PANEL SESSION 67: IAEA Special Session on Management of Disused Sealed Sources

Co-Chairs: **Julia Whitworth**, *IAEA (Austria)*
Yasser Mohamed, *Egyptian Atomic Energy Authority (Egypt)*

Panel Reporter: **Julia Whitworth**, *IAEA (Austria)*

Panelists:

1. **Meaghan Jennison**, *NNSA GTRI*
2. **Bernard Sevestre**, *CEA- GIP-HA (France)*
3. **Abderrahim Bouih**, *CNESTEN (Morocco)*
4. **Julia Whitworth**, *IAEA (Austria)*
5. **Julia Witworth** on behalf of **Rustem Paci**, *Radiation Protection Office (Albania)*
6. **John Zarling**, *Los Alamos National Laboratory*
7. **Rainer Pruesse**, *Gamma-Service Recycling (Germany)*

About 30 people attended this panel session, which focused on challenges associated with the safe, secure, and sustainable long-term management of Disused Sealed Radioactive Sources (DSRS), a topic of interest at recent forums including the 2012 Seoul Nuclear Security Summit (NSS) and the most recent IAEA meeting on topics related to the Code of Conduct on the Safety and Security of Sources. The session primarily consisted of the six panelists giving seven presentations about their programs for the management of Disused Sealed Radioactive Sources (DSRS), including Mr. Pruesse speaking on behalf of the International Source Suppliers Association (ISSPA) about the industry's recycling initiatives and challenges. Each panelist responded to several questions from the audience, as well as two general questions posed after all of the panelists.

Summary of Presentations

Meaghan Jennison described the US National Nuclear Security Administration (NNSA) Global Threat Reduction Initiative (GTRI) program for security assistance with disused and unwanted sealed sources. Security enhancements provided are voluntary, and GTRI works in coordination with the US regulator, the Nuclear Regulatory Commission. She also discussed prioritization criteria for the assistance, as well as challenges associated with disposal of DSRS in the US and a variance that the program recently obtained that allows commercial disposal of smaller (Class A) DSRS for 1 year at a facility in Utah.

Bernard Sevestre described the French program of DSRS management in the context of the French national program for radioactive waste management. DSRS were first regulated in France in 1990 and the current DSRS management process is the reverse of the sales process – responsibility rests with the supplier. He articulated that DSRS can be managed either as radioactive material or as waste, but management as waste removes many management options, so they refrain from making a waste designation for most DSRS until a final disposition is determined. DSRS are attractive for misuse and can remain dangerous even after long storage periods. France has a PNGMDR national roadmap for the management of nuclear material, including DSRS that is reviewed every 3 years with input from stakeholders. While recycling is

the preferred option for DSRS, this is not always possible and safe and secure interim storage is absolutely essential. France plans for surface disposal of LLW and ILW, including DSRS, with half-lives less than or equal to that of Cs-137. Sources with longer half-lives will go to dedicated sub-surface or deep geologic disposal. Mr. Sevestre discussed which facilities will be used for collection, interim storage, and final disposal. France expects up to 43,000 TBq and less than 400 m^3 in DSRS disposed as waste, far less than from the nuclear industry. The detailed roadmap is possible only because the country has the criteria for final disposal from the disposal operator, ANDRA. Funding is a real issue because users never anticipate the final disposal costs.

Abderrahim Bouih spoke about early uses of sealed sources in Morocco, going back to 1929. Morocco has a good legislative framework that started in 1971, with responsibility for DSRS assigned in 1986 and one regulatory body (CNRP) for radiation safety. Morocco has had a licensing system for sealed radioactive sources since 1971 and maintains a national inventory updated annually and shared among governmental agencies. Most sources in use are located in a few cities along the coast; most are Co-60 and Cs-137 in gauges. The country has about 250 DSRS, including 6 Spent High Activity Radioactive Sources (SHARS) and 240 Tc-99 generators and smoke detectors. CNESTEN has collected the SHARS. They have found some orphan sources at ports during monitoring. An accident involving a sealed source encouraged the government to give emphasis to managing DSRS, but it remains a challenge, as Morocco has no final disposal option. With a new law, two regulatory authorities will be combined and will be independent of other ministries, reporting directly to the Prime Minister. Now, DSRS must either be returned to manufacturer or sent to CNESTEN, as is done with orphan sources. Long term storage has begun for now until a disposal facility become available. Major challenges in the near term are to complete the national inventory and develop a national strategy.

Julia Whitworth summarized IAEA's authority to address DSRS management issues and the various programs that the agency provides to assist its members states in safely and securely managing their DSRS. She showed some examples of sources that had fallen out of control and storage facilities from which the DSRS had been stolen, as well as going over reports from some of the major accidents involving DSRS. She then went over IAEA's major activities, including the publication of requirements and guidance documents covering sealed-source topics, direct assistance with source conditioning, physical protection, regulatory reviews and assistance, the International Catalogue of Sealed Sources and Devices, and Category 1-2 DSRS removal assistance. She also provided a list of relevant documents and contact information for further resources.

