International Conference on Challenges Faced by Technical and Scientific Support Organizations (TSO)
in Enhancing Nuclear Safety and Security, 25-29 October 2010, Tokyo, Japan

University centres of nuclear competence as TSO's in small non-nuclear countries – *example of Montenegro* –

Slobodan Jovanovic

University of Montenegro
Centre for Nuclear Competence and Knowledge Management
Dz. Vasingtona bb, MNE-81000 Podgorica, Montenegro

Abstract. Montenegro is small, developing "non-nuclear" country, the use of radiation sources being modest and limited to ordinary medical and industrial applications. Even though - and taking into account current and near-future status of the field - there is (or will be) significant need in nuclear knowledge. It goes about the following areas: (i) medical applications (diagnostics, radiotherapy, palliation, sterilization of equipment, consumables, blood products, etc.), (ii) environmental protection (radioecology, low and medium activity radioactive waste management, analytical and monitoring services, etc.), (iii) industrial, geological, hydrological, agricultural, biochemical and archaeological applications (non-destructive testing, various gauges, radioisotope labeling, etc.), (iv) scientific and educational applications, (v) radiation protection, emphasizing safety and security of radiation sources, (vi) legislative and regulatory aspects, including complying to international safety/ security norms and joining international conventions in the field, (vii) preparedness and response to radiological and nuclear emergency situations, (viii) combating illicit trafficking of nuclear and radioactive materials, (ix) forensic applications, (x) security systems based on X-ray and other nuclear methods, (xi) introduction of some future topics (e.g. nuclear power for electricity generation and sea water desalination) and (xii) information and communication with media. At present, there is clear a shortage in NK in the country, resulting i.a. from long lasting poor interest of young students for the subject

University of Montenegro - the only state university in the country - effectuates practically complete high education in natural and technical sciences. At the Faculty of Natural Sciences and Mathematics, Department of Physics, there is a basic education in nuclear physics, while some post-graduate curricula offer topics in radioecology, medical physics and radiation protection.

The idea of establishing a university Centre for Nuclear Competence and Knowledge Management (UCNC) is raised with intention of: (i) being national center of competence and expertise in nuclear related issues, (ii) acting towards assessing, creating, preserving and transferring NK, according to Montenegro needs, (iii) offering consultancies and technical support services to regulatory authorities and stakeholders, (iv) being advisory body to the government for nuclear related issues and (v) focal point for dissemination and exchange of NK, in particular with the IAEA, (vi) promoting nuclear applications for peaceful purposes, in particular medicine and environmental protection, (vii) being national radiation protection centre, (viii) developing curricula for nuclear related studies at all levels (from elementary education to university degrees), (ix) supporting young students and scientists in nuclear related field and facilitate their exchange with reputed institutions abroad and (x) giving proper and timely information and comments to the public and media on relevant nuclear related subjects.

IAEA assist expert mission, including NKM experts from the region, was invited and conducted visit to the UCNC by September 2009. It is expected to be the germ of the extensive and successful cooperation with the Agency.

1. Background and Justification

Nuclear knowledge and based-on-it nuclear competence represent a broad range of both theoretical and practical achievements of research and experience accumulated in more than hundred years of nuclear field extensive development. It goes from fundamental physical laws of the universe to widespread medical applications for diagnostic and therapy purposes, from nuclear power plants or nuclear weapons to common analytical techniques, from huge internationally operated accelerators to plain household smoke detectors…

However, the need for nuclear knowledge in a society may vary substantially, depending primarily on two factors: its level of general development and whether it utilizes (or intends to utilize) nuclear energy for power production or not.

