CNS BRIEF

Nonproliferation Specialists Network
Information Newsletter

James Martin Center for Nonproliferation Studies (CNS)
Monterey Institute of International Studies (MIIS)

№ 32 (Fall 2011.)

Table of Content:

From the Editor

Dear friends and colleagues:

Starting with this issue, we will be publishing our newsletter in English and Russian. Our objective is to cover topics not only dealing with the countries of the Former Soviet Union, but other countries as well.

This was decided because we are expanding our activities to other regions of the world with the goal of creating a global network of nonproliferation specialists.

The first two issues in English will have similar content with the Russian version, but in future this newsletter will highlight the work of our colleagues, not only in the former Soviet Union, but also in other regions.

We would like to draw your attention to the fact that the name "Newly Independent States," which we have used for two decades in reference to the former Soviet Union, will, henceforth, be replaced by the term "Eurasia."

We hope that this newsletter will continue to serve as a source of information about the activities of your colleagues in Eurasia and beyond.

We look forward to including information about your activities in the field of disarmament and nonproliferation in our publication. Please send your information, comments and suggestions to my email address: msevcik@miis.edu.

Sincerely,
Margarita Sevcik

Part I
NONPROILFERATION SPECIALISTS NETWORK IN EURASIA

Tomsk as a hub of a youth nonproliferation network in Siberia

In the last few years, the college town of Tomsk has gained a reputation for being a hub of youth nonproliferation activities in the Siberian region. This phenomenon has been possible thanks to support from the Swedish Radiation Safety Authority, Pacific Northwest National Laboratory (USA), and CNS, as well as the enthusiasm and commitment to the field on the part of faculty and students of Tomsk State University (TSU), Tomsk Polytechnic University (TPU), and other schools in the region.

The establishment of the Siberian Universities Youth Center for Nonproliferation Studies, the inclusion of nonproliferation courses into university curricula, and the founding of nonproliferation summer schools and student conferences are just some of the accomplishments of the dedicated Siberian teams of students and their mentors, including Larisa Deriglazova and Nina Rozhanovskaya from TSU, Dmitry Demyanyuk of TPU, Natalia Tretyakova from Tyumen State University, Vera Gavrilova from Novosibirsk State Technical University, and others.

In addition to this community of individuals dedicated to nonproliferation are several entities that, together, provide Tomsk with the potential to be a regional leader in promoting nuclear security and nonproliferation at all levels, thus fostering a nuclear security culture among present and future specialists.

For example, three years ago, one of 15 nuclear energy information centers was opened in Tomsk by the State Atomic Energy Corporation ROSATOM. The purpose of such centers is to conduct informational and outreach activities by educating the population about nuclear energy. The establishment of such a center in Tomsk can be attributed to plans to build a new nuclear power plant

with two power units in Seversk, a "closed nuclear" town about 20 km. away from Tomsk. Seversk is home to the Siberian Chemical Combine, which produces enriched uranium and plutonium. This new nuclear power plant is to replace the Siberian Nuclear Power Plant which ceased its operation in 2008.

In addition to providing information about nuclear energy, the information center's leadership has expressed an interest in supporting other activities, including nuclear security and nonproliferation outreach activities. The center, equipped with videoconferencing and other online technologies, is an available venue for organizing roundtable discussions, training workshops and public lectures.

Another organization in Tomsk, Tomsk Nuclear Center, is a noncommercial partnership of research and innovation in the field of nuclear energy and nuclear technologies.

One of the key sources of motivation and encouragement for young specialists and students in the nonproliferation field is an opportunity to participate in conferences where they can present their research and network with their counterparts as well as prominent experts. However, a lack of resources prevents Russian universities from sponsoring the participation of their students in such activities. In general, student travel grants or the funding of nonproliferation panels under the auspices of large scientific and practical conferences depends on international donors.

This year, with support from Pacific Northwest National Laboratory (PNNL), Swedish Radiation Safety Authority, and CNS, Tomsk hosted two conferences addressing problems of nuclear nonproliferation.

