

## **Isotope Production and Distribution Program Fund**

### **Program 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 Appropriations Act (Public Law 101-101), as modified by Public Law 103-316. The combination of an annual direct appropriation and cash collections/advance payments from isotope sales are deposited in the Isotope Production and Distribution Program Fund, the revolving fund. This revolving fund allows continuous and smooth operations of isotope production, sales, and distribution when there are fluctuations in the federal budget cycle and sales. The fund's revenues and expenses are audited annually consistent with Government Auditing Standards and other relevant laws, such as the Chief Financial Officers Act of 1990 and the Government Performance and Results Act of 1993.

The Program's fiscal year appropriation is received via transfer from the Office of Science's Nuclear Physics program (see the Isotope Development and Production for Research and Applications section of the Nuclear Physics program within the Office of Science appropriation). Appropriated funds are used to support the scientists and engineers needed to carry out the Isotope Program and to operate and maintain isotope facilities to assure reliable production. In addition, the appropriation provides support for R&D activities associated with the development of new production and processing techniques for isotopes, operations support for the production of research isotopes, and support for the training of new personnel in isotope production and development. Each of the sites' production expenses for processing and distributing isotopes is offset by revenue generated from sales. The combination of appropriated funds and sales from revenue maintain the financial viability of the program. Of the total resources available annually in the revolving fund, about 75 percent is used for operations, maintenance, and isotope production, with roughly 25 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.

Isotopes are currently produced and processed at three facilities which are stewarded by the Isotope Program: the Isotope Production Facility at Los Alamos National Laboratory, the Brookhaven Linac Isotope Production Facility at Brookhaven National Laboratory, and processing facilities at Oak Ridge National Laboratory. In addition, the Isotope Program is planning to use the recently installed hydraulic tube at the Advanced Test Reactor at the Idaho National Laboratory for radioisotope production. This upgrade will provide additional capability to produce short-lived medical and scientific research isotopes in short supply. At the Pacific Northwest National Laboratory (PNNL), the isotope program will continue to distribute strontium-90, a byproduct material of the past weapons programs, and will consider processing other byproduct material stored at PNNL. Starting in FY 2010, the Isotope Program will increase productivity by broadening its suite of facilities to include university accelerator and reactor facilities and other Federal agency facilities which can provide cost-effective and unique capabilities; these include cyclotron facilities at the National Institutes of Health, the Washington University cyclotron, the University of California at Davis cyclotron, and the Missouri University Research Reactor.

### **Background**

The Department has supplied isotopes and related services for more than 50 years. These isotope products and services are used by medical institutions, universities, research organizations, and industry for a wide array of uses and applications. Isotopes are also provided to many Federal agencies, either

directly or indirectly, including the National Institutes of Health and its grantees, the Environmental Protection Agency, and the Department of Homeland Security.

As the range of available isotopes and the recognized uses for them increased, new or improved isotope products contributed to progress in medical research and treatment, new industrial processes, and scientific investigation. Substantial national and international infrastructure has been built around the use of isotopes and is dependent on the Department's products and services. Isotopes are now used for hundreds of research, biomedical, homeland security, and industrial applications that benefit society every day, including heart imaging, cancer therapy, smoke detectors, neutron detectors, explosives detection, oil exploration, and tracers for climate change.

Isotope applications are widely used in medical research, diagnosis, and therapies, which are a growing component of the U.S. health care system. It is estimated that the treatment of one in every three people at a hospital makes use of a radioisotope in laboratory tests, diagnoses, or therapy. Each day, over 40,000 medical patients receive nuclear medicine procedures in the United States. Such nuclear procedures are among the safest diagnostic tests available. They enhance patient care by avoiding exploratory surgery and similar procedures. For example, it has been demonstrated that the use of myocardial perfusion imaging in emergency room chest pain centers can reduce the duration of stay on average from 46 hours to 12 hours. Adequate supplies of medical and research isotopes are essential to the Nation's health care system and to basic research and industrial applications that contribute to national economic competitiveness.

Isotope uses in homeland security applications are also increasing and include radiation portal monitors used to find unshielded or lightly shielded radiological material, imaging systems used to find densely shielded material, systems to detect the presence of nitrogen-based chemical explosives, and other forms of explosives detection.

