

2010

PROGRAM OVERVIEW

INTERNATIONAL NUCLEAR  
SAFEGUARDS AND  
ENGAGEMENT PROGRAM



# PROGRAM MANAGER'S NOTE

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We are pleased to present the 2010 Program Overview for the International Nuclear Safeguards and Engagement Program (INSEP) at the U.S. Department of Energy / National Nuclear Security Administration (DOE/NNSA). The National Nuclear Security Administration (NNSA), through its Office of Defense Nuclear Nonproliferation, works closely with a wide range of international partners, key U.S. federal agencies, the U.S. national laboratories, and the private sector to detect, secure, and dispose of dangerous nuclear and radiological material, and related WMD technology and expertise. INSEP is an important element of U.S. nonproliferation strategy and the Next Generation Safeguards Initiative (NGSI), and cooperates with partners around the world to:

- Enhance International Atomic Energy Agency (IAEA) safeguards by improving the correctness and completeness of Member States' declarations of nuclear material and facilities, thereby reducing the likelihood of theft or diversion of nuclear material for non-peaceful purposes;
- Test new safeguards technologies to meet future and current safeguards challenges; and
- Prepare the safeguards infrastructure necessary to support the safe, secure, and peaceful use of nuclear energy.

The IAEA predicts that approximately 60 countries are considering nuclear power to meet growing energy demands, increasing the burden on an already strained safeguards system. These “newcomer” countries will require training and expertise to ensure that nuclear technologies are used in accordance with international nonproliferation obligations. To facilitate the safe and secure global expansion of nuclear energy, INSEP works directly with the IAEA and its Member States to strengthen safeguards in existing nuclear facilities around the globe, and collaborates with countries to help them plan for nuclear safeguards, as they move toward nuclear power plant development.

With the support of the DOE/NNSA National Laboratories, INSEP has concluded over 150 projects with international partners and has transferred a range of safeguards technologies to the IAEA for its use in advancing its safeguards mission. In addition to these activities, INSEP trains approximately 300 foreign practitioners on international and domestic safeguards annually. Cumulatively, INSEP's efforts provide support for the IAEA's Milestone Process, which provides guidance for countries considering nuclear power, as well as United Nations Security Council Resolutions 1540 and 1887, which call on states to account for and control nuclear materials.

In providing an overview of INSEP's mission, program elements, and strategic goals for the coming year, we hope this brochure will inform those in and outside of government about our program's strategic role in strengthening the international nonproliferation regime.

*Alex Sunshine*

*Program Manager*

*International Nuclear Safeguards and Engagement Program*

**DOE/NNSA**

**Defense Nuclear Nonproliferation**

**Nonproliferation and International Security**

**Next Generation Safeguards Initiative**

**International Nuclear Safeguards and Engagement Program (INSEP)**

# WHAT ARE INTERNATIONAL SAFEGUARDS?

Credit :United Nations



President Eisenhower proposed an international regime to safeguard nuclear material in 1953. In 1956 the International Atomic Energy Agency (IAEA) was established. The IAEA now seeks to ensure that Member States are living up to their Nuclear Non-Proliferation Treaty (NPT) obligations; including that non-nuclear weapons states do not divert nuclear programs to non-peaceful uses; and, nuclear weapons states do not assist non-nuclear weapons states in acquiring nuclear weapons or explosive devices. The IAEA achieves these objectives through the implementation of safeguards agreements, which provide the legal basis for the application of international safeguards within the Member States. Currently, 145 States have entered into such agreements with the IAEA, submitting nuclear materials and facilities to the scrutiny of IAEA inspectors.

