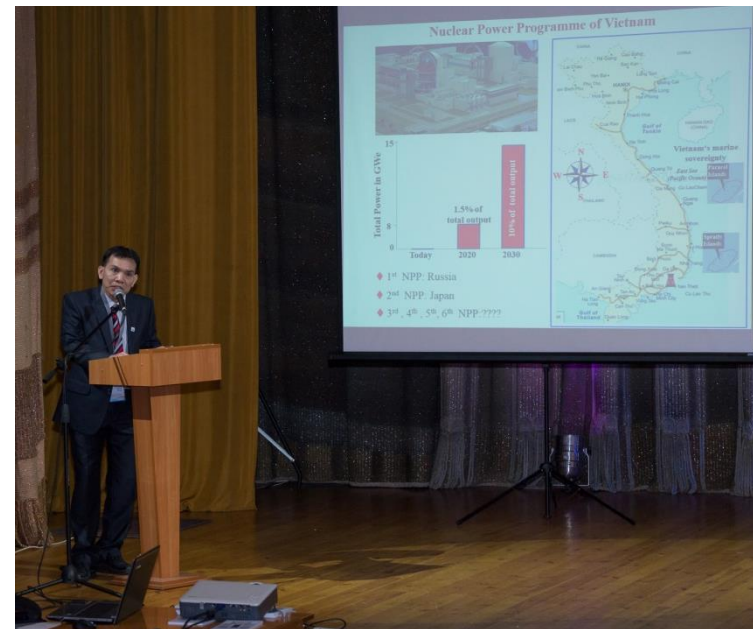
Lecturer and researcher at the **Hanoi University of Science and Technology (HUST)**

Training objectives:

- to define missing elements in engineering programmes of the HUST, which will contribute better understanding of specialized courses in the training of NPP operating personnel of in Russia
- to **specialize CICE&T's courses for Vietnamese audience**

Training courses reviewed:

- «Specifics of WWER design: safety issues»
- «Radiation safety and health protection»





English-Vietnamese glossary for the WWER technology courses

English	Vietnamese
Handling of Radioactive Substances	Quản lý chất phóng xạ
Leak-tight shell	Vỏ bọc chống rò rỉ bức xạ
Primary Circuit	Hệ hoàn lưu nước sơ cấp (đi qua lõi lò, được duy trì ở áp suất cao để nước không bị sôi)
Perforated Elliptic Bottom Head	Đáy lò dạng khum ê-líp có đục lỗ
Protection Tube Unit	Bộ ống bảo vệ
Protection Tube Module	Tổ hợp ống bảo vệ
Reactor Pit	Ống trụ bao quanh thùng lò phản ứng (có đục lỗ hình ê-líp ở đầu phía dưới).
Reactor Thermal Isolation	Lớp cách nhiệt quanh thùng lò phản ứng
Reactor Vessel	Thùng lò phản ứng
Secondary Circuit	Hệ hoàn lưu nước thứ cấp (duy trì ở áp suất thấp hơn để hóa hơi cho hoạt động Tua-bin)

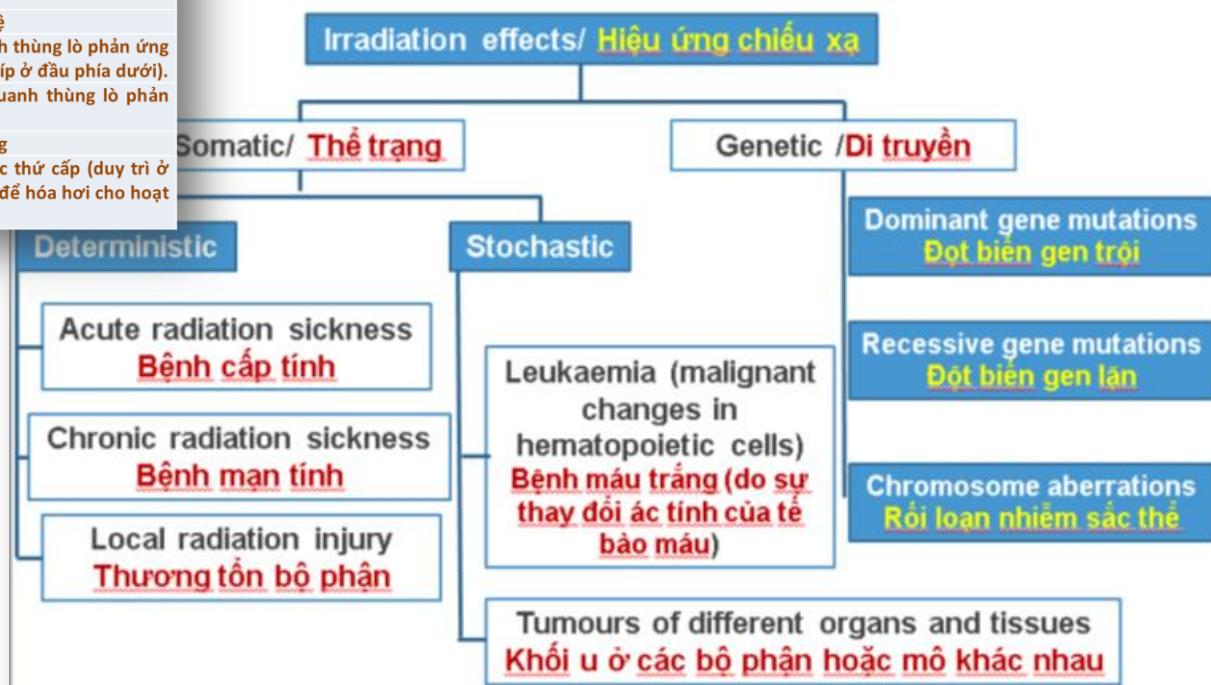
Review considerations of the WWER training courses

Review considerations of training course RP-11 "Radiation Safety and Health Protection" at ROSATOM CICE&T

1. General considerations

- The course consists of 11 modules including 33 specific topics providing the necessary knowledge and skills of safety management in facilities, or situations to enable the trainees with a solid understanding of the critically safety processes of nuclear radiation at INPP.
- The course is very necessary and useful for the undergraduated students in newcomers of nuclear industry like Vietnam because currently there is a lack of such courses in the education, economy, of engineers who would work for nuclear industry and nuclear radiation facilities, afterward.

