Meeting Report

IAEA Consultancy Meeting ET1703267 on

the Role of Research Reactors in Human Capacity Building in Support of Nuclear Technology

25-29 June 2018, Vienna, Austria

Reference to the Agency's programme:

Sub-Programme	**1.4.2**	**Research reactors**
Project	**1.4.2.2**	**Research reactor infrastructure, planning and innovation**
Task/Output	**04/03**	**Human capacity building**

Introduction

Countries worldwide are pursuing or expanding their peaceful applications of nuclear technologies according to their national objectives. On the one hand, countries with long-standing nuclear power programmes need to maintain their capacity. On the other hand, countries further developing or embarking on nuclear science and technology programmes, including nuclear power programmes, need to develop their capacity.

In many countries, research reactors have been or are a first step in the preparation for a national nuclear power programme. In others, research reactors have been built to support various neutron applications that are used in everyday life, such as in basic and applied research, medicine, industry and agriculture.

Regardless of the final goal, nuclear power or nuclear science and application programmes, research reactors are excellent tools to support nuclear capacity building — through academic education, training of professionals, research and development, as well as the supply of services for industry. In the field of human capacity building, such reactors are playing a role of paramount importance to bridge theoretical knowledge and practical experience. For more than sixty years, research reactors have effectively supported the development of human resources in support of nuclear technology.

One programmatic activity of the International Atomic Energy Agency (IAEA) is to assist Member States in accessing research reactors for capacity building, including those Member States embarking on new research reactor or nuclear power programmes. As a complement to services developed by the IAEA to facilitate the access to research reactors for nuclear capacity building, this Technical Meeting will review and gather information on the role of such reactors in human capacity building in support of nuclear technology at large.

Objectives

The purpose of the meeting is to serve as a forum for the participants to share and discuss their needs, experiences and lessons learned in relation to the role of research reactors for human capacity building in support of nuclear technology. In particular, the participants are expected to share their approaches and experiences regarding the utilization of hands-on training at research reactors as a tool that can help with the development and/or preservation of practical competencies and that can provide specific learning inputs for training programmes aimed at professionals working in the field of nuclear technology.

The meeting will provide an opportunity to bring together the stakeholders involved in this activity, including the providers of such training activities, as well as the organizations and institutions benefiting from the training. In addition to the topic of higher educational activities, which was the topic of a Technical Meeting in June 2014 (Vienna, Austria), this meeting will focus on the hands-on training activities addressed to professionals and, in particular, to the research reactor and nuclear power plant workforces.

Participants are invited to provide a paper and a presentation on existing experiences, good practices, lessons learned and challenges related to the topics listed below.

Expected Output

The main expected output of the meeting is a report based both on the papers and presentations provided by the participants and on subsequent discussions. The report will:

- Provide an overview of the needs for hands-on training for human capacity building and preservation in support of nuclear technology;
- Identify the specific contribution of hands-on training at research reactors in support of this activity; and
- Identify opportunities for Member States to access/utilize research reactors for human capacity building and preservation for nuclear programmes.

Work done

The participants (Annex 1) were welcomed by Mr C. Xerri, Director of the Division of Nuclear Fuel Cycle and Waste Technology, who outlined the considerations and objectives of the technical meeting. Mr. F. Foulon, Research Reactor Section, Division of Nuclear Fuel Cycle and Waste Technology, highlighted several IAEA activities that support Member States in launching or increasing nuclear education and training at research reactors in addition to four instruments for human capacity building: distance training such as the Internet Reactor Laboratory, basic training, intermediate training and advanced training such as that conducted at International Centres Based on Research Reactors (ICERRs). Mr M. Van Sickle, Nuclear Power Engineering Section, Division of Nuclear Power, emphasised the IAEA's systematic approach to training and milestones approach to human resources development, which can systematically build sufficient and sustainable human resource in newcomer countries as well as in countries with developed nuclear technology.

The participants introduced themselves and accepted the proposal to designate Mr. P. Varde (India) as chair of the meeting and Mr. L. Sklenka (Czech Republic) and Mr. X. Wohleber (France) as rapporteurs. The agenda of the meeting was adopted (Annex 2).

