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. It operates under a revolving fund, the Isotope Production and Distribution Program 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). Funding for the Isotope Production and Distribution Program Fund is provided by the combination of an annual appropriation from the Isotope Development and Production for Research and Applications subprogram within the Nuclear Physics (NP) program in the Science appropriation account, and collections from isotope sales; 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 in NP funds a payment into the revolving fund 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, appropriated funds provide support for research and development (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 supplies isotopes and related services to the Nation under the authority of the Atomic Energy Act of 1954, which specifies 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 November 2015, the Isotope Program organized its fourth 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 2015, a total of $52.65 million was deposited in the revolving fund. This consisted of the FY 2015 appropriation of $19.85 million paid into the revolving fund from the Nuclear Physics program, plus collections of $32.80 million to recover costs related to isotope production and isotope services. Collections in FY 2015 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 2015, the Isotope Program served more than 140 customers including major pharmaceutical companies, industrial users, and researchers at hospitals, national laboratories, other Federal agencies, universities, and private companies, with the sale of more than 170 different radioactive and stable isotopes. Among the isotopes produced, seven are high-volume, moderately priced isotopes; the remaining are 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 high purity cobalt-60 to support cancer therapy. High purity cobalt-60 is necessary for surgical devices that can treat cancers—in some cases, inoperable tumors—in a less debilitating and more effective manner than alternative treatments. Such devices use high purity cobalt-60 sources to generate highly focused gamma-ray beams for the destruction of tumors with surgical precision without invasive open surgery. The precision of this technique facilitates the eradication of tumor cells while sparing surrounding healthy tissue. In response to the failure of a cobalt-60 production target at the Idaho National Laboratory (INL) that brought cobalt-60 production to a halt in 2012, a team of scientists and engineers from INL and the Oak Ridge National Laboratory designed a robust production target that can be used to resume production with the level of safety and reliability necessary for Department of Energy research reactors. In addition to increased safety and reliability, the new target design also increases production in each target, resulting in more cost-effective production of cobalt-60. Targets of the new design were placed in the Advanced Test Reactor at INL in FY 2015, alleviating a concern about the unavailability of high purity cobalt-60 that could impact the treatment of thousands of cancer patients.

Establishing a lithium-7 reserve and providing emergency supply for nuclear power plant operations. Many of the nation's nuclear power plants require high-enrichment lithium-7 hydroxide to maintain proper chemical conditions in reactor coolant systems. Domestic nuclear utilities are completely reliant upon foreign producers and imports to meet their needs. Owing to concerns about this supply chain, the DOE Isotope Program worked with NNSA to set aside a reserve of legacy Li-7 and is now processing that material at the Y-12 National Security Complex so DOE can mitigate potential domestic supply emergencies. Purification processing commenced in FY 2015.

Highlights of the FY 2017 Budget Request

For FY 2017, the Department foresees moderate growth in isotope demand. The portfolio of the isotope program continues to grow as isotope availability is increased by the program to meet rising demands. Revolving fund resources will be used to support efforts to produce isotopes, increase radioisotope production capabilities and availability to meet demand, and upgrade proton beamline equipment at IPF to enhance the reliability of facility operations. Since FY 2009, investments have been made in R&D associated with 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. The R&D effort to develop stable isotope separation technology at ORNL is on track for completion in FY 2016 with a prototype capability to produce small research quantities of enriched stable isotopes starting in FY 2017. Building upon this R&D capability, funding to initiate the Stable Isotope Production Facility Major Item of Equipment is proposed in FY 2017 in the Nuclear Physics budget. The Facility will provide a cost-effective domestic capability for production of enriched stable isotopes.[a] This will help mitigate dependence of the U.S. on foreign suppliers.

[a] See the Science/Nuclear Physics chapter for more information.