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***Human Resources for Supporting of
National Nuclear Program***

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Introduction



- This presentation discusses the User Requirements (UR), Criteria (CR), Indicators (IN) and Acceptance limits (AL) for availability of adequate human resources to establish and operate a NES based on the experience in Bulgaria.
- The necessary human resources should be available to enable all responsible parties involved in a nuclear power programme to achieve safe, secure and economical operation of the NES during its lifetime.
- The availability of qualified HR for nuclear industry in Bulgaria is insure by national legislation from one side and appropriate programs and classes in the universities and training centers.

Legislation in Bulgaria for Human Resources in Nuclear National Program



- **Primary Legislation**

Act on the Safe Use of Nuclear Energy (ASUNE).

- **Secondary Legislation - Regulations on ASUNE application**

- Regulation on the Terms and Procedure for Obtaining of Vocational Qualification and on the Procedure for Issuing of Licenses for Specialized Training and of Individual Licenses for Use of Nuclear Power.
- Regulation on Ensuring the Safety of Nuclear Power Plants.
- Regulation on the Procedure for Issuing Licenses and Permits for Safe Use of Nuclear Energy.

Legislation in Bulgaria for Human Resources in Nuclear National Program



- The Regulation on the procedure for issuing licenses and permits for safe use of Nuclear Energy establishes the procedure for:
 - 1. Issuing licenses and permits to natural and legal persons for performing activities for which licenses and permits are required according to the Act on the Safe Use of Nuclear Energy (ASUNE);
 - 2. Amendment, renewal, suspension and revocation of the licenses and permits issued;
 - 3. Exercising control over the fulfilment of the conditions of the licenses and permits issued;
 - 4. Maintaining the public registers of the licenses, permits and individual licenses issued.

Legislation in Bulgaria for Human Resources in Nuclear National Program



- The regulation defines:
 - the conditions and procedure for acquiring professional qualification for execution of activities in nuclear facilities, and facilities with sources of ionizing radiation,
 - the positions for which qualification is required,
 - the procedure for issuing licenses for specialized training and certificates for qualification, as well as the conditions and procedure for carrying out exams for acquiring qualification.

Discussion of User Requirement (UR4) and Human Resources Criterion (CR4.1) for SNP in Bulgaria.



- **INPRO methodology has defined a criterion CR4.1 for user requirement UR4 as set out in the table below.**

User Requirement (UR)	Criteria	Indicators (IN) and Acceptance limits (AL)
UR4 Human resources: The necessary human resources should be available to enable all responsible parties involved in a nuclear power program to achieve safe, secure and economical operation of the NES during its lifetime.	CR4.1: Human resources	IN4.1: Availability of adequate human resources to establish and operate a NES.
		AL4.1: Sufficient according to international experience.

Discussion of User Requirement (UR4) and Human Resources Criterion (CR4.1) for SNP in Bulgaria.



Education of specialists in the field of nuclear engineering

- The first groups of specialists in nuclear engineering graduated from different Soviet Union Universities in 60. The education in SU and some other socialist countries continues to 90.
- In parallel with sending students abroad in 70 started and educating the specialists in nuclear engineering in Bulgarian Universities.
- The education of specialists in nuclear engineering is conducted now in couple of Universities in Bulgaria as a main group of specialists graduated from the Technical University of Sofia at the faculty of thermal and nuclear power and from the University of Sofia “St. Kliment Ohridski” at the faculty of physics.

Education and training system in Bulgaria - availability of different levels of education and training..



• The University of Sofia “St. Kliment Ohridski”

- 1973 - the first 5-year M.Sc. program in Nuclear Engineering (NE) started as a part of the more general program of Engineering Physics at the Faculty of Physics.
- 1985 - the Department of NE was established with an initial academic staff reassigned from the Department of Atomic Physics.
- 1991 - the 5-year M.Sc. Program in NE acquired an independent status with its own admission quota.
- 1998 – the NE program was split into a 8-semester B.Sc. program in NE and a 3-semester homonymous M.Sc. Program.
- Recently, three additional formats of M.Sc. programs were created, selecting students from compatible branches of other Science or Engineering programs including students from professional college graduated in Nuclear Power Engineering.

- **The University of Sofia “St. Kliment Ohridski”**

- A typical distribution of the subjects in the B.Sc. curriculum in Nuclear Engineering by topics includes: 20 % Mathematics; 30 % General (non-nuclear) Physics; 10 % General Engineering, 40 % specialized nuclear subjects.
- Among others, some of the notable specialized subjects are: Neutron Physics, Physics of Nuclear Fission, Nuclear Reactor Physics, Introduction to Nuclear Technology, Computational Methods in Nuclear Engineering, Nuclear Fuel Cycle, Dosimetry and Radiation Protection, Nuclear Electronics.
- The M.Sc. curriculum includes subjects like Operational Reactor Physics and Nuclear Safety, Nuclear Reactor Analysis, Heat Transfer in Nuclear Power Plants, Nuclear Reactor Materials, etc.

