Isotope Production and Distribution Program Fund

Overview

The Department of Energy's Isotope Program produces and sells radioactive and stable isotopes, byproducts, surplus materials, and related isotope services world-wide and operates under a revolving fund established by the 1990 Energy and Water Development Appropriations Act (Public Law 101–101), as amended by the 1995 Energy and Water Development Appropriations Act (Public Law 103–316). The combination of an annual direct appropriation and collections from isotope sales are deposited in the Isotope Production and Distribution Program Fund; both are needed to maintain the Isotope Program's viability. This revolving fund allows continuous and smooth operations of isotope production, sales, and distribution independent of the federal budget cycle and fluctuating sales revenue. An independent cost review of the fund's revenues and expenses is conducted annually.

The annual appropriation is requested as Isotope Development and Production for Research and Applications in the Office of Science Nuclear Physics program. Appropriated funds are used to maintain mission-readiness of facilities by supporting the core scientists and engineers needed to carry out the Isotope Program and the maintenance of isotope facilities to assure reliable production. In addition, the appropriation provides support for R&D activities associated with development of new production and processing techniques for isotopes, production of research isotopes, and training of new personnel in isotope production. Each site's production expenses for processing and distributing isotopes are offset by revenue generated from sales. About 80 percent of the resources in the revolving fund are used for operations, maintenance, isotope production, and R&D for new isotope production techniques, with approximately 20 percent available for process improvements, unanticipated changes in volume, and purchases of small capital equipment, such as assay equipment and shipping containers needed to ensure on-time deliveries.

The Department has supplied isotopes and related services to the Nation since the Atomic Energy Act of 1954 specified the role of the U.S. Government in isotope distribution. Substantial national and international scientific, medical, and research infrastructure relies upon the use of isotopes and is strongly dependent on the Department's products and services. Isotopes are now used for hundreds of applications that benefit society every day, such as diagnostic medical imaging, cancer therapy, smoke detectors, neutron detectors for homeland security applications, explosives detection, oil exploration, and tracers for climate-related research. For example, radioisotopes are used in the diagnosis or treatment of about one-third of all patients admitted to hospitals.[a] More than 17 million Americans undergo nuclear medicine procedures each year for a variety of conditions, including cancer, cardiovascular disease, neurological conditions, and other physiological problems.[b] Such nuclear procedures are among the safest and most effective diagnostic tests available and enhance patient care by avoiding exploratory surgery and other invasive procedures. The Isotope Program continuously assesses isotope needs to inform program direction; for example, in FY 2014, the Isotope Program organized its third annual Federal workshop to assess stakeholder requirements in order to optimize the utilization of resources and assure the greatest availability of isotopes.

Isotopes are primarily produced and processed at three facilities stewarded by the Isotope Program: the Brookhaven Linac Isotope Producer (BLIP) and associated processing labs at Brookhaven National Laboratory (BNL), the Isotope Production Facility (IPF) and associated processing labs at Los Alamos National Laboratory (LANL), and processing facilities at Oak Ridge National Laboratory (ORNL). In addition, production and distribution activities are supported at the Advanced Test Reactor (ATR) at Idaho National Laboratory, the High Flux Isotope Reactor (HFIR) at ORNL, Pacific Northwest National Laboratory, the Y-12 National Security Complex, and the Savannah River Site. IPF and BLIP provide accelerator production capabilities, while HFIR and ATR provide reactor production capability. HFIR has the highest neutron flux available for isotope production in the United States. The Isotope Program is broadening capability by including university-supported accelerator and reactor facilities used for research, education, and isotope production that can provide cost-effective and unique production

[a] http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/med-use-radioactive-materials.html
[b] http://www.snmmi.org/NewsPublications/NewsDetail.aspx?ItemNumber=9953

capabilities, including facilities at the University of Washington, Duke University, Washington University, Texas A&M University, the University of California at Davis, and the Missouri University Research Reactor. Most of these facilities reside in university medical departments.

In FY 2014, a total of $59.7 million was deposited in the revolving fund in FY 2014. This consisted of $19.4 million of direct FY 2014 appropriations from the Nuclear Physics program, plus collections of $40.3 million to recover costs related to isotope production and isotope services. Collections in FY 2014 included sales of californium-252, helium-3, selenium-75, and strontium-82. Californium-252 has a variety of industrial applications; helium-3 is used in neutron detectors for national security; selenium-75 is used as a radiography source; and strontium-82 has gained world-wide acceptance for use in heart imaging. In FY 2014, the Isotope Program served 137 customers including major pharmaceutical companies, industrial users, and researchers at hospitals, national laboratories, other Federal agencies, universities, and private companies, with the sale of 190 different radioactive and stable isotopes. Among the isotopes produced, seven were high-volume, moderately priced isotopes; the remaining were low-volume research isotopes, which are more expensive to produce. Commercial isotopes are priced to recover full cost or the market price, whichever is higher.

Program Accomplishments

Production of lead-212 to support medical research. Lead-212 and its radioactive decay product bismuth-212 are being used in research to develop pharmaceuticals for treating cancer. The approach is to use biomolecules for targeted delivery of these isotopes to cancer cells; the alpha particles generated by radioactive decay of these isotopes are highly effective in killing cancer cells while sparing nearby healthy cells due to the short distance traveled by alpha particles in vivo. Successful development of such pharmaceuticals would offer more effective treatment of cancers with fewer side effects relative to conventional therapies. Lead-212 became unavailable in June 2013 due to the termination of production by the sole U.S. supplier, so the Office of Nuclear Physics' Isotope Program established production capability at the Oak Ridge National Laboratory and now supplies lead-212 to medical researchers.

Highlights of the FY 2016 Budget Request

For FY 2016, the Department foresees moderate growth in isotope demand. Revolving fund resources will be used to support efforts to increase radioisotope production capabilities and availability, including the re-establishment of a Federal stable isotope enrichment capability as recommended by the Nuclear Science Advisory Committee. The U.S. government has not had an isotope enrichment capability since 1998. Since that time, inventories of some enriched stable isotopes have been depleted, forcing researchers to rely upon uncertain international supplies. Developing a U.S. enrichment capability at ORNL will assure the supply of enriched stable isotopes to researchers as well as assuring a domestic supply of enriched stable isotopes needed for national security applications. Investments in infrastructure and equipment will increase radioisotope production capabilities to meet demand, and include the development of higher power isotope production targets for IPF and a system to more effectively utilize the proton beam at BLIP.