Presentations were given by the participants and followed by lively discussions. Most of the three first days of the meeting were dedicated to presentations from IAEA staff and from Member States. The IAEA presentations were focused on the topic of human resources development and knowledge management for nuclear power programmes and the role of research reactors in this process. The Member State presentations focused on nuclear education and training using research reactors in an international context but also the nationally specific conditions in their home countries. The participants were then split into three groups, with each preparing a presentation for Thursday with recommendations and conclusions. Finally, the recommendations and conclusions regarding three topics, needs, experience and feedback and future development, were discussed before the conclusion of the meeting.

Here after is a summary of the presentations that were given during the meeting.

Nuclear capacity building instruments based on research reactors, by François Foulon, IAEA. Mr. Francois Foulon emphasised IAEA several activities that support MS to launch or increase nuclear education and training at research reactors in MS. 4 instruments for Human Capacity Building are pointed out: Distance Training (IRL), Basic Training, Intermediate Training and Advanced Training (ICERR).

IAEA Support for Human Resource Development for Nuclear Power, by Matthew Van Sickle, IAEA. Mr. Van Sickle emphasised IAEA systematic approach to training, milestone approach to human resources development which can systematically build sufficient and sustainable human resource in new comer countries as well as in countries with developed nuclear technology.

P- IAEA activities in support of capacity building in support of Nuclear Technology: Capacity Building for the Safety of Research Reactors, by S. Shim, IAEA. Mr. Shim emphasised IAEA

systematic approach to safety and safe operation of any nuclear installation as essential fundamental of any human resources development in nuclear business.

State of the RR and E&T: Presentation of the 3 RR and focus on VR-1, as a powerful tool for training courses for students and trainees, by Lubomir Sklenka form Czech Republic. Mr. Sklenka presented well-established research reactor VR-1 specifically designer for education and training and its extensive educational and training programme for national and international users.

Regional Cooperation in Nuclear Education: Experience and Lessons Learned in Using the TRIGA Research Reactor for Building Engineering Competencies in Newcomer Countries, by Andrei Kosilov, from the Russian Federation. Mr. Kosilov presented STAR-NET educational platform of several CIS countries (Armenia, Azerbaijan, Belarus, Kazakhstan, Poland, Russian Federation and Ukraine) and its close collaboration with Austrian research reactor.

Research Reactors in Nuclear Education and Training at Belarusian State University, by Andrey Timoshchenko, from Belarus. Mr. Timoshchenko recalled that two power plants are under construction. Research reactors are also in consideration for the training needs. In addition, Belarussian is a member of STAR-NET and uses the IRL system.

Activities of the SCK•CEN Academy and specific use of Research Reactors in E&T, by Geert van den Branden, from SCK-CEN, Belgium. Mr. Van Den Branden discussed the role of high power research reactors in nuclear education and training, on BR1 reactor in particular, but also on BR2.

Presentation of ETRR-2 E & T facility, by Magdy Abdela'al, from Egypt. Mr. Magdy emphasised the challenges of ETRR-2 reactor in nuclear training when Egypt is going to build the first nuclear power plant and ETRR-2 reactor is the only nuclear installation in operation in the country.

Overview of the IAEA nuclear power plants' basic principle simulators for education and human capacity development in Member States, by Tatjana Jevremovic, IAEA. Mrs. Jevremovic emphasised role of simulators, particularly basic principles simulators, as another efficient educational and training tool in human resources development and IAEA activities in this field. Theses simulators are designed for all MS, and in particular for newcomers.

Integrating Learning Management Systems and Hands-on Learning Activities to train students as Research Reactors operators at the Utah University, by Matthew Lund and Cole Takasugi, United States of America. Mr. Lund and Mr. Takasugi focused on development and implementation of systematic methodological approach in nuclear education (both theoretical and experimental/hands-on at UURT reactor) in order to increase the quality of education and retention of knowledge of students. With a practical demonstration of the simulator, developed by students.

Role of Research Reactors for Human Capacity Builing in suppot of Indian Nuclear Programme, by Prabhakar Varde, NARC, India. Mr. Varde presented the Research Reactors, belonging to 2 institutes in India: BARC and IGCAR. He focused on system of human capacity building and retention in the country with large nuclear programme (22 NPP unit in operation, 6 NPP unit under construction and with 6 RRs in the country).

