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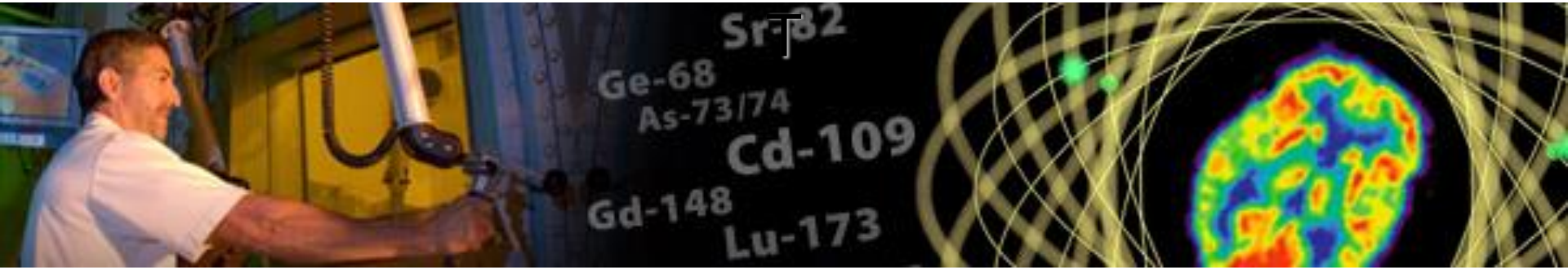
OFFICE OF SCIENCE

Office of Nuclear Physics SBIR/STTR Exchange Meeting



The DOE Isotope Program and Facilities and the SBIR/STTR Program
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Office of Nuclear Physics, Office of Science, U.S. Department of Energy

Outline

- Background
- Applications, Products, and Services
- Facilities and Capabilities
- Isotope Program Development and Areas of Overlap with SBIR/STTR

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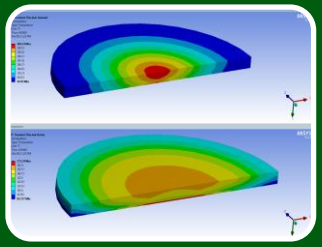
DOE Isotope Program Mission

Produce and/or distribute radioactive and stable isotopes that are in short supply; includes by-products, surplus materials and related isotope services

Maintain the infrastructure required to produce and supply priority isotope products and related service



Conduct R&D on new and improved isotope production and processing techniques which can make available priority isotopes for research and application. Develop workforce.

Produce isotopes that are in short supply only – we do not compete with industry
Mitigation of U.S. reliance on foreign supplies of isotopes is a priority

Isotope Program Authority, Resources, Goals

- Public Law 101-101 (1990), as modified by Public Law 103-316 (1995) created the Isotope Production and Distribution Program Fund (called a revolving fund) and **allow prices charged to be based on costs of production, market value, U.S. research needs and other factors**.

- **Isotope Program in DOE has sole governmental authority to produce isotopes for sale and distribution** – labs may not embark on isotope production on their own.

- Program costs are financed by two resources: appropriation and revenue.
  - Appropriation supports mission readiness and R&D program
  - Revenue supports production and distribution of isotope

- We try to understand and anticipate isotope demand for federal missions, research and U.S. industry
  - **Increase availability of isotopes in short supply**
  - **Mitigate potential shortages**
  - **Develop new production and processing techniques of isotopes currently unavailable**
  - **Reduce U.S. dependencies on foreign supply**
  - **We are prepared to make investments on behalf of research, medicine, & industry**
    - **Annual Federal Isotope Needs Surveys and interacting with POC's**

