Nonlinear Dynamics and Applications. Vol. 13 (2006) 52 - 53

Organization and functioning of system of accounting for and control of nuclear material of JIPNR-Sosny.

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In 1992 the Republic of Belarus signed the Nonproliferation Treaty of the nuclear weapon and subsequently in 1995 Belarus signed INFCIRC 153 type Safeguards Agreement with the International Atomic Energy Agency (IAEA). Republic of Belarus undertook an obligation of developing of State's system of accounting for and control of nuclear material, which would meet the international requirements. After that JIPNR is subject to IAEA Safeguards.

The Belarus material control and accounting (MC&A) system is based on IAEA guidance for a state's system of accounting for and control of nuclear material (SSAC). Belarus has issued state authority regulations for implementation of MC&A, supported by guidance documents.

JIPNR-Sosny is only one nuclear facility in Belarus. History of creation of the Institute begins in the early sixties of last century. The Institute supported research program connected with creation of transportable nuclear power reactor. In 1986 after Chernobyl accident research reactor was shut down and further activity was considered unsuitable.

During initial inspection IAEA conducted verifying of initial inventory list of nuclear material and design information of facility (DIQ). After that IAEA began to conduct routine monthly inspections and annual physical inventory verifications of nuclear material. After finishing of the program of creation of transportable nuclear power reactor big quantity of fuel was unloaded from research reactors and was placed into storages of fresh and irradiated fuel. At present time, Institute has a large variety of nuclear materials over their physics and chemical properties, geometry, enrichment, which is placed in 7 key measurement points (KMP):
fresh fuel storage
spent fuel storage
critical assemblies (in present time shut down)
subcritical assemblies
hot cells
labs.

Majority of material is localized at storages and subcritical assemblies.

Now Institute renews nuclear activities. JIPNR-Sosny in the frame of the international cooperation supports research program of measurements of the transmutation rates of fission products and minor actinides. For that JIPNR has created subcritical assembly driving neutron generator. There are different fields of Institute activity including examination of illicit traffic nuclear and radioactivity material. All retired material is declared and kept at Institute.

During 1995 - 2000 according to the Plan of Coordinated Technical support of the IAEA with financial support of donor – countries (Japan and the USA) the following systems and equipment were installed in JIPNR:

- Gamma spectrometer "U-Pu InSpector" with NaI, LEGe planar detector and HPGe coaxial detector 20% efficiency

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- Gamma spectrometer with HPGe detector 80% efficiency with fast electronics and GENIE-2000 software
- Active well neutron coincidence counter (AWCC)
- Low enrichment uranium standards (CRM969)

Jointly with JIPNR stuff were created:
- Computerized accounting system
- New design of fresh storage.

The equipment is used
for confirmatory measurements of enrichment and mass of uranium
for measurements during physical inventory taking
for neutron activation analyze of samples
for examination of illicit traffic material.

Aside from, with financial support of Government of Japan were obtained computer hardware, server for local area network system and bar-coding equipment.

After enforcing IAEA Safeguards Agreement Institute has designed new fresh storage (previous it didn't meet the IAEA requirements). All material is placed in special containers, mostly of it is under IAEA seals. In storage there operate two-person rule.

The material accounting system at JIPNR consists of several thousands accounting records, confirmatory measurements, physical inventory taking and periodic reporting to the Belarus authorities and the IAEA. The accounting software was developed by staff at Sosny JIPNR using the FoxPro database software based on the COREMASS system developed by Los Alamos National Laboratory. The computerized accounting system is a stand alone system and data are hand carried from locations around the site were data are generated. Much of the hardware for implementation of the material accounting program was provided to Sosny as part of the Material Protection, Control and Accounting Program about 1997. Software allows saving information, to conduct processing of information and producing reports to the IAEA.

In 2005 the Republic of Belarus signed the Additional Protocol to the IAEA Safeguards Agreement that stimulate need strengthening JIPNR system of accounting for and control of nuclear material. For that it is necessary to upgrade current system. Such upgrading could consist of
developing of facility calibration standards for proper and precise measurement of enrichment and uranium mass
modernization of computerized accounting system
modernization of fresh fuel storage containers
developing of new approach of control of nuclear material on subcritical assembly
conducting verification measurements of high enrichment uranium
estimation of burn-up of spent fuel

For Republic of Belarus it is very important to develop nuclear power because Belarus imports about 80% of energy. After finishing Chernobyl syndrome, Government of Belarus can realize plan of building of nuclear power plant. Proper implementation of safeguards allows developing nuclear activity.