Biologic Effects of Ionizing Radiation/ hiệu ứng bệnh lý của BX i-ôn hóa



Translation of lectures for the WWER training courses

Short Term Courses for Top Managers of NEPIO: Start-up of Nuclear Power Programme

A 1- 2-week Scientific Visit under TC IAEA

Modules:

- Becoming a Knowledgeable Customer;
- WWER-technology;
- Russian computer codes for safety assessment;
- Nuclear higher education in Russia;
- Practical implementation of HRD programme:
Technical tour to Novovoronezh NPP;
- Safety fundamentals for NPP with WWER;
- Different designs of safety systems for new
units with WWER-type reactors;
- Human Resources Development Modeling;
- Developing simulators for Training and
Education in Nuclear Engineering;
- Qualification&Competence based on NPP
structure;
- NPP staff recruitment&development.



07-18
April



02-11
June



23-27
June



Training Course on General Aspects of WWER Technology Russian Computer Codes for Safety Assessment



6-week IAEA's fellowship
04.10 - 12.12

Regulatory Officer at the Nigerian Nuclear Regulatory Authority (NNRA)

Scientific Officer at the Nigeria Atomic Energy Commission (NAEC)



Training objectives:

- Comprehension of safety systems of NPP with WWER Reactors;
- Comprehension of Russian computer codes for safety assessment during normal and abnormal operational modes.

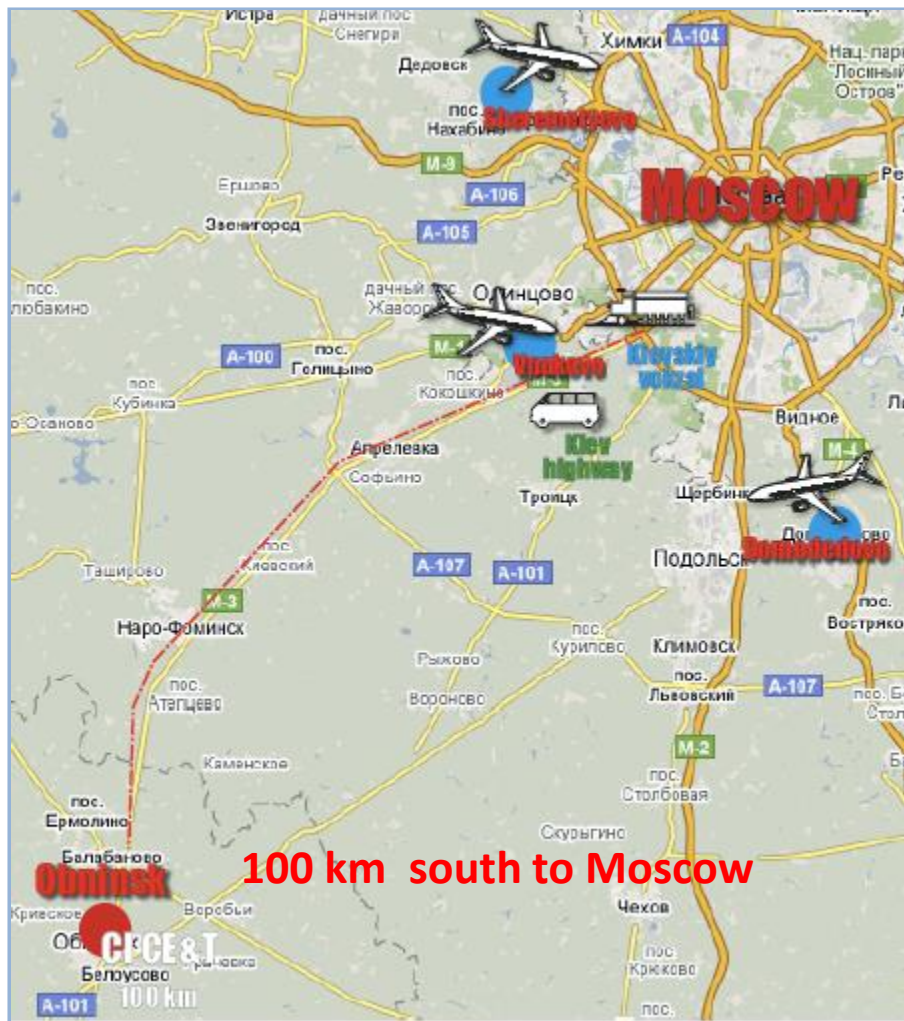


HRD – penetrates all the other issues/elements of nuclear infrastructure development (19+)

HRD + Specialized Centres (TC for NPP personnel, Emergency TC, Information Centre, etc) are the basis for national nuclear infrastructure support

To form the joint working groups for elaboration on the Roadmap (2-3 yrs period) for each of the 19 issues/elements of nuclear infrastructure development

ROSATOM –CICE&T Location and Contact Details



<http://rosatom-cicet.ru/>
21, Kurchatov str., Obninsk,
Kaluga rgn., 249031, Russia
Contact person for infrastructure:
Prof. Vladimir ARTISIUK
VVArtisyuk@rosatom-cipk.ru