

Isotope Science and Engineering

Radioisotope Science and Technology

The Radioisotope Science and Technology Division provides leadership in actinide science, delivers new innovations in isotope production technology and advances the field of radiochemical processing methods to provide for the production and delivery of radioisotopes for science, medicine, industry, and security.

Radioisotope Research and Development

Leadership in the science and technology of radioisotope target design, radiochemical separations, process development, and innovative applications.

1. *Target Design, Analysis, and Qualification* — Design, modeling, and qualification of irradiation target assemblies.
2. *Target Production and Infrastructure Development* — Engineering design and process development for fabrication and scaled-up production of target assemblies, as well as customized glove box and hot cell processing equipment.
3. *Radiochemical Separations Science* — Development of chemical process methods to separate and extract isotopes from irradiated target assemblies.
4. *Emerging Isotopes Research* — Focused on process development & optimization for new isotopes.
5. *Isotope Applications Research* — Focused on radioisotope applications R&D.

Radioisotope Production and Operations

Production and delivery of radioisotopes for science, medicine, industry, and security.

1. *Bethel Valley Radiochemical Processing* — Focused on production of radioisotopes in radiological and nuclear hazard category 3 facilities such as 4501 and 3047. Works in close partnership with NNFD.
2. *Melton Valley Radiochemical Processing* — Focused on production of radioisotopes that require nuclear hazard category 2 facilities, such as REDC. Works in close partnership with NNFD.
3. *Technical Services, Finishing, and Dispensing* — Responsible for purification, dispensing, packaging, and shipment of radioisotopes. Performs all laboratory work to provide the material in the quality, quantity, and physical form requested. Qualified to operate under current good manufacturing practices (cGMP).

Enrichment Science and Engineering

The Enrichment Science and Engineering Division is the national steward for research, development, and demonstration of centrifuge technology innovations; advances electromagnetic isotope separations technology; and delivers stable isotopes for medical, industrial, and DOE mission critical applications.

Centrifuge Engineering and Fabrication

National steward of expertise gas centrifuge research, development, and demonstration.

1. *Machine Dynamics* — Centrifuge concepts and engineering analysis: Develops and applies advanced theoretical and engineering analysis principles to machine design and development.
2. *Engineering Design* — Engineering design of components: Employs state of the art engineering design and robust systems engineering principles for the realization of design concepts and detailed prototype manufacturing requirements.
3. *Prototype Manufacturing* — R&D manufacturing execution: Develops and demonstrates manufacturing and assembly approaches with application of novel fabrication tools and techniques.
4. *Modeling and Data Science* — Application of first principles and empirical approaches: Advances the physics and engineering understanding of gas centrifuge systems.

Testing Science and Cascade Engineering

Develops and applies gas testing principles and leads conceptualization, development, and deployment of enrichment systems.

1. *Testbed Science and Engineering* — Gas testing testbed development: Conceptualizes and designs robust and flexible testbeds for gas testing enrichment devices using state of the art systems engineering principles.
2. *Electrical, Instrumentation, and Controls Engineering* — Human machine interface research and system logic development: Develops and implements advanced control system architectures for centrifuge test beds.
3. *Gas Testing Science* — Development and interpretation of testing experiments: Leads the application of machine and cascade theory to develop, execute, and interpret testing evolutions for discovery, performance evaluation, and optimization of enrichment systems.
4. *R&D Operations* — Execution of operations supporting testing: A team of expert operators and support staff available to lead and support testing operations.

Stable Isotope Research, Development, and Production

Leads the science and production process development that delivers stable isotopes for medical, industrial, and DOE mission critical applications.

1. *Stable Isotope Process Development* — Conceptualize and assess new processes: Leads the development of new enriched stable isotope production approaches while supporting the execution of current missions.
2. *Dispensing and Technical Services* — Customer-focused support: Leads the development and implementation of robust dispensing protocols consistent with sponsor and customer needs, and provides in-depth technical support for isotope utility in new and emerging applications.
3. *Production Operations* — Execution of operations supporting production: A team of expert operators and support staff available to lead and support stable isotope production operations.

Nonreactor Nuclear Facilities

The Nonreactor Nuclear Facilities Division operates, maintains, and modernizes ORNL's unique complex of nuclear facilities to support the ongoing and increasing demand for isotope production and nuclear fuels and materials development. This includes the facility infrastructure, staffing and processes needed to support the R&D mission.

Nuclear Facility Management

Maintain and update the nonreactor nuclear facilities to support the diverse nuclear R&D mission.

1. *REDC Facility Management* — Maintain and update the facilities within the REDC complex to support the R&D mission.
2. *Bethel Valley Facility Management* — Maintain and update the facilities within the Bethel Valley complex to support the R&D mission.
3. *Transportation and Asset Management* — Provide for transportation of nuclear materials on-site in support of the ongoing mission, and develop strategic plans for the needed investments to sustain the nuclear facilities.
4. *System Engineering* — Provide qualified engineers to support the maintenance and upgrades to the nuclear facilities including oversight to those systems that protect the public and workers.

Nuclear Operations

Conduct operations within the hot cell facilities to ensure safe and compliant execution of the R&D mission.

1. *7920 Operations* — Conduct operations within the 7920 hot cell facilities to ensure safe and compliant execution of the R&D mission.

2. *7930 Operations* — Conduct operations within the 7930 hot cell facilities to ensure safe and compliant execution of the R&D mission.
3. *3525/3025 Operations* — Conduct operations within the 3525/3025 hot cell facilities to ensure safe and compliant execution of the R&D mission.
4. *3047 Operations* — Conduct operations within the 3047 hot cell facilities to ensure safe and compliant execution of the R&D mission.

Safety Engineering and Support

Implements safety and management programs in support of the safe conduct of the diverse nuclear R&D mission.

1. *Design Engineering* — Provides engineering designs for facility upgrades and for implementation of R&D mission activities.
2. *Hot Cell Operations Support* — Provides support for the hot cell facilities operations including ESH&Q, training and document control.
3. *Nuclear Research Operations* — Provides support for the R&D mission work outside the nuclear facilities including ESH&Q, training and work control.