*President Eisenhower made his “Atoms for Peace” speech to the United Nations in December, 1953.*

## Safeguards in the Field



Credit: Vadim Mouchkin, IAEA

*Environmental sampling is used to detect undeclared nuclear activities in air, water, and soil.*



Credit: Dean Calma, IAEA

*Installation of an All in One Surveillance Unit used to monitor activities in a reactor hall.*



Credit: Dean Calma, IAEA

*Inspector using a handheld device to verify the amount of uranium in fresh fuel assemblies.*

# ENGAGEMENT OVERVIEW

## *INSEP collaborates with international partners to strengthen international safeguards at all stages of nuclear development.*

Strengthening international safeguards on nuclear materials that can be used for non-peaceful purposes is vital to preventing the spread of nuclear weapons and deterring terrorist acts using nuclear material. INSEP engages with partners to improve the development and application of international safeguards at all stages of nuclear development. INSEP draws on the unique experience and expertise of the DOE National Laboratories to accomplish this mission. Through regional and bilateral engagements, INSEP provides training, equipment, and expertise needed by international partners to implement safeguards early in the development of nuclear power programs. Additionally, INSEP also collaborates with established civil nuclear programs to test and implement state-of-the-art detectors for safeguards measurements in complex environments.



*INSEP experts install a Radioactive Liquid Waste Evaporator System at the Nuclear Research Center in Tajura, Libya.*



*Credit: Dean Calma, IAEA*

*IAEA safeguards inspectors verify the integrity of a seal during a training exercise at a Slovenian nuclear reactor.*



*Credit: INL*

*Developing three dimensional design information verification tools for monitoring complex facilities.*

### *Safeguards Infrastructure Development*

INSEP works with countries at all stages of nuclear development to prepare the safeguards infrastructure necessary to support the safe, secure, and peaceful use of nuclear energy.

### *Safeguards Implementation Cooperation*

INSEP cooperates with countries to enable the effective and efficient implementation of international safeguards obligations.

### *Advanced Safeguards Testing*

INSEP partners with countries to develop and implement next generation safeguards technologies to address challenges posed by advanced nuclear fuel cycle technologies.

# SAFEGUARDS INFRASTRUCTURE DEVELOPMENT



*U.S. laboratory expert inspects nondestructive analysis equipment at the new Indonesian safeguards laboratory.*

## Challenge

Faced with increasing energy needs and pressures to combat climate change, many countries are considering nuclear power for the first time. Often, the nuclear expertise and safeguards infrastructure of these countries is limited to supporting research reactors used for radioisotope production and scientific research. As a result, they will require an enhanced safeguards infrastructure and the related expertise to handle the amount of nuclear material and technology associated with the development of a new nuclear power program.



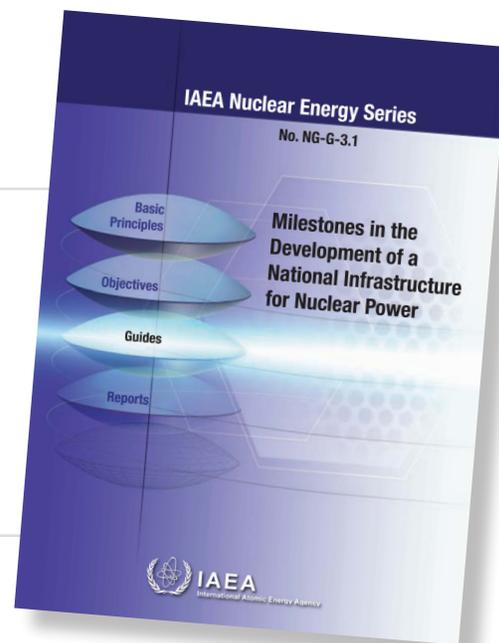
*Participants from the Middle East learn about international safeguards and other nonproliferation fundamentals at this Technical Training Workshop in May 2009.*

## Response

INSEP partners through technical engagement projects to develop the safeguards infrastructure necessary for effective nuclear material stewardship. Projects cover a range of activities designed to build capacity and expertise fundamental to the development of safe, secure and peaceful nuclear power programs fully compliant with international nonproliferation norms.