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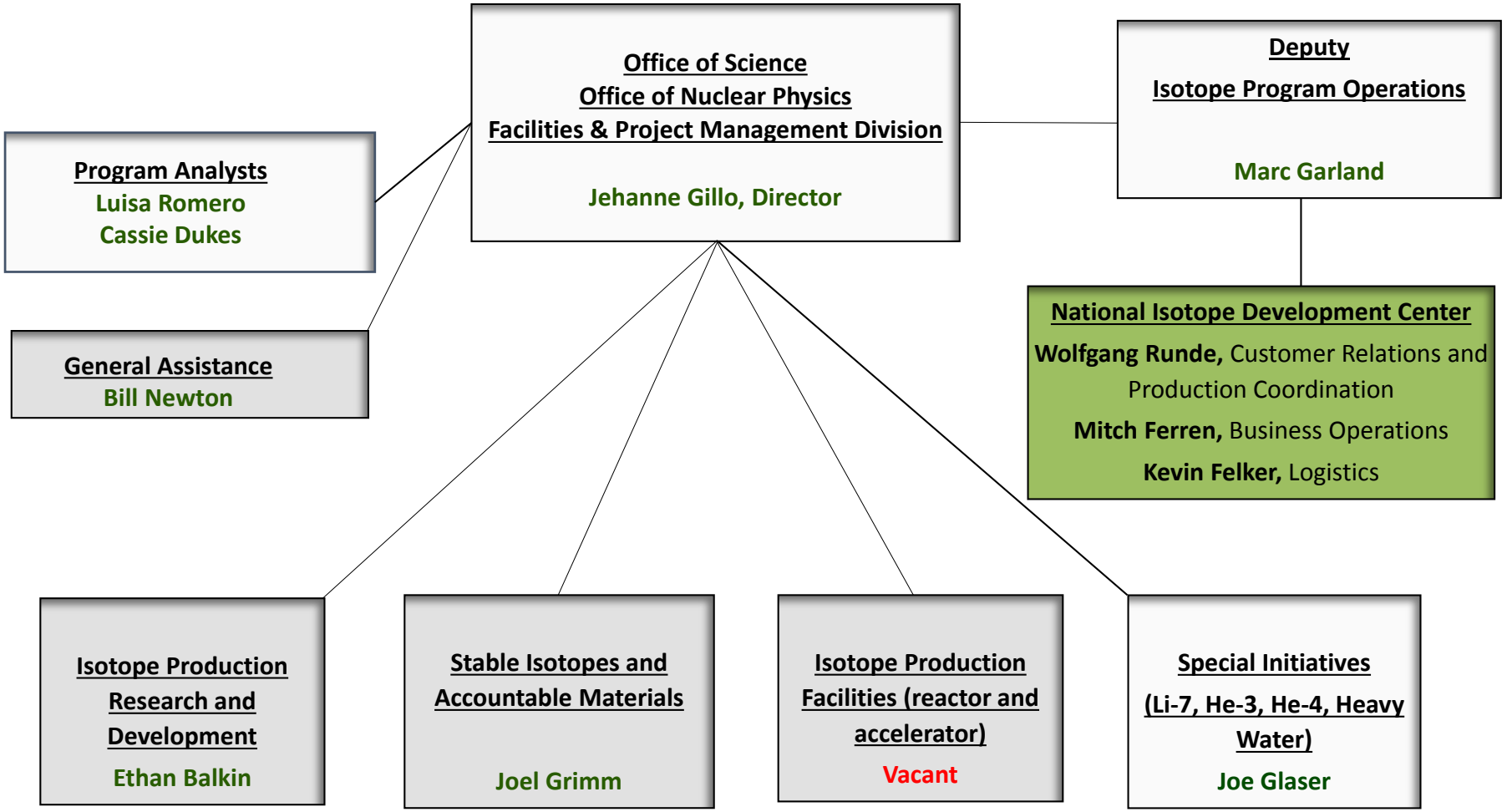
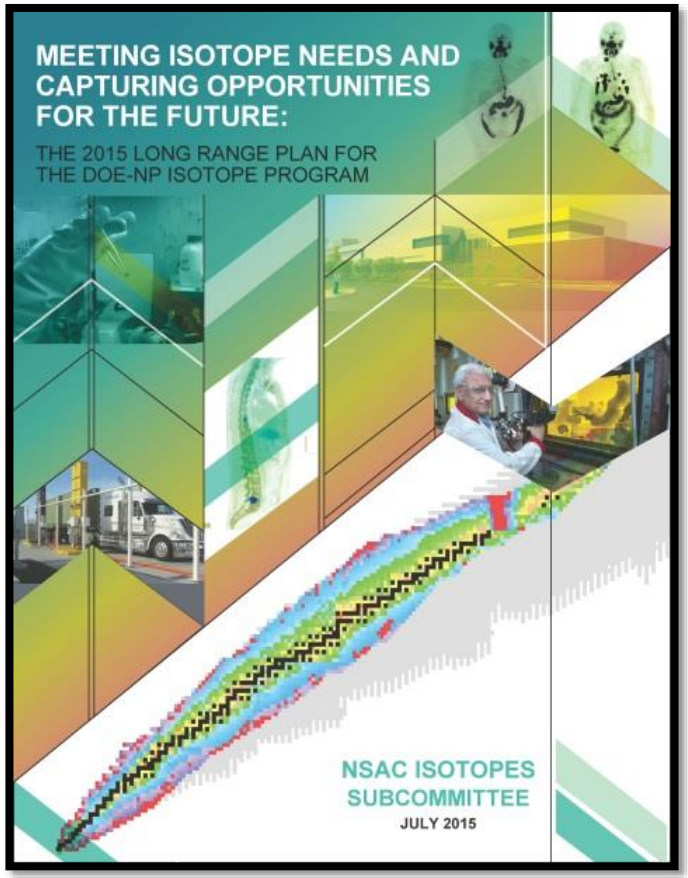
DOE Isotope Program Organization



