

## 11-1 Direction of Scientific & Technical Development for Nuclear Nonproliferation

### Past and Present View of Nonproliferation

The Treaty on the Non-Proliferation of Nuclear Weapons (NPT) entered into force in 1970 as a mechanism to prevent further proliferation of nuclear weapons while simultaneously promoting the peaceful use of nuclear technology. Under the NPT, nuclear-weapon holding states are prohibited from transferring nuclear-weapon technology to other countries and are obliged to continue nuclear disarmament efforts. Non-nuclear-weapon states are obliged to accept safeguards by the International Atomic Energy Agency (IAEA) to assure that there is no diversion of nuclear materials to weapons, thus obtaining the right to use nuclear energy for peaceful purposes.

The NPT has functioned as the base for nuclear nonproliferation activities and the peaceful use of nuclear energy for more than 35 years. However, weak points in its regime recently have surfaced, such as the clandestine Iraqi weapons program, North Korea's nuclear weapon development and withdrawal from the NPT, and Iran's undeclared uranium enrichment activities. As a result of Iraq's program, the safeguards were strengthened to monitor and assess other undeclared activities. In addition, other unique problems exist, such as India and Pakistan who became nuclear weapon countries without ratifying the NPT.

New ideas have been proposed to support the NPT in this changing global situation. One idea is to apply limits to technology that could lead to proliferation upon holders of nuclear reprocessing and enrichment equipment, and/or control these parties under international cooperation. In the new nuclear energy policy of the US, the Global Nuclear Energy Partnership (GNEP) is proposed as an international fuel-services consortium where only "fuel supply nations" possess sensitive technologies. These countries then supply fuels to "user nations" who choose only to operate nuclear power plants.

Early on, Japan realized and pursued advanced peaceful nuclear applications and achieved favorable international nuclear nonproliferation status. At the same time that Japan has been complying with the international rules, it has been continually making efforts to improve transparency and confidence. Now, Japan is recognized to hold one of the highest standards in the international community for peaceful nuclear use. As such, Japan is also expected to contribute to the world's peaceful use of nuclear energy by proposing new nonproliferation systems and developing new Safeguards technologies.

### IAEA Missions for Nuclear Nonproliferation

We have two primary missions regarding nuclear nonproliferation. One mission is to support the government in developing nonproliferation related policies through research and study.

The other mission is to support government and international organizations by performing nuclear nonproliferation

technology development. Other important missions of JAEA are to support denuclearization, nuclear material control of its own facilities, and human resource development.

When JAEA was established in 2005, the "Nuclear Nonproliferation Science and Technology Center" was created to carry out JAEA's nuclear nonproliferation activities and obligations. This center works closely with other parties within JAEA and with the international nonproliferation community.

### Policy Research and Study

We support the government by performing nonproliferation related policy research, utilizing in-house technical knowledge. At present, We are performing two major policy studies in cooperation with other domestic and international organizations and specialists. The first study is the "Evaluation of the Safeguards Achievements in Japan". This study evaluates safeguards achievements in Japan, extracting and highlighting "best practices" to develop an improved global standard.

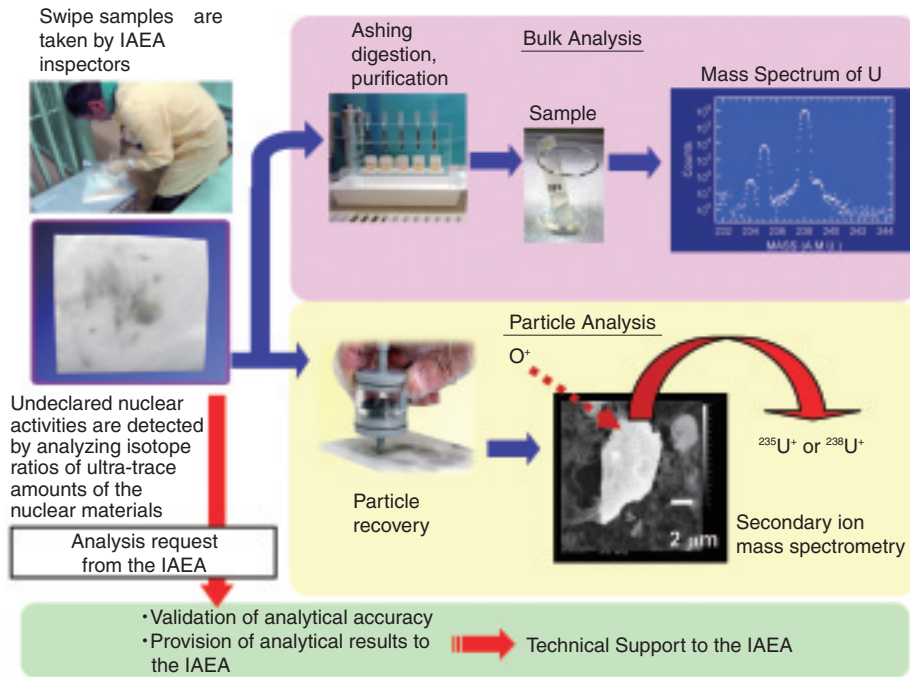
The second project is the "Study of Peaceful Nuclear Use In Asia and Improvement of Its Transparency and Confidence." The study evaluates procedures to improve the transparency of the rapidly expanding nuclear use in Asia. To promote the better understanding of nonproliferation and to support peaceful nuclear use, We release result of their studies and other information through the Internet, and holds international conferences and forums.