On these events was the second annual conference of young nuclear scientists from Siberia, "Prospects of Nuclear Energy Developments," which took place on October 4-6. This conference was conducted with support of the Tomsk regional administration, Rosatom, TPU, TSU, Seversk Technological Institute, the Nuclear Energy Information Center, and Tomsk Nuclear Center. The conference had its debut in September 2010 as an alternative to the annual "Polar Lights" conference which, until last year, was held in St. Petersburg.

As last year, this year's conference program, included a student panel on nuclear nonproliferation, which was organized by TPU with the support provided by the Pacific Northwest National Laboratory (PNNL) and CNS. More than 50 papers were submitted for the panel. Due to time limitations, however, only 15 papers were selected for oral presenations and the rest were poster presentations.

Students from various universities from Siberia and the Urals participated in the panel. Another group of participants included students from Kazakhstan who are enrolled in TPU's nuclear security master's program.

The general conference agenda focused on technical questions. The technical nature of the conference was also reflected in the nonproliferation session, where two-thirds of the presentations were devoted to various technical aspects of nuclear security and nonproliferation.

On November 24-27, another conference of young scientists was organized to take the place of a traditional nonproliferation summer school. The conference theme was "Nuclear Technologies and Challenges of the XXI Century: Nonproliferation, Disarmament and Peaceful Use of Nuclear Energy."

Jointly organized by TSU and TPU with support from the Swedish Radiation Safety Authority and PNNL, this event featured invited experts, including Gennady Pshakin, Analytical Nonproliferation Center, Institute of Physics and Power Engineering in Obninsk, Russia; Robert Kelly, Stockholm International Peace Research Institute, Sweden; Dmitry Pobedash, Ural Federal University, Russia; and Margarita Sevcik, CNS. In addition to invited guest speakers, other CNS experts, including Nikolai Sokov from Vienna and Ferenc Dalnoki-Veress from Monterey, gave lectures to conference participants via Skype.

The conference featured more than 30 presentations by representatives from TSU, TPU, and other Russian universities, as well as from Odessa National University from Ukraine. Participation of a Ukrainian representative at the conference became possible thanks to a travel grant provided by the U.S. Department of Energy's Global Initiatives for Proliferation Prevention Program.

The conference program, a synthesis of papers by students and young scientists in the technical, liberal arts and social studies branches of learning, once again demonstrated the cross-disciplinary nature of the nonproliferation field.

The conference concluded with a role-playing exercise in which participants were challenged to use their knowledge and understanding of IAEA safeguards and inspections. Gennady Pshakin and Robert Kelley, former IAEA inspectors, served as team advisors.

Nonproliferation education and outreach activities in Tomsk could serve as a model of creating a new generation of nonproliferation specialists, not only in Siberia, but also in other Russian regions, and beyond.

Part II
CNS NEWS

Eurasia Nonproliferation Program

One of the key developments at CNS was a change of personnel and the renaming of the Newly Independent States Nonproliferation program to the Eurasia Nonproliferation Program, now headed by a new director, Bryan Lee. Bryan is a former career army officer and Eurasian affairs specialist with more than 20 years of experience in a variety of national security assignments. Most recently, he was the director of the International Counterproliferation Program at the Defense Threat Reduction Agency.

Education Program

With Fred Wehling's full transition to a teaching position at MIIS, Dr. Avner Cohen was appointed director of the CNS Education Program. Dr. Cohen is an internationally recognized author and expert on nonproliferation issues, focusing on the Middle East. He is the author of a number of publications, including two books about Israel's nuclear program: *Israel and the Bomb* and *The Worst Kept Secret: Israel's Bargain with the Bomb*.

Vienna Disarmament and Non-Proliferation Center

Official opening of the Vienna Center for Disarmament and Non-Proliferation (VCDNP) took place on February 25, 2011 (see press-release). Elena Sokova is the Center's Executive Director. Other VCDNP staff includes Nikolai Sokov and Hakan Akbulut.

Since the moment of its opening, VCDNP began implementing its mission to promote international peace and security by providing a platform for independent analysis and dialogue in the field of nuclear disarmament and nonproliferation.