## Coordinating with the IAEA

*INSEP closely coordinates its infrastructure program with the IAEA Milestones Process, which provides guidance on developing the necessary infrastructure for countries considering nuclear power. By aligning its program with key elements of the Milestones Process, INSEP provides partner countries with comprehensive training in accordance with international standards and best practices.*



# SAFEGUARDS IMPLEMENTATION COOPERATION



*Evaluating surveillance equipment for IAEA safeguards in Japan.*

## **Challenge**

IAEA safeguards are a central component of the international nonproliferation framework. However, as more states develop nuclear power programs, it will become increasingly difficult for the IAEA to verify that all states are conducting nuclear activities peacefully. As a result, the IAEA will rely more heavily on its Member States to support its verification responsibilities. This change will require Member States to continually refine their existing nuclear material accounting and control systems to improve effectiveness and efficiency. As in any modern industrial management system, these systems must be consistently monitored, tested and strengthened to satisfy current and future IAEA safeguards requirements.

## **Response**

INSEP increases the effectiveness and efficiency of safeguards in partner countries through bilateral technical exchange projects that directly support the development and improvement of State Systems of Accounting for and Control (SSAC) of nuclear material. A state's SSAC is the national authority for the implementation of IAEA safeguards and is a critical link in strengthening the international safeguards system. INSEP's outreach activities directly enable countries to provide correct and complete facility and state-level declarations to the IAEA per their obligations under their Comprehensive Safeguards Agreement and Additional Protocol. These activities help ensure states develop the necessary accountability and transparency to prevent the diversion of materials and verify the peaceful intent of their nuclear programs.



*Training Course for ABACC Inspectors on Nondestructive Assay Techniques and Equipment for Nuclear Material Verification held in Rio de Janeiro, Brazil.*

## **Implementing UNSCR 1540 and 1887**

*Through its safeguards implementation outreach, INSEP supports the universal application of United Nations Security Council Resolutions (UNSCR) 1540 and 1887, which call on states to develop and maintain appropriate and effective measures to account for and secure nuclear material while in production, use, storage or transport.*



*Credit: United Nations*

## ADVANCED SAFEGUARDS TESTING

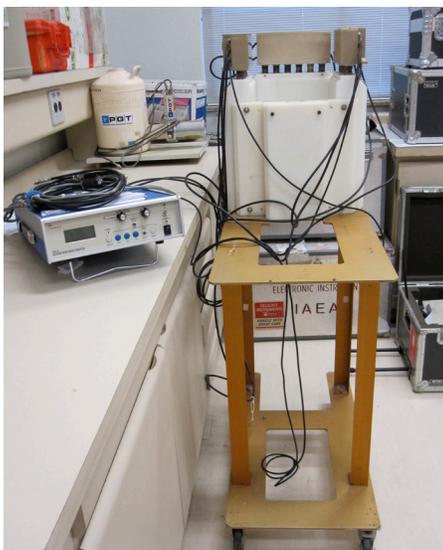


Credit: IAEA

*U.S. and Japanese experts collaborate to install the Epithermal Neutron Multiplicity Counter (ENMC), which will improve Japan's ability to maintain accountability of plutonium inventories and report accurately to the IAEA.*

### Challenge

Advances in nuclear technology create new challenges for international safeguards. As innovation in the nuclear field increases, new proliferation threats will emerge and the IAEA's responsibilities will expand. Development in safeguards technology must keep pace with these changes to ease the burden on the IAEA and to ensure that nations continue to generate nuclear power safely, securely and in accordance with international nonproliferation obligations.



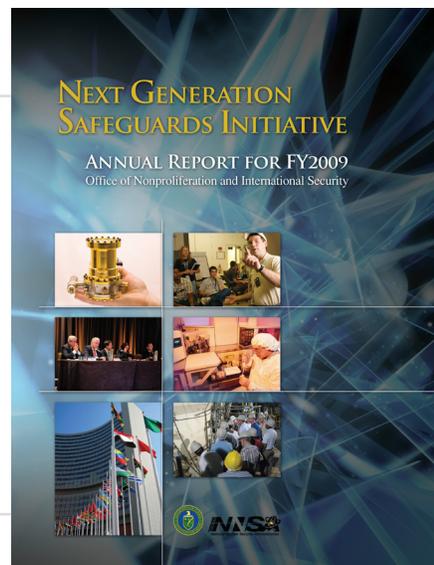
### Response

INSEP develops and tests next-generation safeguards technologies through collaborative technical projects with foreign partners. These technologies are intended to reduce the requirement for on-site inspector presence at particular facilities and increase the consistency of international safeguards reporting.