Education and training system in Bulgaria - availability of different levels of education and training..



• **Technical University of Sofia**

- 1973 – started Nuclear Engineering (NE) education in M.Sc. program at the Faculty of Thermal and Nuclear Power Energy.
- 1984 – it have been established specialization in three subjects: nuclear engineering, thermal - power engineering and industrial thermal – power engineering.
- 1995 – establishing one subject of education called “Thermal and Nuclear Power Energy” divided in two subjects for specializations called: “thermal power engineering” and “nuclear power engineering”.
- 1999 – the NE program was split into three levels of education: B.Sc. program in NE; M.Sc. Program in NE; PhD program in NE.
- Now graduated around 20 - 30 students from B.Sc. program in NE and 15-20 students from M.Sc. Program in NE. At the same level graduated and from “thermal power engineering” specialization direction.

Education and training system in Bulgaria - availability of different levels of education and training..



- **Realization of experts graduated Technical University of Sofia and The University of Sofia “St. Kliment Ohridski”**
- After graduation in the field of NE, the specialists are able to find jobs in a nuclear power plant, as well as in different TSO working in the fields of nuclear energy and the applications of ionizing radiation. They find career opportunities in institutions related to the metrology and monitoring of ionizing radiation and, more generally, to the area of environmental protection.
- There is no strict study of realization of graduated students, but in general can be stated that around 40-50 % of graduated M.Sc. NE programs have been employed at the Kozloduy NPP, the other part of graduated students are employed at different organizations such as the SERAW, the INRNE-BAS, state institutions as NRA, MEE, NEK, and the rest in various research, development and consulting establishments related to nuclear energy, as well as other branches of applied nuclear physics.

Main Activities of KNPP Training Center



- The Training Centre (TC) Division is a special training organization inside of the KNPP taking important position in the organizational structure of Kozloduy NPP plc. The TC assists the Plant Manager to ensure the fulfillment of all regulatory requirements for providing specialized training for activities with nuclear facilities and sources of ionizing radiation and on this basis KNPP obtains a license issued by the Nuclear Regulatory Authority. The TC Division is an individual structural unit within Kozloduy NPP plc which is subordinated to the Production Director and has the following main functions:
 - ✓ prepare, organize, perform, control, and record the entire TC activity for adequate contribution to safe, reliable and efficient operation;
 - ✓ within the frame of the available materials and technical recourses as well as using the Training Center's staff qualification, the TC performs or supports the performance of the engineering analyses, projects and other tasks, related to operational safety of nuclear power installations.

Main Activities of KNPP Training Center



- Prepares, organizes, conducts and records the entire TC activity and personnel training on work with nuclear installations, for guarantying safe, reliable and efficient operation;
- Within the frame of the available materials and technical basis as well as using the TC's staff qualification, the Training Center fulfils or supports the fulfillment of the engineering analysis, projects and other tasks, related to nuclear equipment operation and safety.



- **Customers of KNPP TC**
 - ✓ **Training of NPP staff**
 - ✓ Training of subcontractors staff for permission to site access and work at KNPP
 - ✓ Training and licensing for IRA activities performing
 - ✓ Training and licensing on Industrial Safety National Regulations
 - ✓ **Students practices and internships**
 - ✓ Training upon request

Training of NPP staff

- Initial and continuous specialized training (theoretical, practical, OJT, simulator) for:
 - Managers
 - MCR job positions
 - Operational staff (field operators and supervisors)
 - Maintenance personnel

Students practices and internships

- Annual group students practices for students from Sofia Technical University and “St. Kliment Ohridsky” Sofia University in the area of nuclear technologies (1-2 weeks)
- Individual students practices for students with different specialties from Bulgarian and foreign universities (2-4 weeks)
- Specialized students internship programs (4 weeks)

Main Activities of KNPP Training Center



Training facilities

- 10 fully equipped class rooms, 2 computer rooms, interactive examination room
- specialized mock up hall
- Workshops – I&C, electrical, valves, pumps.
- Operating thermo-mechanic assembly
- SKF bearing center
- Full-scope VVER-1000 simulator
- Library
- 3 conference halls and 4 meeting rooms supplied with audio, video and translation equipment



*Thank you
for
your attention !*