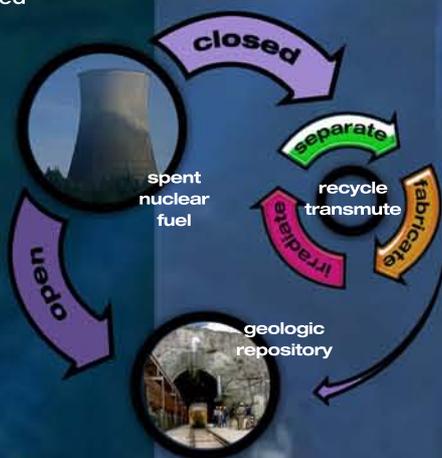




Since the beginning of the atomic era, scientists have developed methodologies to produce, use, and dispose of nuclear materials for defense and nondefense applications alike. The common foundation to these applications is the scientific knowledge, expertise, and infrastructure supporting nuclear materials and their management.

Production

As Earth's oil and coal resources diminish, nuclear energy has become an increasingly attractive alternative—but for waste disposal. To solve that problem, engineers at Los Alamos are working to close the nuclear fuel cycle by assessing plutonium recycling and by transmuting long-lived radioactive isotopes into materials with reduced radiotoxicity. To achieve these goals, they fabricate and test mixed-oxide (plutonium and uranium) reactor fuels and actinide-bearing nitride fuels. In addition, the advanced crystallization process developed at Los Alamos could provide a simpler and cheaper way to separate uranium from spent fuel than current aqueous recovery methods.



SCIENTISTS AROUND THE GLOBE HAVE PROPOSED CLOSING THE FUEL CYCLE TO RECOVER THE ENERGY IN SPENT NUCLEAR FUEL, REDUCE WASTE, AND MAKE WASTE LESS RADIOTOXIC. THE THICK ARROW INDICATES A LARGE AMOUNT OF WASTE SENT TO THE REPOSITORY WHEN THE FUEL CYCLE IS OPEN. THE NARROW ONE SHOWS THAT A CLOSED FUEL CYCLE REDUCES THE AMOUNT OF WASTE BY RECYCLING AND TRANSMUTATION.

NUCLEAR MATERIAL

PRODUCTION, USE & DISPOSITION

LIFETIME

Use

Developing nuclear fuels for use in space exploration contributes to a major programmatic thrust at Los Alamos. The safety case to support launch approval and use of nuclear power in space will depend on integrating modeling techniques and qualified fabrication processes to predict the performance of nuclear fuel for space applications. By recapturing the Los Alamos technology for fabricating uranium-nitride fuel and by developing advanced fuel forms, Los Alamos engineers can help power the Jupiter Icy Moons Orbiter and surface missions on the Moon and Mars.

THE JUPITER ICY MOONS ORBITER, DEVELOPED BY NASA AND THE DOE, IS SCHEDULED TO TRAVEL TO JUPITER IN 2012. (INSET) THESE URANIUM NITRIDE PELLETS WILL PROVIDE THE NUCLEAR POWER NEEDED FOR THE SUCCESS OF THE MISSION.

Disposition

As part of a nationwide effort to stabilize weapons-grade plutonium around the Department of Energy (DOE) complex, Los Alamos engineers assess experimentally the characteristics of stabilized plutonium and evaluate its behavior when it is stored.



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