

Nuclear Science and Technology Division

Brookhaven National Laboratory is operated by Brookhaven Science Associates, a not-for-profit research management company, under contract with the U.S. Department of Energy.

The Nuclear Science and Technology Division (NSTD) conducts research and development related to: nuclear technologies (reactors and accelerator-driven systems); reliability and risk assessment; and advanced modeling techniques for reactor simulation and energy systems. The Division serves as a resource in these and related areas to support the missions of the Department of Energy (DOE), the Nuclear Regulatory Commission (NRC), other national and international organizations, and industry. In achieving these missions, the Division collaborates with other departments within BNL, other national laboratories, and industry.

The Nuclear Science and Technology Division has a world class staff of professionals with expertise in a broad range of areas related to the design and analyses of commercial, research and advanced nuclear systems. Capabilities and facilities are also available to support and execute experiments in support of these missions. Additional strengths are in the areas of Probabilistic Risk Analysis, Modeling of Complex Energy Systems, Risk Informed Regulation, and technical support to DOE and NRC to improve the safety of nuclear power plants, both domestic, and in the Former Soviet Union.

The major programs/projects include:

Risk-Related Modeling – NSTD uses risk analysis and consequence estimates to provide quantitative information to decision-makers on which to base their actions. Applications include: risk-informing the regulations governing the operation of commercial power reactors; using risk insights to develop high-level decision criteria; and developing consensus standards for risk analyses.

Integrated Safety Management – NSTD is providing support to the Department of Energy in areas such as development of nuclear safety guides and standards, and conduct of nuclear facility safety analyses.

Economic and Environmental Modeling – The energy, economic and environmental impacts of



Prototype Collimator for SNS

different mixes of energy technologies are analyzed to provide support to decision-makers in many nations via collaboration, workshops, and training. The principal modeling tool used is MARKAL-MACRO. Current programs include support to the DOE Policy Office, to EPA, and projects with the Taiwan and Hong Kong governments, Puerto Rico and several Central

American countries.

Proliferation-Resistant Reactors –NSTD staff head an international team that is developing a fuel cycle that uses thorium-based fuels in existing LWRs with minimal or no modifications. Additional projects under the DOE NERI program complement the above project.

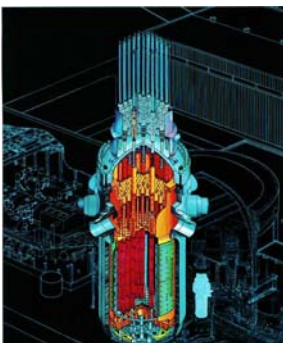
Advanced Accelerator Applications – BNL has a long history of examining and proposing accelerator-driven concepts to address issues related to nuclear energy. One area being addressed by NSTD is the examination of options for the accelerator transmutation of spent nuclear fuel. Another area of work is the design and construction of a subsystem of the Spallation Neutron Source being constructed at Oak Ridge National Laboratory. In both these projects, NSTD staff collaborate as part of a larger multi-laboratory team.

Support to the Nuclear Regulatory Commission– Under these programs, NSTD provides supporting activities to nuclear regulators in Kazakhstan and Armenia to develop independent regulatory capability and authority by providing workshops, training, computer codes and equipment for safety analysis, inspection and oversight based on the U.S. NRC and International Atomic Energy Agency (IAEA) regulatory models.

Support for the Nuclear Regulatory Commission US Reactor Inspection Program - BNL is supporting the development of risk-informed inspection notebooks, also called Significance Determination Process (SDP) notebooks, as tools to aid the NRC in performing inspections of commercial power plants in the US.

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Calculation of Pressure
 Vessel Fluence