*INSEP cooperates with partners to improve their safeguards capabilities. This device, developed in cooperation with Brazil, measures the amount of uranium in fresh reactor fuel.*

### Testing Next Generation Safeguards Technologies

*The Next Generation Safeguards Initiative (NGSI), launched in 2008 by DOE/NNSA, will strengthen U.S. domestic policies, technologies, and expertise related to the application of safeguards, while also strengthening the international infrastructure to support the international safeguards system as its mission evolves over the next 25 years. Through INSEP, NGSI tests newly developed safeguards technologies with experienced international partners, exchanges international safeguards best practices, and provides training and educational opportunities for the next generation of safeguards professionals from around the globe.*



# INTERNATIONAL NUCLEAR SAFEGUARDS AND ENGAGEMENT

**EURATOM** – Partner since 1993. INSEP has worked on many significant safeguards projects with the European Atomic Energy Community (EURATOM), including: advanced safeguards video surveillance technology; a training simulator for inspectors to measure plutonium mass; and mixed-oxide fuel measurement and spent fuel verification techniques. Three dimensional sensing technologies for unattended monitoring and safeguards inspection applications are currently under development.

**FRANCE** – Partner since 1983. INSEP’s cooperation with France has focused in two primary areas: environmental sampling and the evaluation and testing of codes to allow for more accurate nuclear material counting. France will continue to be a key partner in these areas, as well as others, in the future.

**ALGERIA** – Partner since 2006. Although one of INSEP’s newer partnerships, cooperation with Algeria is already well underway through the implementation of a “Joint Assessment Roadmap” that outlines a collaborative path forward. Activities in radiation protection and health physics are currently ongoing, with additional activities planned for the near future.

**MOROCCO** – Partner since 1994. A long standing partner with INSEP in safeguards infrastructure development, Morocco has cooperated with INSEP on waste management, environmental monitoring and modeling, research reactor management and maintenance, emergency management planning and response, and human resource development.

**ABACC** – Partner since 1994. As a key regional organization and partner, the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC) has cooperated closely with INSEP on topics including: enhancement of environmental sampling capability; design and testing of surveillance equipment; safeguards best practices training; quality control and quality assurance; and three-dimensional design information verification systems to assist safeguards inspectors in facility measurements.

**BRAZIL** – Partner since 1995. Since the beginning of this partnership, INSEP has cooperated with Brazil on more than 19 projects covering such topics as containment and surveillance, nondestructive assay, environmental sampling, safeguards options for enrichment facilities, and quality assurance.

**ARGENTINA** – Partner since 1994. INSEP has collaborated jointly with Argentina on a wide range of safeguards projects, including: the development and implementation of a nuclear regulatory authority safeguards network; training on uranium enrichment safeguards measures; environmental sampling; and the establishment of a safeguards gamma-ray nondestructive assay laboratory.