Montenegro is small, developing "non-nuclear" country. The use of radiation sources is modest and limited to ordinary medical and industrial applications, which is likely to remain so in a foreseeable time to come. Even though (thus, taking into account current and near-future state of the matter), there is, or will be, significant need for nuclear knowledge and competence. It goes about the following areas, the list being far from exhaustive:

- medical uses of radiation sources (diagnostics, radiotherapy, palliation, sterilization of equipment, blood products, etc.)
- environmental protection (radioecology, low and medium activity radioactive waste management, analytical and monitoring services, etc)
- industrial, geological, hydrological, agricultural and biochemical applications (non-destructive testing, various gauges, radioisotope labeling, etc.)
- scientific and educational applications (both nuclear and non-nuclear)
- radiation protection, emphasizing safety and security of radiation sources, radon issues, food and consumables radioactivity control...
- legislative and regulatory aspects, including complying to international safety/security norms and joining international conventions in the field
- preparedness and response to radiological and nuclear emergency situations
- combating illicit trafficking of nuclear and radioactive materials
- forensic applications
- security systems based on X-ray and other nuclear methods
- introduction of some future topics (e.g. nuclear power for electricity generation and sea water desalination)
- information and communication with media, etc.

At present, there is an obvious NK shortage in the country – in medical, environmental, industrial, regulatory, etc. sector. The shortage will be more acute in the time to come. Besides general decline of students' interest for natural and technical subjects (following the socio-economic evolution of the society in the past two decades), another reason seems to be the absence of an adequate, goal-aimed organization of the existing nuclear expertise.

The latter is particularly valid for "nuclear" staff at the University of Montenegro - a respectable group of experts on their turn. By establishing the University Centre for Nuclear Competence and Knowledge Management (UCNC) the fundaments would be laid for NK proper management in Montenegro. UCNC is meant for NK assessment, creation, preservation, transfer and dissemination, as well as a forum for discussion and analysis of nuclear related issues relevant for the country. UCNC would supposedly become the core of NK and competence development at national (possibly also regional) level.

If nothing is done shortly towards improving NK level in the country, the consequences could turn seriously harmful. One might just think of e.g. radiotherapy or nuclear medicine practice, food radioactivity control, radon protection, waste management, source licensing and inspection, etc. Several international expert missions conducted in Montenegro by the EU and IAEA in the past few years confirmed the deficiencies in radiation source utilization, radiation protection and regulatory control, originating primarily from inadequate nuclear knowledge and competence.

2. Goals and Scope of Activities

The idea of establishing a university Centre for Nuclear Competence and Knowledge Management (UCNC) is raised with intention of:

- being national center of competence and expertise in nuclear related issues
- acting towards assessing, creating, preserving and transferring NK, according to Montenegro needs
- offering consultancies and technical support services to regulatory authorities and stakeholders

- being advisory body to the government for nuclear related issues
- focal point for dissemination and exchange of NK, in particular with the IAEA and EU
- promoting nuclear applications for peaceful purposes, in particular medicine and environmental protection
- being national radiation protection centre
- developing curricula for nuclear related studies at all levels (from elementary education to university degrees)
- supporting young students and scientists in nuclear related field and facilitate their exchange with reputed institutions abroad and
- providing proper and timely information and comments for the public and media on relevant nuclear related subjects.

The above goals will be met through the following scope of UCNC activities:

- organizing a series of training courses on radiation protection for middle medical staff (nurses and technicians) working with radiation sources
- training courses for medical doctors and engineers (maintenance) working with radiation sources
- delivering public lectures (also for media) on a series of topics of common interest (benefits and harmful effects of radiation, nuclear energy for electricity production, nuclear research, etc.)
- visiting schools and animating young people for joining studies of nuclear related sciences
- curricula will be developed first for post-graduate, then for bachelor or certificate studies on various nuclear related subjects pertinent to Montenegro current and future needs, including:
    - application of radiation sources in medicine
    - radiation protection in medicine
    - application of radiation sources in industry
    - radiation protection in industry
    - nuclear security
    - dosimetry
    - nuclear analytical methods
    - radioecology
    - legal framework and regulatory control of radiation sources (notification, inventory, licensing, inspection)
    - radiological and nuclear emergency preparedness and response
    - nuclear legislation and international nuclear law, etc.