In the course of a few months, the center organized a number of events, including an intensive training course for diplomats, a briefing for journalists, and seminars for governments, international organizations, NGOs and independent experts and researchers.

CNS Visiting Fellows

This year, CNS hosted 16 visiting fellows from Russia, China, Pakistan, Mexico and other countries. For the first time, young specialists from the Philippines, Egypt, Burkina Faso, and Romania participated in the CNS Visiting Fellows Program. Expanding the program's geographical scope allows CNS to target countries and regions that play an important role in international security and the nonproliferation regime.

Fall'11 fellows included:

- *Ms. Liliya Belkina*, Senior Instructor, Snezhinsk Physical and Technical Institute, NRNU "MEPhI," Snezhinsk, Russia;
- *Ms. Honorine Bonkoungou*, Foreign Affairs Counselor, Ministry of Foreign Affairs & Regional Cooperation, Ouagadougou, Burkina Faso;
- *Mr. Ding Tongbing*, Second Secretary, Department of Arms Control and Disarmament, Ministry of Foreign Affairs of China, Beijing, China;
- *Mr. Gerardo Guiza*, Alternate Representative of Mexico to International Organizations, Vienna, Austria;
- *Dr. Ekaterina Mikhaylenko*, Assistant Professor, International Relations Department, Ural State University, Yekaterinburg, Russia (IAEA funded fellow);
- *Mr. Ibrahim Said*, Third Secretary, Ministry of Foreign Affairs of Egypt, Cairo, Egypt;
-Ms. *Narcisa Vladulescu*, First Secretary, Ministry of Foreign Affairs of Romania, Bucharest, Romania.

Next year, CNS plans to bring into its program, in addition to participants from Eurasia and China, specialists from South and Southeast Asia, South America, Africa, and the Middle East.

Please contact Margarita Sevcik for information about CNS Visiting Fellows Program: msevcik@miis.edu.

Program on Strategic Stability Evaluation (POSSE) Workshop

On 11-13 December 2011, the fourth POSSE workshop took place in Washington, DC. Coordinators of this project are Dr. Adam Stulberg, a professor at Georgia Tech University and Dr. William Potter, CNS Director and Sam Nunn and Richard Lugar Professor of Nonproliferation Studies at MIIS. The workshop involves young researchers from the U.S., Russia, and China who are interested in the problems of strategic stability and nonproliferation. For more details about the POSSE project, its participants, and events please visit: http://www.posse.gatech.edu/about.

Part III
NONPROLIFERATION EDUCATION AND OUTREACH ACTIVITIES

CIF Teacher Development Workshop

The 2011/2012 Critical Issues Forum (*CIF*) Teacher Development Workshop took place in Monterey on December 1-3, 2011. CIF is an international project for high school students and teachers from U.S., Russia, China and other countries. This year's project theme is *Nuclear Safety and Security*. In addition to traditional CIF participants from the U.S. and Russia, CIF participants include China (since 2010) and—via the Internet—teachers from schools in Bosnia-Herzegovina, The Netherlands, and Jordan. Since only three teachers out of ten Russian schools participating in CIF were able to

attend the workshop, a follow-up training event was organized for Russian teachers by the Information and Education Center of Ural Nuclear Cities in Novouralsk.

The CIF conference for high school students will take place in May 2012 in Vienna, Austria. For more information about the workshop in Monterey, and the CIF conference's new format, please visit: http://cns.miis.edu/activities/111201_cif_nuclear_security.htm.

Part IV

***Non-proliferation and the transfer of nuclear knowledge: Systematic problems in the transfer of nuclear technology,* by Irina A. Koupriyanova, Obninsk, Russia (article printed in condensed form)**

History

The increasing demand for energy, most notably in developing countries, stimulates the proliferation of nuclear power. At the same time, the danger presented by the dissemination of nuclear technology knowledge is a cause for concern among developed countries. The importance of nuclear knowledge management was first realized in the context of defense projects, attracting active support of this issue at the government level. It became evident that although nuclear knowledge has enormous potential for human development, it is crucial that the information and expertise be managed to avoid use by unauthorized actors. The founding of the International Atomic Energy Agency (IAEA) can be regarded as the first step taken by the international community in nuclear knowledge management.