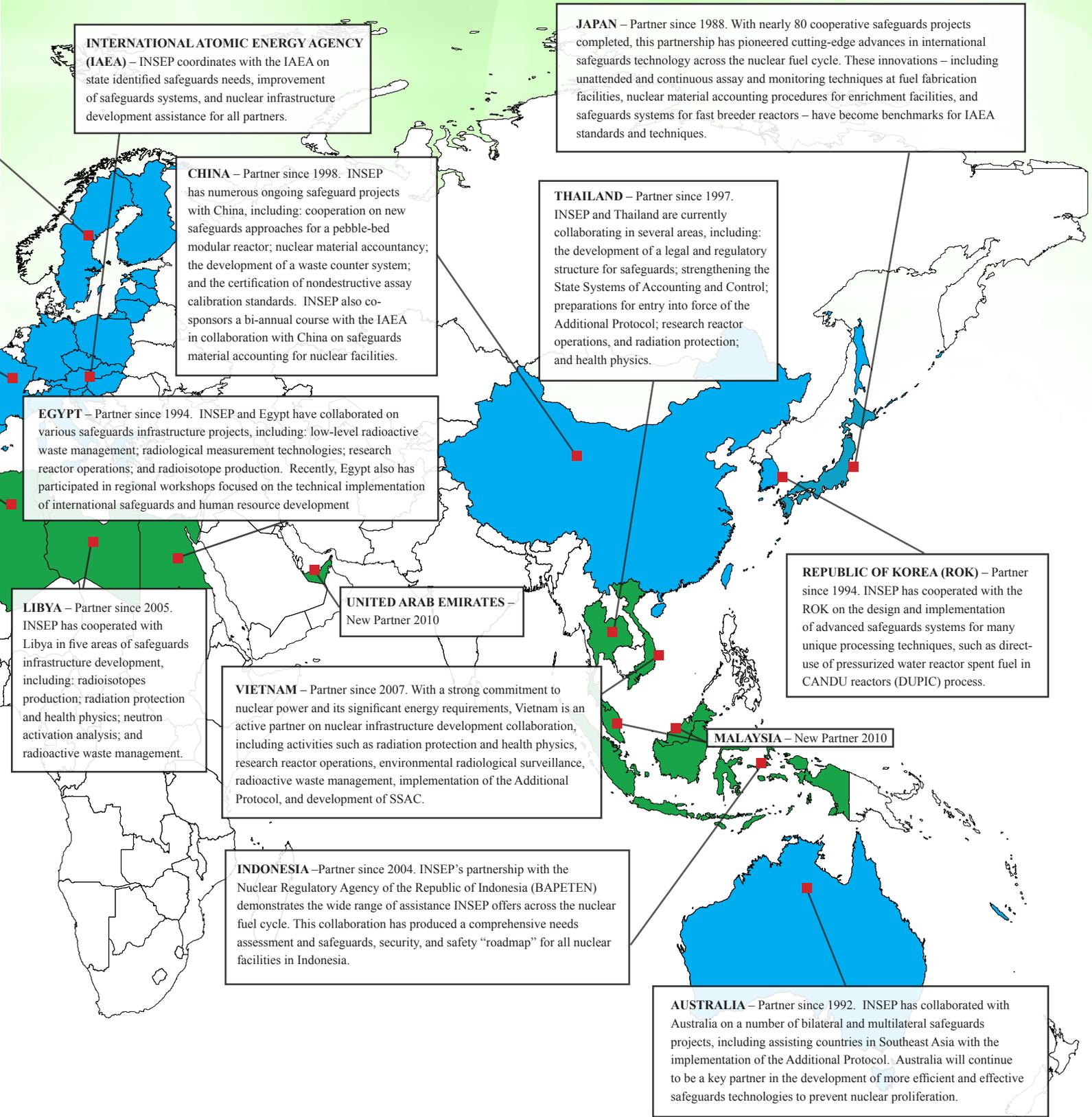
INSEP also engages many other countries through regional activities, such as workshops, seminars, and training sessions.

## Legend

- Safeguards Infrastructure Development
- Safeguards Impementation Cooperation
- Advanced Safeguards Testing
- All Other Countries

0 750 1,500 3,000 Miles

# INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA) – INSEP COOPERATION PROGRAM STATUS 2010



**INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)** – INSEP coordinates with the IAEA on state identified safeguards needs, improvement of safeguards systems, and nuclear infrastructure development assistance for all partners.

**JAPAN** – Partner since 1988. With nearly 80 cooperative safeguards projects completed, this partnership has pioneered cutting-edge advances in international safeguards technology across the nuclear fuel cycle. These innovations – including unattended and continuous assay and monitoring techniques at fuel fabrication facilities, nuclear material accounting procedures for enrichment facilities, and safeguards systems for fast breeder reactors – have become benchmarks for IAEA standards and techniques.

**CHINA** – Partner since 1998. INSEP has numerous ongoing safeguard projects with China, including: cooperation on new safeguards approaches for a pebble-bed modular reactor; nuclear material accountability; the development of a waste counter system; and the certification of nondestructive assay calibration standards. INSEP also co-sponsors a bi-annual course with the IAEA in collaboration with China on safeguards material accounting for nuclear facilities.

