The National Isotope Development Center and
The Isotope Production and Applications,
DOE-NP

American Nuclear Society
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Isotope Production and Applications
Office of Science, U.S. Department of Energy
The mission of the DOE Isotope Program is threefold:

- Produce and distribute radioactive and stable isotopes that are in short supply, associated byproducts, surplus materials and related isotope services.

- Maintain the infrastructure required to produce and supply isotope products and related services.

- Conduct R&D on new and improved isotope production and processing techniques.
The isotope program was created by Congress in the late 1980s to consolidate isotope production activity in DOE.

The program was located in the Office of Nuclear Energy with funding from a revolving fund amounting to one year’s sales.

Ironically, most of the production facilities utilized by the program were outside NE.

In FY2009, the program was moved from Office of Nuclear Energy to the Office of Science Nuclear Physics program.

Better alignment with production labs was achieved – BNL, ORNL, PNNL are OSc labs.

LANL (NNSA) and INL (NE) maintain participation in the program.

NP had traditionally supported a mix of lab-based and university-based facilities.
The program was re-christened the National Isotope Production and Applications Program.

A clear revision of its focus was adopted.

The program will be run from HQ.

Issues of substance will be conducted “Fed to Fed”.

Peer review will be utilized.

Funds to support SBIR are now available.
Isotopes for the Nation’s Future - A Long Range Plan

- Maintain a dialogue with all interested federal agencies and commercial isotope customers to forecast and match realistic isotope demand and achievable production capabilities.
- Coordinate production capabilities and supporting research to facilitate networking among existing DOE, commercial, and academic facilities.
- Support a sustained research program in the base budget to enhance the capabilities of the isotope program in the production and supply of isotopes generated from reactors, accelerators, and separators.
- Invest in workforce development in a multipronged approach, reaching out to students, post-doctoral fellows, and faculty through professional training, curriculum development, and meeting/workshop participation.
- Devise processes for the isotope program to better communicate with users, researchers, customers, students, and the public and to seek advice from experts:
  - Encourage the use of isotopes for research through reliable availability at affordable prices.
  - Increase the robustness and agility of isotope transportation both nationally and internationally.
- Construct and operate an electromagnetic isotope separator facility
- Construct and operate a variable-energy, high-current, multi-particle accelerator and supporting facilities that have the primary mission of isotope production.
Compelling Research Opportunities using Isotopes

- Invest in new production approaches of alpha-emitting radionuclides, e.g. Ac-225, At-211.
- Invest in coordination of production capabilities and supporting research.
- Produce isotopes of the heavy elements, e.g. Cf, Ra, TRU.
- Focused study and R&D on new or increased production of He-3.
- Re-establish domestic production and supply of stable isotopes.
- Robust investment into education and training.
As part of the move, NIDC was set up. NIDC is responsible for five activities:

- Identify and provide expert support for IPA activity
- Manage the Isotope Business Office at ORNL
- Oversee production scheduling
- Oversee shipping and distribution
- Communications
  - Website
  - Newsletter
  - IPA booth
  - Customer interactions
Examples of the engagement of expert resources

- Identify participants for peer review activity
- Accelerator production on new products for the portfolio
- Engage experts on reactor production on new products for the portfolio
- Engage experts on enrichment technology for re-instituted program
- Identify experts to advise on issues related to QC and QA

- Calibration
- Assessing production
- Drug Manufacturing Files
- Good Manufacturing Practice
- ISO 9000
Production Planning

- Align production capability and demand
  - Assess capabilities of sites
  - Review operating schedule vs delivery dates
  - Determine most cost effective option
  - Work with customer to determine specifications for material
  - Monitor operating schedule
  - Revise any production plan if necessary
Current Isotope Production Sites used by the DOE Isotope Program

**Brookhaven – BLIP:**
- Ge-68 – Calibration sources for PET equipment; Antibody labeling
- Sr-82 – Rb-82 gen used in cardiac imaging
- Cu-67 – Antibody label for targeted cancer therapy

**Richland:**
- Sr-90 – Y-90 gen for cancer therapy

**Idaho – ATR:**
- Co-60 – Sterilization of surgical equipment and blood

**Los Alamos – LANSCE/IPF:**
- Ge-68 – Calibration sources for PET equipment; Antibody labeling
- Sr-82 – Rb-82 gen used in cardiac imaging
- As-73 – Biomedical tracer

**Oak Ridge – HFIR:**
- Se-75 – Industrial NDA; Protein studies
- Cf-252 – Industrial source
- W-188 – Cancer therapy

**Stable Isotopes Inventory:**
Top 10 stable isotopes sold over the last 5 years:
- Ca-48, Ga-69, Rb-87, Cl-37, Pt-195, Nd-146, Sm-149, Ru-99, Zr-96