Guided by NSAC Report released July 20, 2015

Recommendations: *All in Progress*

- Significant increase in R&D funding
  - Continue R&D on alpha-emitters (Ac-225, At-211)
  - High specific activity theranostic isotopes
  - Electron accelerators for isotope production
  - Irradiation materials for targets
- Complete stable isotope capability
- Increase in infrastructure investments and operating base
  - Isotope harvesting at FRIB
  - Separator for radioactive isotopes
    - DOE to host meetings in the new year; focus on additional mission needs
    - Several programs looking at actinide EMIS
    - Potential needs for medical and research isotopes
  - BLIP intensity upgrade and second target station
  - IPF intensity, stability and energy upgrades
- Continue integration of university facilities



https://science.energy.gov/~/media/np/nsac/pdf/docs/2015/2015_NSACI_Report_to_NSAC_Final.pdf

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National Isotope Development Center
http://www.isotopes.gov

- The DOE NIDC coordinates the distribution of all DOE isotope products and services for the DOE IP.
- All contractual discussions with customers.
- Responsibilities in transportation, Q&A, public relations (website, newsletter, booth), cross-cutting technical topics, marketing strategy and
- Receive updates and request quotes for products.

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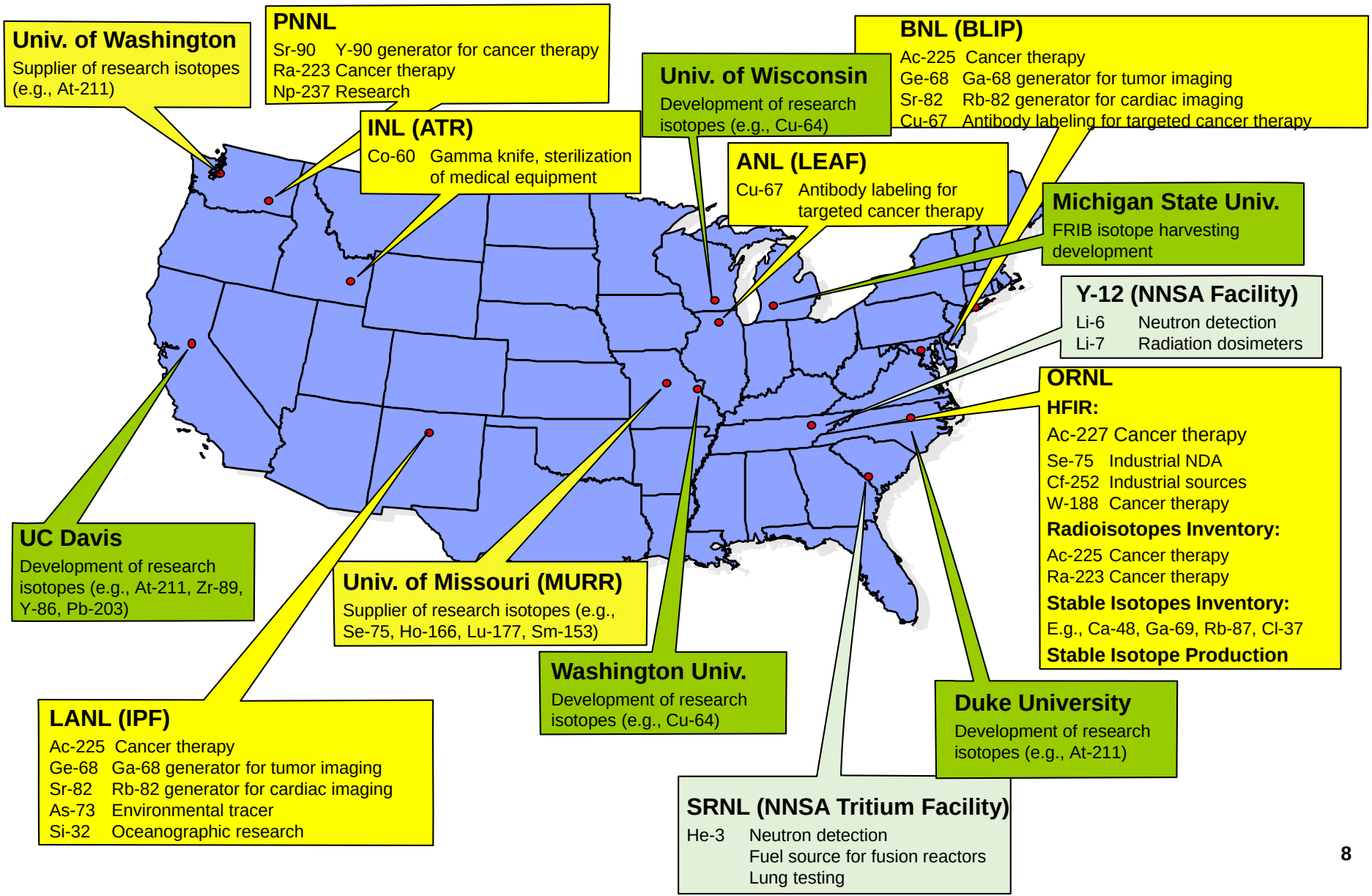
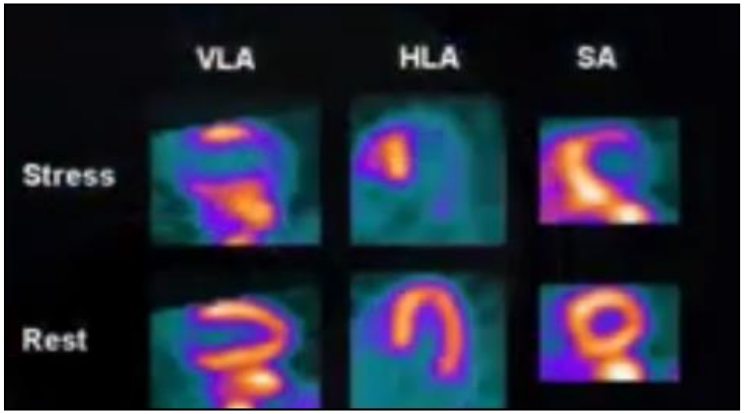
DOE Isotope Program Production and/or Development Sites -2018