The total budgetary resources available in the revolving fund in FY 2009 were \$59.2 million. This consisted of \$24.8 million from the FY 2009 direct Nuclear Physics appropriation, \$14.8 million from the Recovery Act, and collections of \$19.6 million, which were used to cover expenses, support research into alternative production and processing techniques, and develop new production capabilities. Collections increase or decrease depending on customer demand, production efficiencies, and the availability of facilities. The collections for FY 2009 represent a modest increase over recent years, reflecting an increase in sales and production output due to californium-252, helium-3, and strontium-82. For example, the program received advance payments from californium-252 customers to ensure a long-term production capability of this critical isotope. Californium-252 has a variety of industrial and medical applications. Strontium-82 has gained world-wide acceptance for use in heart imaging which has resulted in increased sales over the last several years. Helium-3 sales also increased due to its use in neutron detectors. Sales are not static; they can fluctuate significantly on a monthly basis, presenting a challenge for managing a productive and optimized core staff.

In FY 2009, the Isotope Program served over 170 customers including major pharmaceutical companies, industrial users, and over a hundred researchers at hospitals, national laboratories, universities, and private companies. There are ten high-volume and low unit cost isotopes among the many produced by the Program; the remaining isotopes are low-volume research isotopes and thus more expensive to produce. Progress has been made in the past year in evaluating the pricing of isotopes in an effort to make research isotopes more affordable; these efforts are continuing. In FY 2010 and FY 2011, commercial isotopes will continue to be priced to recover full cost. Research isotopes will be provided at a reduced price that will provide reasonable compensation to the government while encouraging research and development. For example, some expenses that were paid traditionally by the researcher

are now being supported with appropriated funds, reducing the price of the research isotope to the customer. Improved communication with the user community and federal agencies has improved the ability to forecast demand of needed isotopes, which poises the Isotope Program to better meet the projected needs of the community, resulting in a more reliable supply of research isotopes.

Of the isotopes produced by the Isotopes Program, about 60% are for medical research and applications, 20% are for commercial use, and 20% are for other research. A total of about 570 shipments were made in FY 2009, of which 29% were foreign and 5% were intra-governmental, with the remainder being for other domestic needs. Customer satisfaction with product specifications continues to be high with 99.7% of products and services provided meeting the terms of the contract/sales order.

### **Selected FY 2009 Accomplishments**

- As a result of growing demand for selenium-75, a total of 30 targets irradiated in the High Flux Isotope Reactor, amounting to approximately 27,500 curies of high specific activity (about 6,500 curies per gram) selenium-75, were processed and shipped in FY 2009. This allowed the manufacturers to produce and distribute over 300 commercial gamma radiography sources for non-destructive quality testing applications. The source applications include quality verification of welds in oil and gas pipelines, pressure vessels (boilers), and shipbuilding.
- The Nuclear Physics program facilitated the formation of a federal working group on the helium-3 supply issue involving staff from Nuclear Physics, NNSA, the Department of Homeland Security, and the Department of Defense. This working group will ensure that the limited supply of helium-3 will be distributed to the highest priority applications and basic research. Helium-3 is used in neutron detectors for national security, nonproliferation, defense, border security, and homeland security applications.
- After many discussions with the californium-252 source manufacturers and users, and bottoms-up evaluation of the californium-252 costs associated with production, the Nuclear Physics program resolved production issues and a four-year contract was signed with the source manufacturers to continue californium-252 production and ensure its availability in the outyears. Californium-252 is used for medicine, research, nuclear fuels, mining and cement manufacturing, and homeland and national security. This isotope is available only in the U.S. and Russia.

### **Budget Overview**

For FY 2011 and the future, the Department foresees more than moderate growth in isotope demand, coupled with the possible need for new isotope products for homeland security, medicine, and industry. In order to satisfy the needs of its customers, the program seeks to meet supply requirements for year-round availability of isotopes for scientific and medical research and, in particular, for human clinical trials. The program's production capability may be called upon for initial ramp-up of production of major new isotope products until market forces bring in private producers that are willing to invest and produce the needed isotopes.