John Zarling articulated the problem with thousands of sources becoming disused/unwanted in the US, and gave an example of a disused and almost-forgotten Cs-137 irradiator at a high school in San Antonio, TX. The project he manages, the Offsite Source Recovery Project (OSRP) can acquire DSRS in the interest of national security or public health/safety. OSRP prioritizes sources in private facilities with less security such as hospitals, and DSRS in large metropolitan areas. OSRP also recovers high-activity beta-gamma sources (Cs-137 and Co-60). OSRP maintains a registration website on which users can register DSRS. The US has only one container that can be used right now for high-activity Co-60 source-containing device recoveries, which can cost $500,000 for a 20-day rental. OSRP has recovered 27,050 DSRS (over 30,000 for GTRI as a whole) totaling 3.08e4 TBq (834,000 Ci), including more than 2,400 sources from

overseas with more than 153 TBq. To be recovered, small sources comprise 48 TBq, but most activity is in 3.7-370 TBq range (more than 10,000 Ci). Lack of commercial (or any) disposal is a primary challenge, especially for Co and Cs sources with more than 30 Ci and foreign-origin TRU sources. For transportation, OSRP uses field-sealable special form capsules, S300 Type A fissile pipe overpack containers, and a truck with security features including real-time tracking. OSRP is developing a 435B Type B container to transport LTSS (10,000 lbs loaded) and a very large container weighing up to 125,000 lbs to cover 95% of devices (Model 380B).

Rainer Pruesse stated that ISSPA was founded to address initiatives to improve source safety and security. Members agree to a Code of Good Practice and participate in policy and guidance discussion with IAEA. ISSPA provides a way for small companies to have a greater voice; it has 17 members in 9 countries, representing more than 95% of radioactive sources produced globally. Mr. Pruesse noted the widespread use of radioactive sources worldwide for benefits such as sterilization of 45% of the worldwide medical disposable products using Co-60. Three strategies are possible for DSRS – recycle, long-term storage, and disposal. For recycling, sources must be disassembled using specialized equipment such as dedicated hot cells and by qualified technicians. Some sources can also be reused as-is after testing, and some of the considerations for these activities were discussed. Manufacturers generally cannot provide long term storage due to liability issues and financial responsibility, especially if there is no ultimate disposal path known. Users should avoid designating sources as waste because this can complicate or make impossible return to manufacturer. Challenges include determining source country of origin, so ISSPA recommends one-for-one source exchanges (where possible) with any authorized and willing manufacturer. Another challenge is container availability – device-specific containers lose certification when devices become obsolete, and authorized contents often exclude non-special form sources. Full revalidations by competent authorities are time consuming and expensive. He mentioned the example of a US /Canada joint guide for approvals of Type B containers. Denial of shipment is another problem, such as a recent event in Thailand involving a Co-60 shipment for which Gamma Recycling finally had to rent its own vessel for the transport due to shipment denials by normal carriers. ISSPA would also like to see harmonization of security requirements. Industry is recycling sources and modifying devices to use lower-activity sources. Gamma Services accepts Co-60 and Cs-137 sources for recycling and reuse.

Questions and Answers

1. Ms. Jennison: Q. Why is the variance limited to only one year? A. Due to the disposal facility requirements. Q. Why are Class A sources being targeted? These are lowest risk. A. Other sources are being recovered by the US OSRP. Also, aggregations of Class A sources can reach dangerous thresholds. Q. What about Greater-than-Class-C (GTCC) sources? A. The variance described does not apply to those, that is being worked by the federal government.
2. Mr. Sevestre: Q. Is the non-sustainability of long-term storage included in France's national strategy? A. Not officially, but it is acknowledged that all such waste must go to disposal eventually. Q. Is it legally binding that suppliers must receive sources back? In which case does CEA accept ownership of the DSRS? A. Yes, this is in the law. CEA was the first producer of sources and for many years the main supplier. As such, it has an

obligation to take back the sources. Cis-Bio and CEA have created GIP, which Sevestre manages, so it is now GIP's job to take back old sources; they are also repatriating sources supplied by any French company, such as Massiot-Philips. Q. Is the limit of 1 Bq after 30 years per package? Even if many sources are consolidated? Does this not cause problems for disposal in an intrusion scenario? A. No, the limit is per source – this is good for example for nuclear medicine sources. CEA must check that the content is okay and other requirements are met. Q. How are you managing legacy or orphan sources? A. For orphans, there are 2 possibilities – low activity or Ra-226 sources will go to ANDRA; high-activity sources will go to GIP. Q French law does not prohibit import of DSRS? A. No, if they were exported by France, they can be returned. Q. Will France take back all exported sources from its territories overseas? How many were exported? A. Yes. Some of the territories are in the national inventory, some are not, but there are funding limitations.