Role of Research Reactors Infrastructure for nuclear technology in Iran, by Safaei Arshi Saiedeh, Nuclear Science and technology Research Institute (NS/TRI), Iran. Mrs. S. Safaei Arshi emphasised connection of the four Iranian research reactors with national universities. She recalls the cooperation of the Iranian engineers and experts with Poland, Hungary and Romania, in addition of IAEA missions.

Human Resources Development on Research reactor on Vietnam, by Phung Khac Toan, Vietnam Atomic Energy Agency, Viet Nam. Mr. Khac Toan focused on the role of Dalat research reactor in human capacity building and retention in the country which recently stop the launching nuclear power programme, but still is considering building NPPs in the future.

Research Reactor Simulator Developed by Jozef Stefan Institute, by Anže Jazbec, Jozef Stefan Institute, Reactor Infrastructure Centre, Slovenia. Mr. Jazbec promoted basic principles simulator of research reactor that is mainly focused on reactor operations and transients. The simulator is after registration available to anybody from research reactors community or universities free of charge and definitely can be very valuable tools that can support real reactor experiments for education and training.

The Role of Research Reactors in Human Capacity Boiling for Kenya's Research Reactors and Nuclear Power Plants, by Hilda Mpakany, Kenya Nuclear Electricity Board (KNEB), Kenya. Mrs. Mpakany described situation in new comer country which is aiming to build nuclear power programme in the future and as the first step is planning to build the research reactor as a first nuclear installation in the country.

The Role of Russian Research Reactors in the E&T for Nuclear Science and Technology, by Nikolay Arkhangelskiy, State Atomic Energy Corp., Rosatom, Russian Federation. Mr. Arkhangelskiy focused on potential of Russian research reactors (in total 57 RRs in operation and 2 under construction) in nuclear education and training in the country with large nuclear power programme.

Experience and Lessons of the IRT MEPHI Research Reactor used for Education and Training during the long shutdown, by Viacheslav Fedoseev National Research Nuclear University Moscow Engineering Physics, MEPhI, Russian Federation. Mr. Fedoseev described the role of IRT RR in nuclear education and training from the perspective of university that is operation the reactor and also teaching students in nuclear engineering and reactor physics.

The Compendium "Research Reactors Exercises for Higher Education Programmes", by François Foulon, IAEA. Mr. Foulon promoted this compendium, publication which will be published in 2019.

Training in Maria Reactor in support of nuclear technology expertise, by Mr. Gaweł Madejowski, National Centre for Nuclear Research, Świerk, Poland., Mr. Madejowski described how nuclear education and training can be carried out also at high power research reactor Maria (30 MW).

Educational and Training opportunities at the ICN Triga Research Reactor in support of nuclear technology, by Laurentiu Costel Aioanei, Institute for Nuclear Research Pitesti ICN Pitesti, Romania. Mr. Aioanei presented the status of NPP in Romania (essentially CANDU-types reactors), and the two TRIGA research reactors (one can work in pulse mode), the hot cell and the spectroscopy labs.

The role of Research Reactors in Human Capacity Building for Nuclear Power Programme in Pakistan, by Ahmad Masroor, Pakistan Institute of Engineering and Applied Sciences; Pakistan Atomic Energy Commission, Pakistan. Mr. Masroor presented the NPP fleet in Pakistan, and the need of new plants, with the willingness to acquire a power of 8800 MW in 2030. He also presented the two Research Reactors PARR-1 (5 then 10 MW) and PARR-2 (30 kW), both used in E&T.

Contribution of Research Reactors to develop Human capacities of the HAEA, by Annamaria Sandor, Hungarian Atomic Energy Authority (HAEA), Hungary. Mrs. Sandor presented the NPP fleet (4 VVER plus 2 units in project), the regulatory body and the nuclear panorama in Hungary. She also presented the 2 research reactors and their importance in in knowledge development at HAEA.

Nuclear Knowledge Management - Future Section Activities, by David Drury, IAEA. Mr. Drury defined the role of IAEA in the Nuclear Knowledge Management (NKM) by running the industries and supporting organisations. Its goal is to support and maintain operational performance and standards, as well as reinforce and protect nuclear safety boundaries. It is a cross cutting activity between Education, Training, HRD, and Plant Knowledge.