The term "knowledge management" first appeared in the mid-1990s. More than 80% of the world's leading industries, institutions and international organizations have adopted knowledge management strategies. In the field of knowledge management, *knowledge* is often defined as the ability to act effectively. To *be informed* means to be able to achieve desired results. This ability is acquired through the integration of technical expertise, methodological knowledge and social competence. Knowledge can be explicit or implicit (hidden).[1]

Explicit knowledge is quantifiable and easily defined. It can be recorded in the form of reports, procedures or instructions and can be transmitted without much difficulty.

Implicit, or tacit, knowledge is difficult to define in a quantifiable fashion, as it represents the expertise and methodology that is inherently natural and obvious to experts. However, tacit knowledge can be transformed into an explicit form as documentation through close cooperation between the specialist and those receiving the information.

[1] Knowledge Management for Nuclear Industry Operating Organizations.IAEA-TECDOC-1510. October, 2006. Vienna, Austria

Nuclear knowledge management (NKM) is an integrated approach used in all stages of the knowledge cycle, including identification, sharing, protection, dissemination, **preservation and transmission.** It affects human resource management, information and communication technologies, processing and control methods, systems for record management, and internal and national policies.

Knowledge management focuses on how an organization defines, creates, stores, acquires, distributes, and applies knowledge. Systematic processes are the basis of all these actions, making it possible to reproduce good ideas. It is fair to say that knowledge management is focused on people and the corporate culture in order to:

- Stimulate and develop the desire to share and use knowledge
- Identify the processes and methods that help to find, create, preserve and pass on knowledge
- Keep knowledge and make it available through technologies, which help people work together, even if they are physically separated.

From a safety and security standpoint, two other important aspects of knowledge management are:

- The prevention of improper use of classified information and unauthorized nuclear activities
- The exchange of operational experience to prevent emergency situations.

The creation of an interdisciplinary system for transferring nuclear technology knowledge is one way to work on modern complex projects while using formal knowledge in its explicit form. The main advantage of this new approach is the effective use of results obtained in one sphere through state funding for accelerated developments in other projects without having to fund the work all over again.

The IAEA has proposed the creation of an interdisciplinary knowledge databank as a logical step to manage the transfer of nuclear knowledge. Such a knowledge "portal" will help organize the formation of specialized competencies within interdisciplinary working groups.

Important issues to consider are changes in management, the relationship between nonproliferation and security, and the concept of nuclear knowledge management within the nonproliferation domain. The security of a nuclear facility has long been associated only with the security of facility perimeters; thought was often not given to potential ulterior motives of personnel—the human factor, or so-called "organized actions." Now it is understood that all factors related to domestic, foreign, and international security must be taken into account.

According to IAEA experts and leading specialists from those countries that use nuclear energy,[2] it is of the utmost importance to guard knowledge related to nuclear power plants (NPP). The loss of information and knowledge not only impedes the development of the nuclear energy industry, but it can also lower the level of security at NPPs. Furthermore, even among those countries that do not have NPPs, there are some that employ medical and other types of equipment

[2] The Russian Atomic Community website: www.atomic-energy.ru/node/10198

based on nuclear and radiation technology. In these countries, a loss of nuclear knowledge, as well as lack of qualified experts, can have serious consequences. The IDC (International Data Corp.) reports that each year in high-tech industries, 3.2% of corporate knowledge becomes irrelevant or outdated, and access to another 4.5% is lost due to staff turnover and poor information management.[3]

The use of nuclear energy for the good of society requires highly complex knowledge in several disciplines, including fundamental science and technology, law, economics, finance, commerce, management, and public relations. As a result, retaining knowledge in the nuclear industry is critical. However, personnel working in the atomic industry is aging, and after two decades of stagnation, the younger generation is not eager to study nuclear issues or to seek careers in the industry. It is vital to boost the visibility of nuclear education to attract a new generation of specialists in nuclear science and technology. Even those graduates from technical universities who are training to become nuclear specialists do not seem to aspire to stay in this field. Many countries have already realized the potential consequences of such a negative trend—some of them quite some time ago started to systematically work on nuclear knowledge management. Having said that, the following problems remain common to many countries:

- Aging and retiring staff
- Loss of knowledge
- The degradation of technological skills and the loss of "know-how"
- Possible security degradation
- Decrease in (disappearance of) innovative capacity.