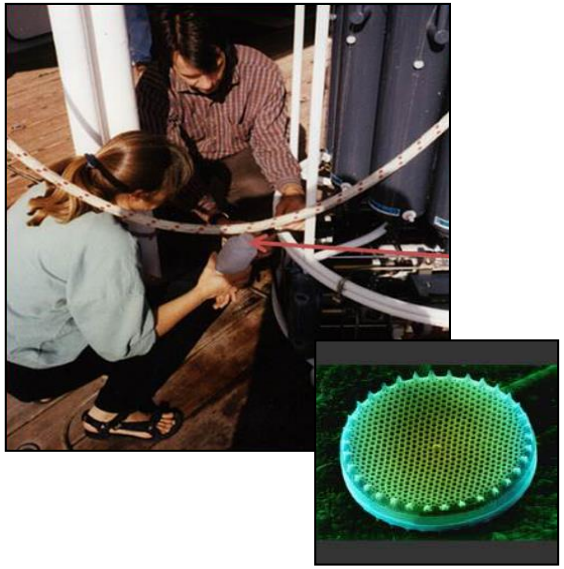


Products – Accelerator Isotopes

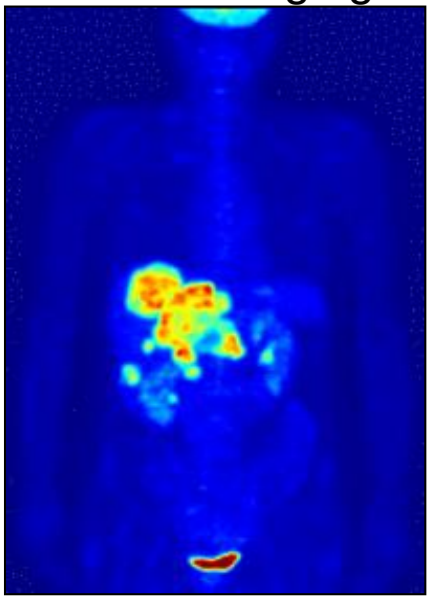
Sr-82/Rb-82:
Generator- cardiac imaging



Si-32:
Environmental applications



Ge-68/Ga-68:
Generator-cancer imaging



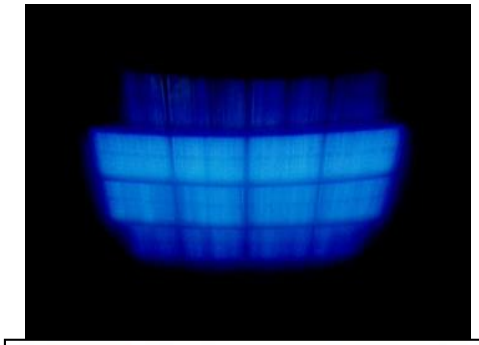
Na-22: Source for PET imaging

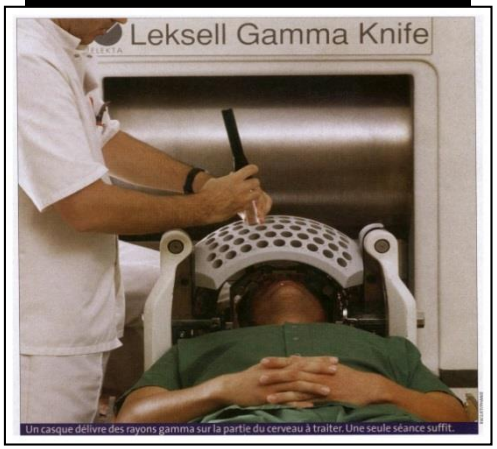
Cd-109: X-ray fluorescence source

Applications – Reactor Isotopes

Cf-252: Source – Oil Well Logging

Co-60:
Source – gamma sterilization
Gamma-Knife

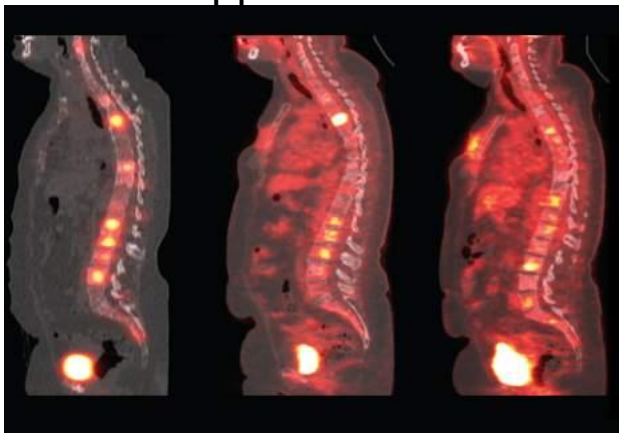




Se-75:
Source – medium energy gamma applications; non-destructive testing

W-188/Re-188: Generator – Cancer therapy applications

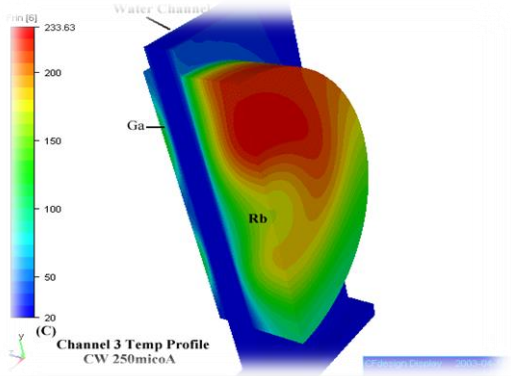
Ra-223: Cancer therapy applications

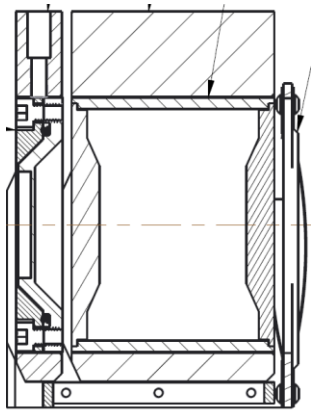


Isotope Program Development and Areas of Overlap with SBIR/STTR

SBIR and the Isotope Program

- **SBIR/STTR**
  - Support R&D toward commercialization of isotope products or services and process improvements with broad impact
  - Encourage collaboration between Labs and Industrial Partners
  - SPP (Strategic Partnership Project; replaces WFO), CRADA, IBO Contract
- **Expectations**
  - No adverse impacts on programmatic mission (facilities, personnel resources)
  - Development to commercialization primarily responsibility of the industrial partner
  - Private industry may not use Government facilities for commercial production