The use of RA-0 and the other Research Reactors for the education and training of nuclear Workers in Argentina, by Carlos Alejandro Murua, Reactor Nuclear RA-O; Comisión Nacional de Energía Atómica (CNEA), Argentina. Mr. Murua presented the rich history of the research reactors in Argentina, and the NPP. He focused on the RA-0 reactor, mainly used for Education and Training. He also made an interesting demonstration of start up the reactor at distance, using the website of the reactor for showing the broadcast of the neutron parameters.

Diversity of French research reactors: Benefits and perspectives in terms of training and access to nuclear culture, by Xavier Wohleber, CEA, and François Huet, TechnicAtome, France. Mr.Wohleber and Mr. Huet presented the history and the different types of research reactors in France, in support of science, technology and education and training.

IAEA Support for Nuclear Power Infrastructure Development. Role of Research Reactors in providing support to Nuclear Power Programmes, by Andrey Sitnikov, IAEA. Mr. Sitnikov focused on the role of IAEA assistance for embarking countries.

EVOC project: The Augmented Virtual Reality teaching reactor of the French nuclear industry, by Xavier Wohleber, CEA, France. Mr. Wohleber presented the EVOC project, a multimodal platform mixing virtual (kinetics simulator, augmented virtual reality) and real things (console, hall), for carrying out training courses in the conditions of a nuclear facility.

Jordan's experience in the Role of Research Reactors in Human Capacity Building for the nuclear power Programme, by Mr. Salaheddin Malkawi, Jordan Nuclear Power Company, Jordan. Mr. Malkawi presented the difficult situation of Jordan in terms access to water, and the strong need for energy, showing that the construction of NPP will be a necessary challenge. He presented also the chronology of the nuclear field in Jordan, beginning by a subcritical assembly, then acquiring the JRTR (multipurpose reactor).

Saudi Arabia country presentation, by Mr. Hasan Abduhamid, Atomic Energy Research Institute; King Abdulaziz City for Science and Technology (KACST), Saudi Arabia. Mr. Abduhamid explained that in Saudi vision of 2030, atomic and renewable energies are high

priority. The first nuclear research reactor (LPRR) is a multipurpose facility which will support training and human resources development, facilitate nuclear scientific research, and develop and transfer nuclear technology to the Kingdom.

Part of the meeting was dedicated to group work on three complementaty topics: needs in capacity building, experience and feedback related to capacity building based on research reactors and future developemnt of the activity. One leader was nominated for each of these topics:

- Ms Annamaria Sandor, for the needs in capacity building
- Mr Viacheslav Fedoseev, for the experience and feedback related to capacity building based on research reactors
- Mr Lubomir Sklenka, for the future development of the activity

Group work performed on Wednesday and Thursday was concluded by a presentation, recommendations and conclusions from each of the groups. This was followed by a final discussion with all participants giving rise to the following conclusions and recommendations.

Conclusions

In the last 70–80 years, research reactors have played a vital role in nuclear capacity building and nuclear technological development due to their potential for practical operations in a real nuclear environment.

Given the renewal and, furthermore, expansion of human resources needed by nuclear programmes, it is important to maintain these competences through access to research reactors.

Research reactors provide education and training for human capacity building in support of all aspects of nuclear technology, but education and training is not only teaching reactor physics.

A nuclear research reactor facility can provide not only demonstrations of nuclear reactor technology and operation but also aspects such as practical utilization of safety concepts, safety culture and an interrogative attitude, radiation protection in the field, good practices in operation and maintenance of nuclear systems, nuclear facility security, quality assurance programmes and emergency preparedness.

Research reactors are specific tools to earn practical knowledge, competency and skills through hands-on training to complement lectures, e-learning tools and simulators.

As a tool for education and training, research reactors are capable to perform complex experiments such as licensing a new reactor core as well as simple demonstrations such as reactor transients.

Utilization and feedback forms can describe a simple yet comprehensive package of offered education and training exercises, but over time the RR community has expanded the range of services in education and training by developing and using films, calculation codes, simulators, internet broadcasting and reactor simulators to facilitate learning and exercises.