In contrast to knowledge in other scientific areas, the free exchange of nuclear knowledge needs to be monitored and strictly controlled because of the danger of the proliferation of WMD technology by those with illegal intentions—either inside or outside the nuclear facility. The following factors can increase proliferation risks:[4]

- Growth in nuclear energy—a growing number of nuclear power plants, including regional low capacity NPPs
- Growing number of fuel cycle factories
- Increasing nuclear materials transactions and transportation of such materials
- Structural changes in the nuclear power industry
- Expansion of fuel production using fast breeder reactors
- Reprocessing of spent nuclear fuel, recycling of nuclear fuel, and the closed fuel cycle
- The development of a nuclear power industry in non-nuclear countries that historically have not been prepared to deal with nuclear technology (nuclear safety and nonproliferation).

[3] A. Kosilov. Risk assessment of a loss of nuclear knowledge. The IAEA pilot school for the conservation of knowledge in radiation monitoring and radioecology. September 7-9, 2010, A branch of SNIIP, Golden Vine (the city of Gelendzhik).

[4] V. M. Murogov. Modern problems of nuclear power. NRNU MIFI The International Center for Nuclear Education and Nuclear Knowledge Management. September 7-9, 2010, Gelendzhik, The IAEA School of Nuclear Knowledge Preservation

At the same time, the exchange of information and experience is necessary to prevent accidents. Thus, to properly manage nuclear knowledge it is important to strike a balance between nuclear safety and security requirements.

International efforts to train specialists in nuclear knowledge management

In various countries, the need to maintain knowledge and expertise in the nuclear industry has been recognized for the past 5 - 10 years. The World Nuclear University and the School of Knowledge Management are examples of the effort to prepare specialists in the sphere of nuclear knowledge management.

World Nuclear University

In September 2003, the opening ceremony of the World Nuclear University (WNU) was held in London. The university was created to systematize nuclear education worldwide. The WNU offers courses to states for the purpose of training their specialists in nuclear science and technology. WNU also hosts summer classes for young professionals from different countries. With the goal of promoting global partnership, many countries seek to send their young professionals to these schools. WNU is supported by several organizations, such as WANO (World Association of Nuclear Operators). The Fifth Annual Summer School was held at Oxford University with the support of the London coordination center (WNUCC).[5]

The School of Knowledge Management Trieste (Italy) annually hosts the School of Nuclear Knowledge Management. The IAEA organizes this school in cooperation with international organizations and institutions—in 2006 it was supported by the Centre for Theoretical Physics Abdus Salam (ICTP) and WNU. Of topics typically discussed are:

- Policy and strategy of nuclear knowledge management
- New approaches to knowledge management
- The creation of an education network and other topics related to knowledge management.

The fifth and sixth Schools of Knowledge Management took place in 2008 and 2009. In 2008, 22 countries participated in the school, marking the first time three participants from Russia attended the school.[6] At that time, the school was supported by traditional organizers (the IAEA, the International Centre for Theoretical Physics and WNU), as well as the European Commission. The school is primarily focused on ideological issues, such as nuclear knowledge management strategies and policy work, with the nuclear knowledge at the organizational level. Other issues that the school addresses are human resource management and knowledge organization. Knowledge accumulated by participants both attracts interest and decreases the risk of the loss of such knowledge.

