



## **MOX Fuel Insurance Risk**

ANI has received inquiries concerning underwriting the use of Mixed-Oxide (MOX) fuel. While its use is insurable, ANI Engineering is evaluating the many technical issues related to the development and use of this type of fuel.

MOX fuel is made by blending uranium and plutonium into fuel pellets that behave similarly to uranium-only fuel pellets in producing heat in the reactor core. It was originally conceived as an end product of spent fuel reprocessing but has now become a means of managing domestic and international stockpiles of weapons materials.

MOX fuel is presently being used in other countries. It was used in the U.S. from 1960 until 1979 on a demonstration basis at six commercial nuclear power plants. In 1979, for purposes of plutonium non-proliferation, the government established a ban on spent fuel reprocessing. Its present resurgence stems from a surplus of fissionable material from nuclear weapons dismantling in the U.S. and the former Soviet Union. However, the DOE and plutonium non-proliferation concerns are preventing the import of foreign-made MOX fuel assemblies for test-use in domestic reactors. Additionally, the U.S. has lost much, if not all, of its MOX fabrication expertise since 1979.

In 1994, the National Academy of Sciences issued a report that concluded that MOX fuel conversion and its use in commercial power reactors was one of the most effective ways to prevent theft and misuse of the nuclear warhead stockpiles.

ANI Engineering is investigating issues concerning MOX fuel fabrication which potentially affects our underwriting of its use in commercial power plants:

- Using MOX fuel in a commercial nuclear reactor requires an operating license change from the NRC. To help evaluate the insurance risk, ANI Engineering will need to review the utility's license change request.
- There should be little difference in risk during normal power operations with "some" MOX fuel. Its behavior under transient conditions and the type and amount of radioactive material in the reactor core is essentially equivalent unless the entire core is MOX fuel.
- The highest degree of risk is associated with the conversion of warhead plutonium metal into plutonium oxide, which is used to make fuel pellets. Plutonium metal is highly pyrophoric (spontaneously combustible). This process is planned for a DOE-indemnified facility.
- In 1992, a fuel element fabrication accident at a MOX fuel fabrication plant caused considerable property damage from a relatively minor event. During automatic fuel rod assembly operations, 1 gram of plutonium from a broken fuel pin was dispersed within the fabrication plant.
- The structural integrity of the MOX fuel pellets can be less than uranium-only fuel pellets. The blending of uranium and plutonium into a structurally sturdy pellet has been more of an art than a science. Global MOX fuel fabrication and irradiation experience using reprocessed spent fuel as the plutonium feed-stock has existed for over 30 years. The U.S., however, will use down-blended weapons-grade plutonium and there will be no reprocessing of the U.S. spent fuels. Therefore, the

MOX Lead Test Assemblies (LTAs), manufactured in the U.S. to possibly different specifications, represent a potentially higher property and liability insurance exposure.

- A MOX fuel assembly failure in the new fuel storage vault may create significant personnel contamination hazards and cleanup costs.
- Transportation of the new MOX fuel may represent an increased insurance risk due to the potential increased expense involved in accident cleanup operations.