A HARD MONTH'S WORK IN MANILA
Securing Radioactive Sources

The sealed sources are slid through a passageway into a long term storage shield. The IAEA provided two of these shields for the Manila mission.
(Photo: P. Pavlicek/IAEA)

Security managers keep a watchful eye on spent radioactive sources. These disused sources, which served myriad purposes in medicine, industry and research, present a potential security threat; they could be obtained by terrorists to construct a dirty bomb. To ensure nuclear security and safety, it is essential to package, store and eventually dispose of these spent sources safely and securely.

In some cases, that is easier said than done. For instance, removing an old and highly radioactive source from a medical device is difficult and dangerous. Imagine doing this remotely, using manipulators, in temperatures of up to 35 degrees and over 20 times. This is exactly what the IAEA, together with the South African Nuclear Energy Corporation (Necsa), successfully achieved in March and April 2013 at the Philippine Nuclear Research Institute (PNRI) in Manila.

The mission was financed by the IAEA's Nuclear Security Fund, a voluntary fund established to contribute to support the implementation of nuclear security activities. Conceived by the IAEA and built by Necsa in 2007, the mobile equipment may be used by the IAEA under a special arrangement with Necsa up to three times a year. Over six weeks in Manila, under an IAEA project, Necsa managed to remove the cobalt and caesium sources from 16 old, teletherapy devices, which had been used to treat cancer patients, and place them into two long-term storage containers. Six other sources were so badly corroded that they could not be 'conditioned', despite the Necsa team's best efforts to extract the sources in an attempt to place them in the storage containers.

Such sources are classified for security and safety reasons as 'category 1', meaning they are considered the most dangerous because they can pose a very high risk to human health if not safely managed or securely protected.

"What's important about disused sources from a nuclear security perspective is that they are vulnerable to loss, abandonment, theft or misuse. In the worst case scenario such sources could be used by terrorists or other criminals in

a so-called 'dirty bomb' to spread radioactive material," said IAEA Radioactive Source Security Officer, Christina George.

Speaking in Manila, George said: "What we're doing here is a process known as 'conditioning'. Conditioning means that the sources are prepared to be isolated from the environment and from weather conditions and are secured against loss and theft. If this is not done, the source may be lost and later found by an unauthorized person and misused."

She added that once the sources have been removed and stored in the new and more secure shields, it reduces the likelihood they can be stolen or misused. "These shields have inherent security features. The sources are welded into capsules, which are then placed in the storage shield. The storage shield is bolted, covered by a metal container and an additional cage sits over them," said George.

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"A hot cell is a shielded radiation chamber," explained George, adding, "It's called 'hot' because the material handled inside the hot cell is highly radioactive."

"The people responsible for the operation therefore need to be protected from the radiation emitted by the sources they remove. So they stand outside the hot cell and operate the equipment inside remotely, using special manipulators. Similar to how you see a joystick being used in a video game."

The Necsa team observes the action within the hot cell via a shielded viewing window or a monitor outside of the cell, where live images captured by a camera inside the cell are displayed.

During a conditioning operation each device is lifted into the hot cell using a crane. The drawer within the device where the source is stored is extracted and the cap covering the source is removed — this step alone can take up to two hours.

Once the source is removed, it gets placed into a capsule within the hot cell. This is welded, checked to ensure it is airtight and then slid through a passageway into the long term storage shield.

Necsa's project manager, Leo Hordijk, said the Philippine operation was more difficult than previous hot cell missions: "Due to the conditions in which these devices have been stored over many years and the humidity in this country, around 80 per cent of them are badly corroded. This makes the mission more technically challenging since it's even harder to remove the sources and this has caused quite a lot of delay."

He added that a further challenge comes from the wide variety of devices being used in each country: "We need a different approach for each device and some have no design documents. We aim to do two a day, but sometimes need two days to condition just one source."

The radioactive waste storage facility at the PNRI is the only storage option for radioactive waste and disused sources in the whole of the Philippines. Out-of-use radiotherapy equipment has been coming to the facility for storage since the early 1970s. Editha Marcelo, head of the PNRI's Radiation Protection Services Section, said: "We're so pleased that this operation is finally taking place. It's been in preparation for around five years."

"These disused teletherapy heads were taking up so much space and now there's more room to receive more radioactive waste. This process also ensures that the public and the environment are protected from these radioactive sources."

Eventually, the institute hopes to move the radioactive sources to a new final disposal site in the north of the country. The IAEA, through a technical cooperation project is helping the institute to locate a suitable site for this kind of facility.

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