IAEA Addresses Global Radioisotope Shortage

On November 6, the International Atomic Energy Agency (IAEA) released a collection of recommended practices for research reactor operators intended to avert the possibility of a future "global medical emergency" such as that caused by recent unscheduled downtime in European and Canadian reactors. Noting the limited number of aging reactors and increasing worldwide demand, the IAEA publication, titled *Optimization of Research Reactor Availability and Reliability*, focuses on an array of operational management areas, including risk-informed maintenance and planning, configuration management, communication and operating experience, and corrective action management. The publication draws on the experience of 12 reactor operators and institutions of different sizes and various geographical locations.

"The reliance on a limited number of research reactors and, specifically, the age of these reactors is closely linked to the issue of the global shortage of medical isotopes and could lead to serious consequences," said Ed Bradley, a nuclear engineer from the IAEA Research Reactors Group in the Division of Nuclear Fuel Cycle and Waste Technology who was the lead developer of the IAEA report. "No new isotope production facilities have been commissioned for several decades, and it will take time before new reactors start producing isotopes. Modifications to currently operating facilities are also being developed, but these will also take some time to fully implement. This issue will remain with us for several years to come. At the IAEA, we gathered recommended practices directly from research reactor operators with demonstrated performance excellence. Our aim was to make sure that practical advice is made available to operators to help ensure facilities operate to produce medical isotopes as required."

Two-thirds of the world's research reactors are more than 40 y old. Only 5 of these reactors account for almost the entire worldwide production of ^{99}Mo, from which ^{99m}Tc, the most commonly used nuclear medicine radioisotope, is fabricated. These facilities are the High Flux reactor (Petten, The Netherlands); BR2 (Mol, Belgium); Osiris (Saclay, France); National Research Universal reactor (Chalk River, Canada); and the Safari-1 (Pelindaba, South Africa). These facilities range in age from 42 to 51 y. A sixth reactor, Australia's recently constructed OPAL at Lucas Heights, is expected to begin ^{99}Mo production soon. The 2 MAPLE research reactors at Chalk River—each dedicated to isotope production and expected to produce enough molybdenum to account for the bulk of global supply—were recently canceled as a result of technical challenges.

Several countries, including the United States, have expressed interest in building more modern research reactors and exploring alternative isotope production methods. However, 10 or more y may be required before a new reactor can be planned, approved, built, and become operational. Projects to initiate molybdenum production from an existing facility not originally conceived for that purpose can also take 5 or more y to become operational, depending on available equipment and facilities at the reactor site, according to an IAEA press release accompanying the report.

The objective of the IAEA report and related efforts is to identify management system attributes and good practices supporting optimal research reactor availability and reliability. The practices of interest are generally within the direct control of the research reactor operation and maintenance organization. A supporting aim is to initiate a discussion about availability and reliability issues involving key international stakeholders representing organizations committed to improving research reactor operational performance. Included in the 70-page document are materials on customer relations and public information, templates and forms for maintenance and operations management, design considerations, human resource topics, continuous improvement strategies, and performance monitoring. The report was developed over the course of 2 meetings in 2006 and 2007. Participants included operation and maintenance managers representing heavily utilized facilities with demonstrated operation and maintenance performance excellence. The full IAEA report is available at: http://www-pub.iaea.org/MTCD/publications/PDF/Pub1338_web.pdf.

The IAEA report was released at the same time that announcements were made by several radioisotope-producing agencies about the status of current and future production. On the same day that the IAEA released its report, Belgium's nuclear regulator announced the go-ahead for production of ^{131}I, ^{133}Xe, ^{90}Y, and ^{188}Re as well as limited amounts of ^{99}Mo/^{99m}Tc at the Institute of Radioelements at Fleurus. The facility had been inoperative since an unexpected release of 45 GBq of ^{131}I in August 2008. The extended outage compounded the global shortage of materials for nuclear medicine and therapy caused by unexpected downtime at other reactors.

In Petten (The Netherlands), the Nuclear Research and Consultancy Group continued to project that its High Flux Reactor will restart on February 16. The Petten reactor, which contributes between 30% and 40% of the worldwide supply of radioisotopes, has been out of service since August 2008.

On November 17, TRIUMF (Canada's National Laboratory for Particle and Nuclear Physics; Vancouver) released a report proposing the use of photo-fission to produce select medical isotopes without using weapons-grade uranium or nuclear reactors (see full story in Newsline Newsbriefs, p. 20N).

International Atomic Energy Agency