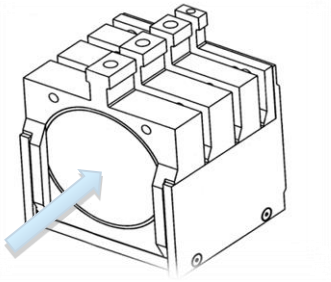


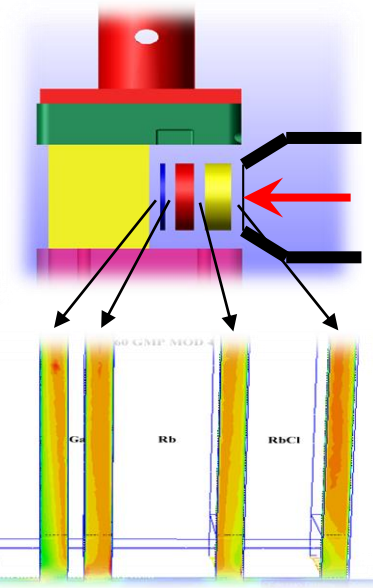


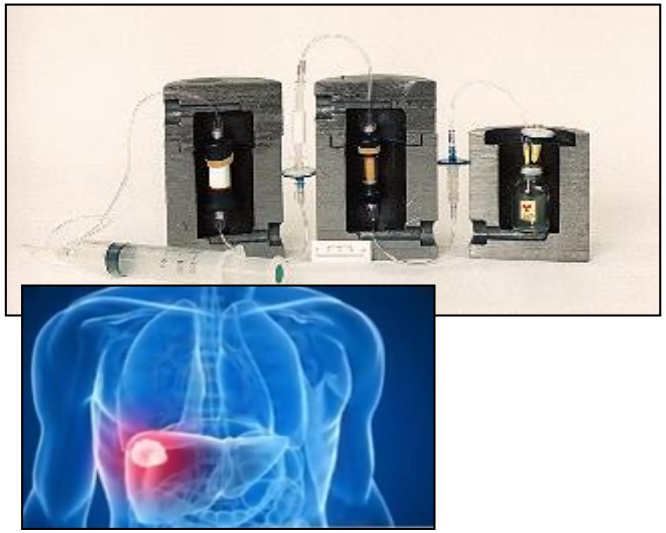
Programmatic Interests

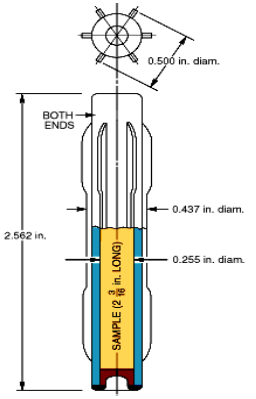
Novel or Improved Isotope Production and Separation Techniques

- Production of theranositc, alpha, and auger emitters
- Targetry design, fabrication and thermal modeling
- Separations and purification
- Automation and remote handling
- Safe compliant transportation of radioactive products
- Waste management
- In situ target monitoring
- Radiation resistant IX resins, sorbents and extractents
- Novel self-healing materials with extreme radiation resistance

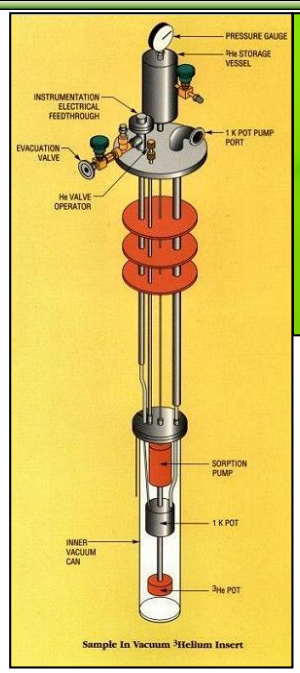








Isotopes From DOE's Nuclear Defense Mission



He-3 (beta decay tritium, SRNL): Neutron Detection (proportional counter tube), cryogenic systems (below 300 mK)

New Production:

- We anticipate longer term He-3 demand growth in areas including:
  - Cryogenics
  - Oil/gas exploration
  - Medical diagnostics
- Proposals are sought for efforts leading to terrestrial production of He-3
  - Potential methodologies might include natural gas, reactors, or other means of production not listed

D_2O (Heavy Water) Remediation and Tritium Capture:

- Current need to process contaminated D_2O (Heavy Water)
- Proposals are sought for novel processes that:
  1. remove head-gas He-3
  2. remove and capture residual tritium from U.S. Government (USG)-owned heavy water
- After purification, the residual tritium levels in the heavy water must be below the established EPA limit of 2 uCi/Kg.

Summary

Strong synergy with US Private Sector (Medical and Industrial Applications) – would like to see growth fostered by SBIR/STTR interactions

Variety of production capabilities (accelerator and reactor) and associated hot cell processing infrastructure

Potential areas of opportunity with SBIR/STTR:

- Target Optimization – new modeling capabilities, new materials and designs can be considered, novel fabrication techniques
- General Equipment – areas related to improved accelerator and reactor technologies as well as stable isotope separation: general diagnostics
- Process Optimization – automation of process and associated activities (product dispensing) would be of great benefit to overall program; focus on developing transportation needs


Thank You!