3. Mr. Bouih: Q. Do you have a storage facility? Also, we understand your plan to store Co-60 for 50 years, but what about Cs-137 and other longer-lived isotopes? A. Yes, they have national storage in 2 buildings - one for treatment, one for storage. This has concrete cells with 50 cm thickness of concrete for shielding, meets the requirements for a nuclear facility. They will have to do long-term storage of other isotopes. They have no other solution unless they can accomplish final disposal. Q. For Cs-137, could these DSRS be treated? Are you going to store such sources for 300 years? When will institutional control end? A. This topic was discussed at some length among the audience and panelists. This is exactly an example of a difficult problem from the perspective of sustainability.
4. Mr. Zarling: Q. Can't GTCC sources be disposed at the US deep geologic repository, the WIPP? A. No. The US DOE is working on GTCC EIS, but no decision has yet been made on where or how they will be recovered. Q. How did OSRP recover DSRS Pu-239 from Germany? A. Yes, these were brought to the US. Q. What is an unwanted source? Same as disused? Q. What are the requirements for OSRP to repatriate US-origin sources? A. The main requirement is that they be US-origin. Small sources considered exempt under US regulations can be disposed as municipal waste, so OSRP does not need to be repatriated. Q. Regarding the RFID system on the transport truck, will this be used for radioactive containers? A. OSRP is only tracking the truck. Not having a transmitter on the container is a problem. The goal of the transport container is to be able to track the container. The large cask being developed will have tracking. Ms. Jennison: GTRI working with well-logging companies to track sources that move frequently in use, possibly with a GPS device, but the device will be on truck, not the sources, because the technology could not survive downhole. Q. Are you working on the front end to improve the registration of sources when they are still in-use? A. NRC may work on this. Q. Brazil is proud to be part of this effort. GTRI is now preparing for repatriation of Cat 1-2 sources from Brazil, permissions have been completed, and NECSA collected information.
5. Mr. Pruesse: Q. Not declaring sources waste is a nice idea. Canada sold sources to a Brazilian hospital, which finally considered them as waste. Now, they may be shipped back to Canada, but Canada won't repatriate them, so they will have to be recycled. A. If sources are already declared waste, it is often not possible to transfer them to another

location – it is definitely easier if they are still radioactive material. To re-categorize material from waste to material is always very complicated.

6. Financial assurances – In Egypt, costs for removing sources to the Egyptian Atomic Energy Agency would normally be paid by users; but GTRI has helped to fund amnesty recovery program to pay these costs so that users don't have to pay. Amnesty program was started 2 years ago and more than 300 sources were recovered (about 200 orphans). When this program ends, the Egyptian government will have to pay future costs. For GTRI, the goal is to make licensees pay. They would like to see financial assurance as part of license requirements, but NRC regulations are not currently set up for this. Illinois has a good model of financial assurance so that taxpayers don't have to pay all costs. For Morocco, users pay for conditioning and transportation. For orphans, CNESTEN pays. When an orphan is found, the finder must report to CNESTEN, which checks it to see whether it was registered. If the owner is not known, CNESTEN manages the source. Funding responsibility should be with the user, but some provision must be made for the case where user doesn't have funds.
7. Problem of Ra sources in Africa – this is being addressed by conditioning missions by IAEA teams such as the team from NECSA. But for sealed sources in Africa, especially Ra-226 and Cs-137, disposal is the only sustainable solution.
8. For Mr. Pruesse – Q. Where had a country declared a sealed source as a waste with intention to dispose? A. Gamma also recycles smoke detector sources for Am-241 in a new facility by chemical processing. Many public facilities are interested, and some had already declared this material as waste, so they are now trying to figure out how to re-designate the sources. If there is no re-use solution, materials remain designated as material. Sometimes, the main obstacle is in the law.
9. For international recoveries, OSRP faces problems with expired Special Form Capsule (SFC) certifications. A. Some sources are really old, especially well-logging sources. OSRP can make a 20 Ci Am-241 source special form and recover it. During a recent experience in India, workers were afraid to even look at sources. The special form capsule (SFC) is important – OSRP has a Nuclear Regulatory Commission domestic certificate and a DOT international Certificate of Competent Authority (CoCA).
10. For Zarling - Q. Morocco has more than 12 Troxler (US) gauges in possession – how can they ask for repatriation assistance? A. OSRP can help, but sources must be registered. In case of Troxler, that company will return the sources. Q. Do sources in Africa have to be consolidated, or can individual countries contact OSRP? A. Either way is fine.
11. Is there a national storage facility in your country for DSRS? If not, who is responsible for storing them and for how long? A. Egypt has storage for small sources (EAEA) and LLW disposal. Morocco – each user should have at least 20 m^2 of interim storage for RW including DSRS. CENSTEN is dedicated to storage of conditioned DSRS. France – user is not authorized to keep a DSRS, no national storage for DSRS, this is the responsibility of suppliers, and if there is not supplier, ANDRA stores. US – no national storage – this would be interim anyway, so US is working toward disposition, not storage. Germany – all 17 states have to offer to users the possibility to get rid of nuclear material (industrial and medical, not NPPs). Final storage is in the licensing process since 1976 – may be opened in 2019.