[5] V. M. Murogov. Modern problems of nuclear power. NRNU MIFI The International Center for Nuclear Education and Nuclear Knowledge Management. September 7-9, 2010, Gelendzhik, The IAEA School of Nuclear Knowledge Preservation

[6] School of Nuclear Knowledge Management, September 1-5 2008, Trieste, Italy.CD, November 2008. Complied by the NKM Unit of the INIS & NKM NE Section, IAEA Nuclear Knowledge Desk. nkd@iaea.org

The school also provides training on dealing with information and various forms of documentation, including:

- How to work with information
- How to save information
- What databases need to be developed and maintained
- How to use the portal

In 2010, Russian participants attended the school in Trieste. In January 2010, the first Russian-language school took place in Astana (Kazakhstan). In September 2010, the first Russian-language pilot IAEA seminar on radiation control and radioecology knowledge management was held, in Gelendzhik, Russia. In September 2011, the second IAEA Russian-language school took place in Gelendzhik, focusing on knowledge preservation.

IAEA Nuclear Knowledge Management Unit

The IAEA has created a special body to address nuclear knowledge management issues. The Nuclear Knowledge Management Unit conducts the following activities:

- Organizing international schools of nuclear knowledge management
- Creating a thorough thesaurus of nuclear knowledge
- Creating dictionaries, glossaries, questionnaires and surveys to classify particular areas of nuclear knowledge
- Issuing guidance documents for nuclear knowledge management[7]
- Maintaining and improving information systems on the peaceful uses of nuclear science and technology through the International Nuclear Information System; countries contribute arrays of information to this collection in a specific unified form
- Developing multimedia courses on nuclear knowledge management.

Work with nuclear knowledge in different countries

Some countries have developed national strategies to preserve knowledge in specific areas of expertise. One such strategy includes creating an inventory of knowledge and experience related to nuclear energy possessed by the state, through the development of sets of various classifiers, dictionaries, glossaries, and meta-descriptions of specific technologies.

Several countries have implemented a number of IAEA General Conference resolutions in the area of nuclear knowledge management. Canada is making an effort to preserve and transmit knowledge in its industry's research and development sector. The German company ESN employs information portals to support knowledge management. A knowledge management department within this company is a structural unit that was created several years ago to carry out activities in knowledge management.[8]

[7] Risk Management of Knowledge Loss in Nuclear industry Organizations.STI / PUB/1248.July, 2006.

[8] Mandy Richter.Knowledge Management in the Framework of Integrated Management Systems. Presentation by ESN at POKM-IAEA Workshop in Temelin 23-26/11/2009.

A group of scientists from Sweden, Denmark, Norway and Finland[9] employs an approach designed to analyze related published information on radiation protection methodologies for non-human biota. The project, started in May 2007 and called GAPRAD, fills knowledge gaps in radiation protection methodologies. Its final report was published online in March 2009. This project was organized within research on nuclear security in Nordic countries.

The knowledge management program in Argentina deals with information and expertise related to research reactors and is based on a portal that provides access to various projects (CNEA, NKM Projects, LICRA3 Project). Each project is provided with comprehensive information, including descriptions, sketches, and diagrams of installations and products.

The British company "Electrabel" identifies critical knowledge through a special form to determine individual competence. It has developed a dictionary of technical competencies, consisting of 160 items classified by specific categories such as security, investigations, etc.[10]

The Czech nuclear power plant "Temelin" began its work in knowledge management in 2007, developing a concept of knowledge management in collaboration with Proneos GmbH. This resulting approach introduced the position of engineer for knowledge and a distribution of responsibilities among the staff members involved in knowledge management. For that purpose, specific roles and a responsibilities matrix were developed.

Technologies used to work with knowledge

Knowledge Portals

In general, the word "portal" means a point of connection and access. When applied to the Internet, it could be visualized as a large site combining a variety of universal services, which provide the user with the ability to receive further information from those various sites.

The portal is typically considered the next stage of organizational information development. The portal provides users (both within and outside of the organization) with a single entry point to the data structure, a so-called "single window". It is an integral management system for dispersed information resources. From an organizational standpoint, this concept is suitable for a workplace arrangement that provides a single point of access to all the information necessary to perform assigned functions. From a technical point of view, it is an information system that integrates different data sources and separate function systems with a single access point and uniform rules for information submission and processing.