### Technical Development relating to nuclear nonproliferation

Technical development to support nuclear nonproliferation includes the reprocessing plants and the plutonium fuel fabrication plants, and development of Non-Destructive Analysis equipment and Remote Monitoring Systems. Also, development of the Advanced Safeguards System which will



**Fig.11-1 The International Nonproliferation Science and Technology Forum held in Tokyo on 2006.05.18-19. Invited world specialists exchanged views about various nonproliferation issues**



**Fig.11-2 Schematic diagram of safeguards environmental sample analysis**

be applied to the future Fast Breeder Reactor fuel cycle is underway. This should be considered from an early design stage to realize efficient and effective safeguards.

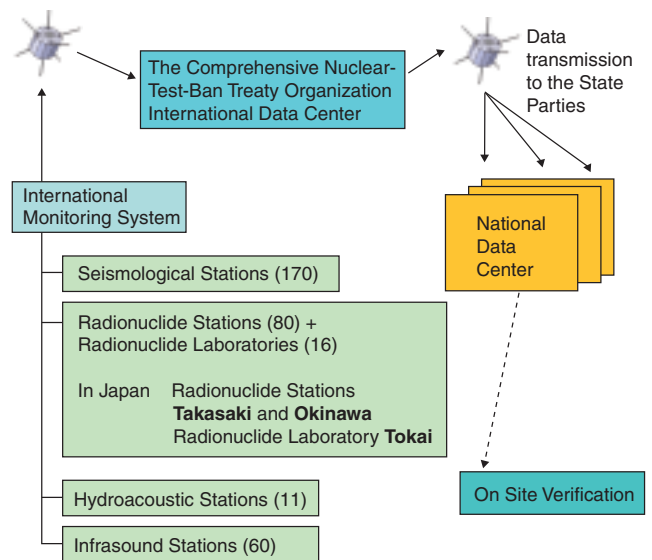
The IAEA established Safeguards Environmental Sample Analysis as a strong tool to detect undeclared nuclear activities. We are performing world-class research and development in this field, at a clean room facility (CLEAR). Safeguards Environmental Sample Analysis includes techniques to analyze isotope ratios etc. of ultra-trace amounts of nuclear material collected on cotton samples by swiping the surface of the floor, etc. inside nuclear facilities.

Other technical projects are also underway at the JAEA to improve the transparency of nuclear activities and thereby improve the reliability of, and confidence in, these peaceful activities. Remote monitoring techniques are being developed and perfected at the Fast Breeder Test Reactor “JOYO” in cooperation with the USDOE and Sandia National Laboratories. In addition, JAEA is participating in the Generation IV International Forum and International Project on Innovative Nuclear Reactors and Fuel Cycles. We are currently performing a study for quantification of the proliferation resistant features of various nuclear activities. Results of the study will be used to develop a more proliferation resistant FBR fuel cycle system.

### Support of Denuclearization

We are performing technical development to contribute to nuclear disarmament and denuclearization efforts in the world. Currently, collaborative programs are underway for disposal of Russian surplus weapons plutonium, and for technical contributions to the international verification system for the Comprehensive Nuclear Test Ban Treaty (CTBT).

We also contribute to nuclear test ban monitoring using seismic and radioactive nuclide monitoring stations. For the



**Fig.11-3 International verification system for the CTBT**

atmospheric testing, very small particles are collected on a filter and measured every day. The results on the radionuclides are transferred to the International Data Center at the CTBT office in Vienna.

### Nuclear Material Management

Strict nuclear material management is the underlying basis of the nonproliferation regime. Nuclear material management includes nuclear material accountancy, support of safeguards activities, physical protection, and nuclear material transportation. We perform research and development to improve the reliability and effectiveness for accountancy and the safeguards. Research and development are also underway to support and enhance physical protection of facilities, and to develop more efficient and safer transportation.