These have complemented exercises using the reactor and enhanced the hands-on component of education and training while improving cost and effectiveness. The diversity of activities and utilization of new technology is also important for adaptation to the changing demands in education and training of the users, while for newcomers, a research reactor can establish human capacity building in nuclear

sciences and technology and serve as a foundational link between universities and NPP operating organizations.

To further promote and enhance the role of research reactors, operating organisations must remain in close contact with current users and identify potential users for education and training. The public, students and professionals must be a focus of outreach, as well as adapting the research reactor facility's offer to the specific needs of each of these targeted groups.

The IAEA can organize meetings devoted to attracting and keeping users in addition to sharing good practices on management to show the research reactor community provides trustworthy examples in licensing and continuous training. These practices are also valuable for newcomers, who must demonstrate the benefits from the experience of research reactors.

Research reactor organisations must remain proactive to show these benefits to users, while keeping in mind the objective to better utilise their entire facility and the strengths of their staff and the necessity of relating value to the money spent on the activity. For example, a nuclear power plant operating organisation may be convinced to make use of a research reactor for the training of their personnel, but the possible users of training are not limited to the reactor staff.

Other groups may also benefit from well-designed training supported by the use of a research reactor, e.g., fire brigades, police and those involved in the organisation of emergency plans. Thus, training given at a research reactor facility need not focus only on the reactor physics, as a research reactor can help trainees learn about other important aspects of work in a nuclear power plant such as safety and security, maintenance and workforce management.

As ways to prepare for presenting their services to the nuclear power plant operating organisation, a research reactor operating organisation can deliver hands-on training to universities to promote the specifics of research reactors as students are hired by the nuclear power plant operating organisation, and the research reactor community can provide an example by organising visits or training at other facilities for their own personnel.

To further develop networking and communication, the periodic sharing of human capacity building experiences within the research reactor community is essential. Organisations can contact RR groups and events in their regions and countries such as the National Organization of Test, Research and Training Reactors (TRTR); Research Reactors Operators Group (RROG); and Regional Advisory Safety Committee for Research Reactors in Africa (RASCA). Problems of cost and transportation may be solved by hosting a virtual network.

While the technology utilised with research reactors may be at least 60 years old, we live in the 21st century. To promote its services, research reactor operating organisations should be using modern tools like Facebook and Twitter.

Research reactors need to use new technologies to augment old education and training exercises to make them more appealing and understandable for new generations and the wider community. The use of digital tools such as e-learning and simulators are becoming more and more popular for many reasons. Digital technology is cheaper than a research reactor while becoming more performant and playing an increasingly important role in our daily lives.

The Internet Reactor Laboratory is an effective tool in the embrace of digital technology, but it can be extended in the future through 3D visualization, for example, of reactor parameters such as neutron flux, and virtual reality can also attract students. Comparison with real experiments is one method to find a

balance between the use of these tools and the use of a research reactor. Just as digital technology can create a more intimate training experiment, teaching methods can also be improved regularly so that hands-on exercises are effectively performed by trainees, rather than the operating staff conducting show-and-tell.

Today there is a strong need of research reactors for human capacity building in nuclear technology not only for education and training but also preserving knowledge for the generations to come. As the realization of their potential in nuclear knowledge management is only beginning, research reactor operating organisations must unlock their potential for education by not limiting their activities to students of nuclear engineering but also reaching students of many other fields such as electrical engineering, mechanical engineering, material science, instrumentation and control, nuclear chemistry and even future physics teachers and nuclear managers.

Research reactors can also play an important role in increasing public awareness. In addition to training reactor operators and staff, regulatory body staff, researchers and lecturers, national emergency infrastructure and back-end solutions for nuclear facilities are issues that can be considered in future training programmes at research reactors.

Feedback from the last 60 years shows that research reactors are a beneficial and effective tool to provide a practical component in education and training as well as communicate appreciation of nuclear science and increase public acceptance. They remain an excellent tool for enhancing public awareness and acceptance to sustain nuclear technology. In the field of training and education research reactor operating organisations must think outside the box, as these reactors provide not just nuclear physics demonstrations to society, but much more.

Recommendations

- RR organisations should be proactive in collecting the needs of various stakeholder groups such as NPPs, regulators, TSOs and the nuclear industry for education and training using RRs and tailoring their capabilities to the needs of stakeholders. The participants noted this should be completed at the beginning of any new RR or NPP project.