**Inventory:**
- Ac-225 – Cancer therapy

**Savannah River – Tritium Facility:**
- He-3 – Neutron detection
- – Fuel source for fusion reactors
- – Lung testing
**Additional Production Sites Integrated in the DOE Isotope Program**

- **Richland:** Sr-90 – Y-90 gen for cancer therapy
- **Idaho – ATR:** Co-60 – Sterilization of surgical equipment and blood
- **Brookhaven – BLIP:** Ge-68 – Calibration sources for PET equipment; Antibody labeling
  Sr-82 – Rb-82 gen used in cardiac imaging
  Cu-67 – Antibody label for targeted cancer therapy
- **Columbia – MURR:** Collaborative supplier for research isotopes (e.g. As-72)
- **Washington Univ:** Collaborative supplier for research isotopes (e.g. Cu-64)
- **NIH - Cyclotrons:** Collaborative supplier for research isotopes (e.g. Br-76)
- **Savannah River – Tritium Facility:** He-3 – Neutron detection
  – Fuel source for fusion reactors
  – Lung testing
- **UC Davis/McClellan:** Collaborative supplier for research isotopes (e.g. At-211)
- **Univ. of Washington At-211 (future)**
- **Los Alamos – LANSCE/IPF:** Ge-68 – Calibration sources for PET equipment; Antibody labeling
  Sr-82 – Rb-82 gen used in cardiac imaging
  As-73 – Biomedical tracer
- **Univ. of Washington At-211 (future)**
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Shipping and Distribution

- Provide oversight for the entire program
- Monitor incoming shipments from external production sites
- Track location and movement of shipping containers
  - Type B
- Monitor shipments from production sites to customers
- Interact with freight companies, customs agents, and others to expedite material movement
Communications

- Website will be updated
  - Searchable by isotope or element
  - Linked to IBO to facilitate inquiry on price and schedule
  - Also provide archive of newsletters and other communications

- Re-establish Newsletter

- Point of Contact for customers

- Staff booth at SNM, ACS and other meetings

- Act to inform both the stakeholders and DOE mgmt on developments related to isotope use
Recent developments

- **Re-establish Cf-252 Production**
  - Used for Well logging sources in oil exploration
  - Serves as ion source for CARIBU accelerator at Argonne National Laboratory
  - Byproduct of production is Bk-249
    - Used to demonstrate existence of Element 117

- **Reviewing needs for the Heavy Element research community**
  - Needs for higher Z 5f elements
  - Feedstock for neutron irradiations
  - Continue to support research on “Island of Stability”

- **Balance competing programs at HFIR**
  - Primary mission is neutron scattering
  - Need for long irradiations at high flux for efficient production
Recent developments

- **He-3 supply**
  - Product of decay of H-3
  - Reduction in weapons inventory -> reduction in He-3 supply
  - Variety of uses
    - Neutron detectors
    - Medical imaging
    - Low temperature physics
  - Homeland security issue
    - Superior performance for neutron detection
    - Need to re-engineer existing monitor systems
  - Examining other supply options
    - Expand H-3 production
    - Mine heavy water reactor coolant
    - He-4 separation
Recent developments

- Am-241 supply
- Need to expand production
- Unstable foreign supplies
- Multiple uses
  - AmBe neutron source
  - Smoke detectors
  - Fluorescence systems
- Proposed path forward
  - Recycle AmBe sources that are reduced in size to < 16 Ci
  - Separate Am-241 from Pu stocks
Office of Nuclear Physics Isotope Production and Applications

National Isotope Data Center Organization

NIDC
Robert Atcher, Director

Isotope Research and Development

Production Coordination
Wolfgang Runde, Assoc. Director

Business Office
Assoc Director, TBN

Transportation and Distribution

Community Outreach

Isotope Production Site Managers at Labs and Universities

- Assess, archive, and distribute R&D information such as: processing enhancements, target development/design/material, nuclear cross section data, irradiation reactions, and environmental/safety concerns
- Production coordination and schedules at DOE labs, universities, private producers
- Quotations
- Contracts
- Invoicing
- Referrals
- Containers
- Export
- Licensing
- Shipping schedules
- Website
- Academic programs
- Newsletters
- Society meetings/conferences
- Accomplishments
- Liaison with user community
Job Opening

- Isotope Business Office at ORNL
  - Isotope Technical Manager
  - Minimum of BS degree in technical discipline; Business background essential – MBA preferred
  - Manage business requirements for technical contracts
  - Assist in developing contract terms, technical spec’s with customers, NIDC staff and HQ
  - Technical assistance for transportation, packaging, rad license verification, export control, etc
  - Act as IBO manager as needed
  - **Must be able to obtain a security clearance at the Q (Top Secret) level**
  - Job Posting **50247059**
Contact information

- **National Isotope Development Center**
  - Robert Atcher, Director
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    - 505-663 5596
  - Isotope Business Office
    - ORNL based activity
    - Supplies stable enriched and radioactive isotopes
    - Mitch Ferren, Assoc. Director
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