**THAILAND** – Partner since 1997. INSEP and Thailand are currently collaborating in several areas, including: the development of a legal and regulatory structure for safeguards; strengthening the State Systems of Accounting and Control; preparations for entry into force of the Additional Protocol; research reactor operations, and radiation protection; and health physics.

**EGYPT** – Partner since 1994. INSEP and Egypt have collaborated on various safeguards infrastructure projects, including: low-level radioactive waste management; radiological measurement technologies; research reactor operations; and radioisotope production. Recently, Egypt also has participated in regional workshops focused on the technical implementation of international safeguards and human resource development

**REPUBLIC OF KOREA (ROK)** – Partner since 1994. INSEP has cooperated with the ROK on the design and implementation of advanced safeguards systems for many unique processing techniques, such as direct-use of pressurized water reactor spent fuel in CANDU reactors (DUPIC) process.

**LIBYA** – Partner since 2005. INSEP has cooperated with Libya in five areas of safeguards infrastructure development, including: radioisotopes production; radiation protection and health physics; neutron activation analysis; and radioactive waste management.

**UNITED ARAB EMIRATES** – New Partner 2010

**VIETNAM** – Partner since 2007. With a strong commitment to nuclear power and its significant energy requirements, Vietnam is an active partner on nuclear infrastructure development collaboration, including activities such as radiation protection and health physics, research reactor operations, environmental radiological surveillance, radioactive waste management, implementation of the Additional Protocol, and development of SSAC.

**MALAYSIA** – New Partner 2010

**INDONESIA** – Partner since 2004. INSEP’s partnership with the Nuclear Regulatory Agency of the Republic of Indonesia (BAPETEN) demonstrates the wide range of assistance INSEP offers across the nuclear fuel cycle. This collaboration has produced a comprehensive needs assessment and safeguards, security, and safety “roadmap” for all nuclear facilities in Indonesia.

**AUSTRALIA** – Partner since 1992. INSEP has collaborated with Australia on a number of bilateral and multilateral safeguards projects, including assisting countries in Southeast Asia with the implementation of the Additional Protocol. Australia will continue to be a key partner in the development of more efficient and effective safeguards technologies to prevent nuclear proliferation.

# SAFEGUARDING THE NUCLEAR FUEL CYCLE

INSEP provides partner countries training on State Systems of Accounting for and Control (SSAC) of nuclear material and implementation of the Additional Protocol, which enables them to better meet their safeguards responsibilities to the IAEA.



Participants from Southeast Asia and North Africa learn safeguards fundamentals at a 2009 Oak Ridge National Laboratory technical training workshop, sponsored by INSEP.