- The RR community should share in developing an integrated offer of exercises and complementary tools such as films, calculation codes, e-learning, simulators and internet broadcast exercises with the assistance of the IAEA.

- RR organisations should continue to develop new education and training tools, incorporating the benefits of new technologies. The IAEA should assist in the development of these tools and promote and facilitate their use, particularly during national/regional workshops.

- The IAEA and RR organisations should collaborate to promote the specific added value of RR education and training regarding the dissemination of practical safety and safety culture and identify opportunities for marketing, such as international conferences and regulator workshops.

Annex 1 List of Participants

No.	Authority	Personal Details
1	Argentina	Mr Murua Carlos Alejandro Reactor Nuclear RA-O; Comisión Nacional de Energía Atómica (CNEA) Apartado Postal 39, Avenida Velez Sarsfield 299 5000 CÓRDOBA ARGENTINA Tel: 3514334429 Email: murua@cnea.gov.ar
2	Belarus	Mr Timoshchenko Andrey Head, Nuclear Physics Department Physics Faculty, Belarussian State University Nezavisimosti ave., 4 220030 MINSK BELARUS Tel: 2306292 Email: a_timoshchenko@mail.ru
3	Belgium	Mr Vittiglio Guido SCK.CEN Boeretang 200 BE-2400 MOL BELGIUM Tel: +32 14 33 21 95 Email: guido.vittiglio@sckcen.be
4	Belgium	Mr Van Den Branden Geert SCK.CEN Boeretang 200 2400 MOL BELGIUM Tel: 4332431 Email: geert.van.den.branden@sckcen.be
5	Czech Republic	Mr Sklenka Lubomir Department of Nuclear Reactors, Faculty of Nuclear Science and Physical Engineering (FNSPE), Czech Technical University (CTU) V. Holesovickach 2 180 008 PRAHA CZECH REPUBLIC Tel: +420 2 21912390 Email: lubomir.sklenka@fjfi.cvut.cz
6	Egypt	Mr Abdelaal Magdy Mahmoud Zaky Egyptian Atomic Energy Authority (EAEA Egypt Second Research Reactor Complex, ETRR-2 PO Box 13759 Inshas CAIRO EGYPT Tel: 44691755 Email: zaky_magdy@yahoo.com
7	France	Mr Wohleber Xavier CEA Saclay DEN/DANS/UPAC, Building 450 GIF-SUR-YVETTE CEDEX FRANCE Tel: 69084538 Email: xavier.wohleber@cea.fr

8	France	Mr Huet Francois AREVA TA 1100 Avenue Guillibert Gauthier de la Laziere CS 50497 13593 Aix-en-Provence Cedex3 AIX-EN-PROVENCE FRANCE Tel: +33 (0)6 43 82 53 06 Email: francois.huet@areva.com
9	Hungary	Ms Sandor Annamaria Hungarian Atomic Energy Authority (HAEA) P.O. Box 676, Fenyes Adolf u. 4 1036 BUDAPEST HUNGARY Tel: +36 1 4364843 Email: sandor@haea.gov.hu
10	India	Mr Varde Prabhakar BARC Room No. 116, Dhruva Complex 400085 MUMBAI INDIA Tel: 25594689 Email: varde@barc.gov.in
11	Iran, Islamic Republic of	Ms Safaei Arshi Saiedeh Nuclear Science and technology Research Institute (NSTRI) 14399-51113-Tehran TEHRAN IRAN Email: ssafaei@aeoi.org.ir
12	Jordan	Mr Malkawi Salaheddin Jordan Nuclear Power Company Building 25, King Hussein Business Park P.O.Box 142755 111814 AMMAN JORDAN Tel: +962 2 7201074 Email: salahm@just.edu.jo
13	Kenya	Ms Mpakany Hilda Kenya Nuclear Electricity Board (KNEB) P.O. Box 30582, Kenyatta Avenue NAIROBI KENYA Tel: 202219410 Email: hildampakany@gmail.com
14	Pakistan	Mr Ahmad Masroor Pakistan Institute of Engineering and Applied Sciences; Pakistan Atomic Energy Commission (PAEC) P.O. Box Nilore ISLAMABAD PAKISTAN Tel: 2207380 Email: mahmad@pieas.edu.pk