Ontologies

The ontological method of describing the subject area has recently become popular. It is fair to say that it has moved away from artificial intelligence specialists to subject matter experts. An ontology defines a common vocabulary for researchers who share an information domain: it is

[9] NKS Order {AFT / B (07) 8}.Filling knowledge gaps in radiation protection methodologies for non-human biota. Electronic report, March 2009. www.nks.org

[10] Knowledge Management inside processes Electrabel-GDF SUEZ. Presentation on the Temelin NPP, IAEA Technical Meeting, 23-26 November 2009.

not only a formal explicit description of the subject matter, but it also addresses the relationships between the terms.

An ontology consists of concepts (classes), properties and attributes of these concepts, as well as limitations. Together with a set of classes, it is a knowledge base. Classes are organized in a hierarchy, which means that they may have superclasses and subclasses.

Ontologies present knowledge, which can be processed with a computer, which means that this knowledge can be written in formal language.[11] In this case, computers make logical conclusions based on knowledge about the subject matter, yet understanding the meaning of symbols and rules remains a human responsibility.

Electronic archives

Creating digital archives involves four steps. In preparation for scanning, the documents are systematized, which requires content processing. The basis for systematization could be a chronology of the documents, their numbers, types, thematic features, etc. In the second stage information is converted into digital form. The third stage is focused on making sure that produced images match the original data. If the original documents are old and in bad condition, the images may need to be further adjusted. This stage is especially important when working with documents created before the digital era (for example, reports on radioactive contamination at Chernobyl were printed using typewriters). The last step in creating an electronic archive is to structure the information, that is, to create a database of the scanned images, or to incorporate them into the existing system. It is also important to create a search system for these scanned documents based on their individual characteristics.

A Review of Recommendations and Requirements for Structuring the Management and Knowledge Preservation System

In international practice, the following elements were identified as critical for knowledge management:

- Knowledge identification
- Collection, recording and preservation of knowledge
- Knowledge examination and maintenance
- Transfer of knowledge.

The essential tasks are to preserve and transmit knowledge.

When working on the preservation of knowledge in the field of nuclear energy, the first major recommendation is to create a *concept* as a major founding document for recording national expertise and experience, as well as an inventory of knowledge and creation of a knowledge register.[12] It is then necessary to create a list of knowledge demands and determine work priorities. The priorities may differ from country to country depending on the level of development of the nuclear energy industry.

The preservation of knowledge as a function of experience and the compilation of separate publications in the subject area should be conducted in such a way as to be able to describe 1) the

[11] Web Ontology Language. Overview. Electronic resource http://www.w3.org/TRowl-features/

[12] V. M. Kupriyanov, A. V. Tyurin, E. N. Stulova. Preserving knowledge in the CIS countries, "Environmental Safety", pp. 18-21, 2, 2007

subject matter and 2) the relationships between them. It is crucial to standardize knowledge and experience, while organizing access to it for qualified users.

Notably, almost every country that has developed a knowledge management strategy in the field of atomic energy recognizes that, due to a lack of resources, it is critical to establish criteria to determine which subject matter is particularly critical for the country to then manage these specific knowledge areas.

Challenges to the transfer of knowledge

The transfer of nuclear knowledge is now well recognized. However, there are some serious challenges of an international nature that can be formulated as follows:

- The language describing the nuclear knowledge is underdeveloped
- The transfer of nuclear knowledge faces certain limitations because of the danger of WMD proliferation
- A multilingual dictionary is not yet developed enough to transmit nuclear and radioecological knowledge
- Currently, the issue of transfer of nuclear knowledge is seen as a fairly narrow matter of specific technology transfer to other countries.

In conclusion, the ways in which the aforementioned challenges to nuclear knowledge management are perceived may vary in different countries. Yet the international community needs to address those questions together as the world strives for a global perspective on the issues concerned with the safe and secure dissemination and use of nuclear energy technology.

CNS Brief
Editor: Margarita Sevcik
Associate Editor: Lisa Donohoe Luscombe
Content Support: Michelle Olson, Margarita Zolotova

Contact:
James Martin Center for Nonproliferation Studies
Monterey Institute of International Studies
460 Pierce Street
Monterey, CA
Tel: 1-831-647-6540
Fax: 1-831-647-3519
E-mail: msevcik@miis.edu
URL http://cns.miis.edu/