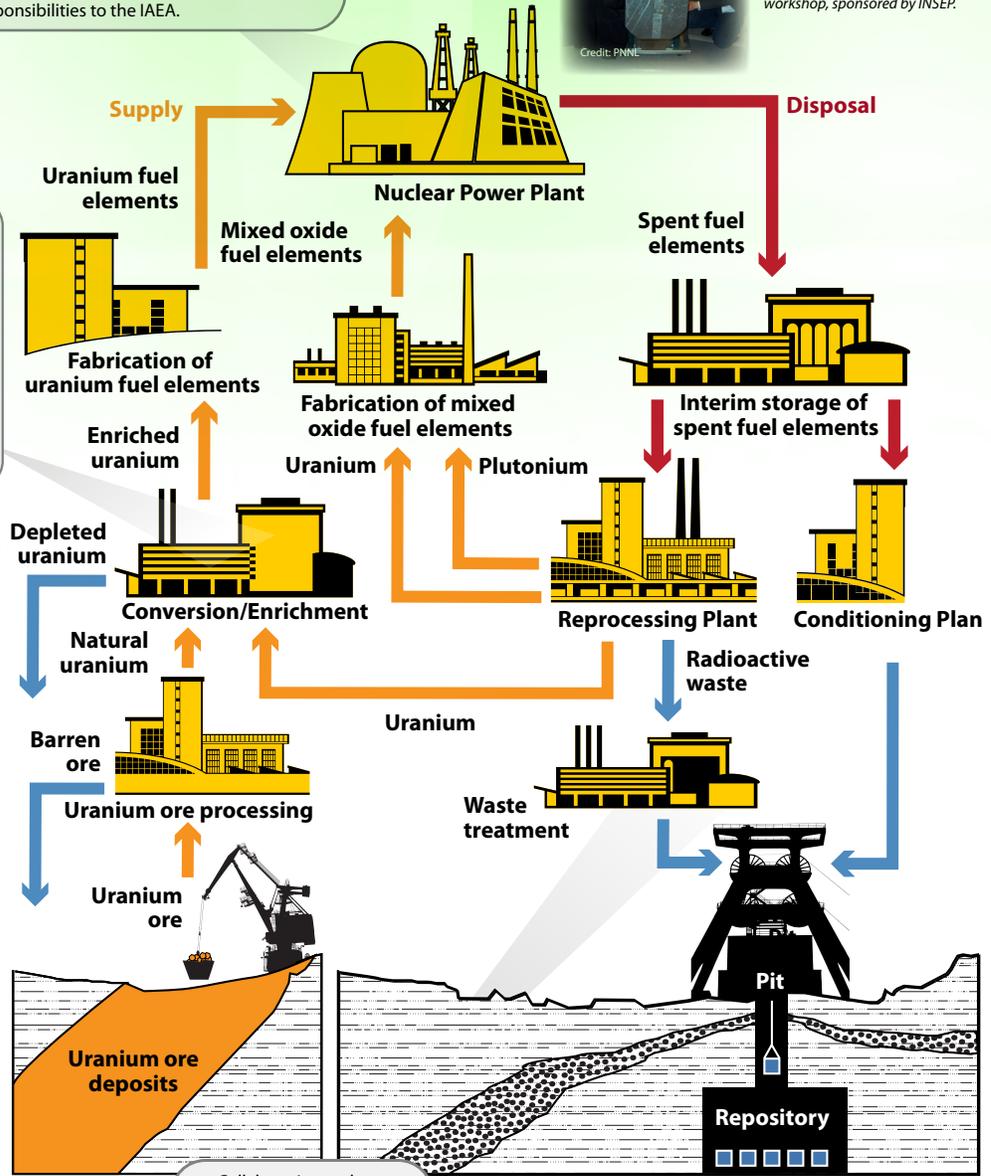
Credit: PNNL

INSEP's global outreach includes working with partners to test advanced safeguards approaches for complex nuclear facilities, such as reprocessing and uranium enrichment facilities.

PERLA Laboratory at ISPIRA



U.S. and French officials utilize a multiplicity counter to verify measurement standards at the PERLA Laboratory in the European Union's Joint Research Center in Ispra, Italy.



Collaborating on best practices in low and intermediate level nuclear waste management is an element of INSEP's international infrastructure partnerships. These activities help countries prepare for the long term commitment associated with nuclear energy development and understand the necessary safeguards obligations.



INSEP worked with Libya's Tajura Nuclear Center to provide training on a U.S. Government supplied radioactive waste evaporator.

## LOOKING TO THE FUTURE



In the coming years, INSEP will continue to engage with new and established international partners at every stage of the nuclear fuel cycle.

During this time, the international nonproliferation and safeguards community will face new and disparate challenges ranging from specific technical needs, such as safeguards for fast reactors and advanced separation facilities, to more universal issues, such as safeguarding the global nuclear revival, implementing U.N. Security Council Resolutions 1540 and 1887, and addressing the global shortage of human capital in the safeguards field. As a key part of NNSA's Next Generation Safeguards Initiatives (NGSI) INSEP is well-prepared and uniquely positioned to meet these challenges through its long-standing relationships with international partners and depth of technical expertise. Working together with DOE/NNSA National Laboratories, the program is actively exploring new opportunities for cooperation in Southeast Asia, North Africa and the Middle East, while expanding its existing activities in East Asia, South America, and Europe.

As an experienced and established element of the U.S. international security and nonproliferation portfolio, INSEP will continue to provide opportunities to strengthen the international safeguards system and related nonproliferation infrastructures. As recognized by the NGSI, these objectives will require the participation of the international community to ensure their success. INSEP looks forward to working together with its partners in the future to reduce the risk of nuclear proliferation.

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