3. Organizational Structure

UCNC will be established and organized in accordance with current legal infrastructure in Montenegro regulating this matter: Statute of the University and Law on Higher Education. While University will remain superior/responsible legal entity, with UCNC appropriately imbedded in its organizational infrastructure, internal UCNC issues will be dealt with on its own. There is already a broad consensus among experts and relevant University and governmental bodies that such an institution is very much needed in the country and the idea of UCNC establishment is largely supported. The administrative procedure of UCNC establishment will likely take time, but we do not expect serious obstacles to its completion.

Upon agreement of the University management bodies, UCNC Statute will be approved and coordinator-manager appointed for a fixed term. It is not intended that UCNC will have full time employed staff, at least not in the initial few years phase. Everyone engaged would be a person already employed at some other university unit (mostly at the Faculty of Natural and Mathematical Sciences, Department of Physics), or elsewhere, and would resume his/her UCNC duties as a part time or contract job. However, depending on the developments, this presumption might change in the future and UCNC might get some fully employed staff - following the appropriate procedure within the University and Ministry. Most of the logistics

necessary for UCNC operation will be provided by the University: housing (offices, lecture rooms, laboratories), maintenance, vehicles, administration, consumables, expenditures, etc.

There will be a core team of experts (4-5 people) who would deal with the most important issues – education and training, medical applications, scientific issues, radiation protection, communication with government (ministries and regulatory bodies), media and public, etc. Another group of experts will be those from the country (mostly from the University itself) – nuclear physicists, radiation protection experts, radiologists, oncologists, radio-ecologists, analysts, legal experts, etc.

Third circle would comprise experts abroad of Montenegrin origin, willing to keep contact and contribute to UCNC in whatever way. These are numerous and could become a perfect bridge to knowledge/expertise in more advanced centers of nuclear competence abroad. Finally, repute foreign experts will be invited to be in touch as well. Hereby regional experts, particularly those from ex-Yugoslav countries (no language barrier), would be most welcome.

It is expected that each expert will bring into UCNC not only his/her knowledge and competence, but also to contribute with his/her professional contacts, "outer expert circle", who would subsequently also be involved in UCNC activities.

In particular a kind of "nuclear youth section" will be organized with the idea of promoting nuclear issues among young generation, but also to supporting them in nuclear related studies when possible/appropriate.

UCNC will seek contacts and cooperation with institutions and professional organizations from its scope of activities: various nuclear societies, radiation protection associations, academies, etc. Special attention will be paid – and much is expected from – cooperation with international organizations like IAEA, OECD-NEA, EURATOM, IRPA, etc. First contacts are established already with IAEA NKM Section, expert mission being invited and expected to help meeting the goals mentioned above.

4. Human Resources

Despite the fact Montenegro is a small, developing and "non-nuclear" country, UCNC may count with a respectable group of nuclear experts in Montenegro itself, and even a much bigger one when experts abroad, originating from the country, are taken into account. Although a nuclear centre never existed, Montenegro university staff was regularly sent for specializing in prominent institutes worldwide, which resulted in having nowadays experts in e.g. theoretical and experimental particle physics, nuclear reactor characterization, neutron activation analysis, solid state physics, nuclear analytical techniques, positron physics, radio-ecology, radiation protection, nuclear law, etc.

In fact, it can be said that for many of the areas which are of current and future interest for the country, experts are available or can easily be found. For a number of fields where this is not the case, experts can be found in the neighboring ex-Yugoslav countries. With an appropriately premeditated plan of specialization, particularly focusing young staff, the picture could be completed in a term of five year or so.

IAEA assist expert mission, including NKM experts from the region, was invited and conducted visit to the UCNC by September 2009. It is expected that the results of the mission will be fundamental for the future cooperation of the UCNC with the Agency, from which our expectations are high.