15	Poland	Mr Madejowski Gawel National Centre for Nuclear Research Budynek R2A, Pok 127 ul. Andrzeja Soltana 7 05-400 Otwock SWIERK POLAND Tel: 2731079 Email: Gawel.Madejowski@ncbj.gov.pl
16	Romania	Mr Aioanei C. Laurentiu Costel Institute for Nuclear Research Pitesti ICN Pitesti Campului St no. 1 P.O.Box 78 MIOVENI ROMANIA Tel: 248213400 Email: laurentiu.aioanei@nuclear.ro
17	Russian Federation	Mr Karezin Valery State Atomic Energy "ROSATOM" ul. Bolshaya Ordinka 24 119017 MOSCOW RUSSIAN FEDERATION Tel: +7 4999492707 Email: vkarezin@gmail.com
18	Russian Federation	Mr Arkhangelskiy Nikolay State Atomic Energy Corpn. Rosatom, Directorate for Scientific and Technical Cmplx 24 Bolshaya Ordynka Street 119017 MOSCOW RUSSIAN FEDERATION Tel: 9494028 Email: nvarkhangelsky@rosatom.ru
19	Russian Federation	Mr Fedoseev Viacheslav National Research Nuclear University Moscow Engineering Physics, MEPhI Kashirskoye sh., 31 115409 MOSCOW RUSSIAN FEDERATION Tel: 97885699 Email: fedvn59@mail.ru
20	Russian Federation	Mr KOSILOV Andrei National Research Nuclear University MEPhI Kashirskoe Shosse 31 115409 Moscow, Russia Federation Tel: +7 499 7052634 Email: a.kossilov@gmail.com
21	Saudi Arabia	Mr Al-Khomashi Nasser Atomic Energy Research Institute; King Abdulaziz City for Science and Technology (KACST) P.O. Box 6086 RIYADH SAUDI ARABIA Tel: +966 1 4813658 Email: khomashi@kacst.edu.sa

22	Saudi Arabia	Mr Abduhamid Hasan Nuclear Science Research Institute King Abdulaziz City for Science & Technology P.O. Box 6086 RIYADH 11442 SAUDI ARABIA Tel: +966 504 100981 Fax: +966 11 4813887 Email: hasan@kacst.edu.sa
23	Slovenia	Mr Jazbec Anze Jozef Stefan Institute Reactor Infrastructure Centre Jamova 39 1000 LJUBLJANA SLOVENIA Tel: 31360358 Email: anze.jazbec@ijs.si
24	United States of America	Mr Lund Matthew University of Utah 50 S. Central Campus Dr., Room 1206 SALT LAKE CITY, UT UNITED STATES OF AMERICA Tel: +1 3727880 Email: matthew1.lund@utah.edu
25	Viet Nam	Mr Phung Toan Khac Vietnam Atomic Energy Agency 113 Tran Duy Hung 10th Floor HANOI VIET NAM Tel: 9412971 Email: toanpk.hn@gmail.com
26	IAEA	Mr Foulon Francois Vienna International Centre P.O. Box 100 1400 VIENNA AUSTRIA Tel: +43 1 2600 22764 Email: f.foulon@iaea.org
27	IAEA	Mr Van Sickle Matthew Vienna International Centre P.O. Box 100 1400 VIENNA AUSTRIA Tel: +43 1 2600 23148 Email: m.c.van-sickle@iaea.org
28	IAEA	Mr Nathan Peld Vienna International Centre P.O. Box 100 1400 VIENNA AUSTRIA Email: n.peld@iaea.org

Annex 2 Agenda

AGENDA
IAEA Consultancy Meeting on Development of the guidelines for "Integrated RR Utilization Assessment (IRRUA)" peer review

Monday, 25 June 2017		
09:30-10:00	Opening session: • Welcome remarks by the IAEA • Objectives and expected results of the meeting • Self-introduction by the participants • Adoption of the agenda • Selection of chairperson and rapporteur	
10:00-10:30	Nuclear capacity building instruments based on research reactors	F. Foulon IAEA/NEFW/RRS
10:30-11:00	IAEA Support for Human Resource Development for Nuclear Power	M. Van Sickle IAEA/NENP
11:00-11:30	Coffee break	
11:30-12:00	IAEA Support for Nuclear Infrastructure Development	A. Sitnikov IAEA/NENP/NIDS
12:00:12:30	IAEA activities in support of capacity building in support of Nuclear Technology: Capacity Building for the Safety of Research Reactors	S. Shim IAEA/NSNI/RRSS
12:30-13:30	Lunch break	
13:30-15:00	Contribution of research reactors to human resource development and preservation – Country presentations	Country presentations
15:00-15:30	Coffee break	
	Overview of the IAEA nuclear power plants' basic principle simulators for education and human capacity development in Member States	T. Jevremovic IAEA/NENP
15:30-17:00	Contribution of research reactors to human resource development and preservation – Country presentations	Country presentations

Tuesday, 26 June 2017		
09:00-10:30	Contribution of research reactors to human resource development and preservation – Country presentations	Country presentations
10:30-11:00	Coffee Break	
11:00-12:00	Contribution of research reactors to human resource development and preservation – Country presentations	Country presentations
12:00-13:00	Lunch break	
13:00-13:30	Compendium on research reactor exercises for higher education programmes	F. Foulon IAEA/NEFW/RRS
13:30-14:00	Innovative and complementary tools based on RR experiments - Presentation of the Research Reactor Simulator developed by the Josef Stefan Institutes	A. Jazbec JSI, Slovenia
14:00-15:00	Contribution of research reactors to human resource development and preservation – Country presentations	Country presentations
15:00-15:30	Coffee break	
15:30-16:30	Contribution of research reactors to human resource development and preservation – Country presentations	Country presentations
16:30-17:00	General discussion on the contribution of research reactor in capacity building in support of nuclear technology – Needs, experience, feedback and future development.	IAEA, All participants

Wednesday, 27 June 2017		
09:00-10:30	Contribution of research reactors to human resource development and preservation – Country presentations	Country presentations
10:30-11:00	Coffee break	
11:00-11:30	IAEA Support for Knowledge Management	IAEA/NEPK
11:30-12:30	Contribution of research reactors to human resource development and preservation – Country presentations	Country presentations
12:30-13:30	Lunch	
13:30-14:00	Group work definition – 3 groups: Needs / Experience and feedback / Future development	IAEA, All participants
14:00-14:30	Innovative and complementary tools based on RR experiments: Multimodal Training Reactor Platform - EVOC	X. Wohleber CEA, France
14:30-14:45	Innovative and complementary tools based on RR experiments - Internet Reactor Laboratory (IRL) project from the IAEA	F. Foulon IAEA/NEFW/RRS
14:45-15:15	Coffee break	
15:15-16:15	Innovative and complementary tools based on RR experiments - Hands-on training through internet for NPP operators at RA0, Argentina	C. A. Murua CNEA. Argentina
16:15-17:00	General discussion on the contribution of research reactor in capacity building in support of nuclear technology – Needs, experience, feedback and future development.	IAEA, All participants

Thursday, 28 June 2017		
09:00-09:30	Contribution of research reactors to human resource development and preservation – Country presentation	Jordan
09:30-10:30	Group work – 3 groups: Needs / Experience and feedback / Future development	Group work (C0343, MOE23, MOE27)
10:30-11:00	Coffee break	
11:00-12:30	Group work – 3 groups: Needs / Experience and feedback / Future development	Group work (C0343, MOE23, MOE27)
12:30-13:30	Lunch	
13:30-15:00	Presentation of conclusions and recommendations from each group	3 Groups, 30 min each
15:00-15:30	Coffee break	
15:30-17:00	General discussion on the contribution of research reactor in capacity building in support of nuclear technology – Needs, experience, feedback and future development.	IAEA, All participants

Friday, 29 June 2017		
09:00-10:30	Final discussion on the contribution of research reactors to human resource development and preservation: needs, experience, feedback and future development.	IAEA, All participants
10:30-11:00	Coffee break	
11:00-12:30	Finalization of the meeting report, including conclusions and recommendations	IAEA, All participants
12:00-12:30	Meeting closing	IAEA, All participants