

1,600°C (2,900°F) to melt and oxidize it in a rotating furnace. Ceramic material would be added as necessary with the mixture homogenized by the torch. When melting and oxidation were complete, the rotating furnace would slow and the melt would fall into molds prepared to receive it.

Some types of SNF might not require the addition of ceramic material to the process because the oxidation would produce a robust ceramic form from the fuel itself. Many metallic fuels would, however, need some ceramic addition. Depleted uranium could be added to the process in almost any form to reduce the uranium-235 enrichment. Criticality issues would be addressed by limiting the process to batch runs of preselected quantities of fissile material, by the addition of the depleted uranium, and by the addition of neutron poisons if necessary. The Plasma Arc treatment would produce about 490 canisters to be contained in 98 repository packages.

As with all processes that dissolve or melt the SNF, the Plasma Arc Treatment would produce radioactive offgases. These gases would be filtered and treated by appropriate means, with the filter and treatment media recycled into the

plasma arc furnace for incorporation into the ceramic product. Figure A-6 shows the Plasma Arc Treatment process flow diagram.

A.2.7 ELECTROMETALLURGICAL TREATMENT

The Electrometallurgical Treatment process would adapt a technology under development at the Argonne National Laboratory for processing Experimental Breeder Reactor-II fuel and blanket assemblies. The process has been demonstrated for the stainless steel-clad uranium alloy fuels used in this reactor. The electrorefining process employs a technology used in industry to produce pure metals from impure metal feedstock. The feasibility of the Electrometallurgical Treatment for aluminum-based fuels has been tested in the laboratory and is theoretically possible as conducted in the following two stages. An electrorefiner facility is available at the Idaho National Engineering and Environmental Laboratory to test development concepts.

Preparation

Before electrorefining, the fuel would be cropped and the end fittings discarded. The fuel assemblies would be compacted and melted with

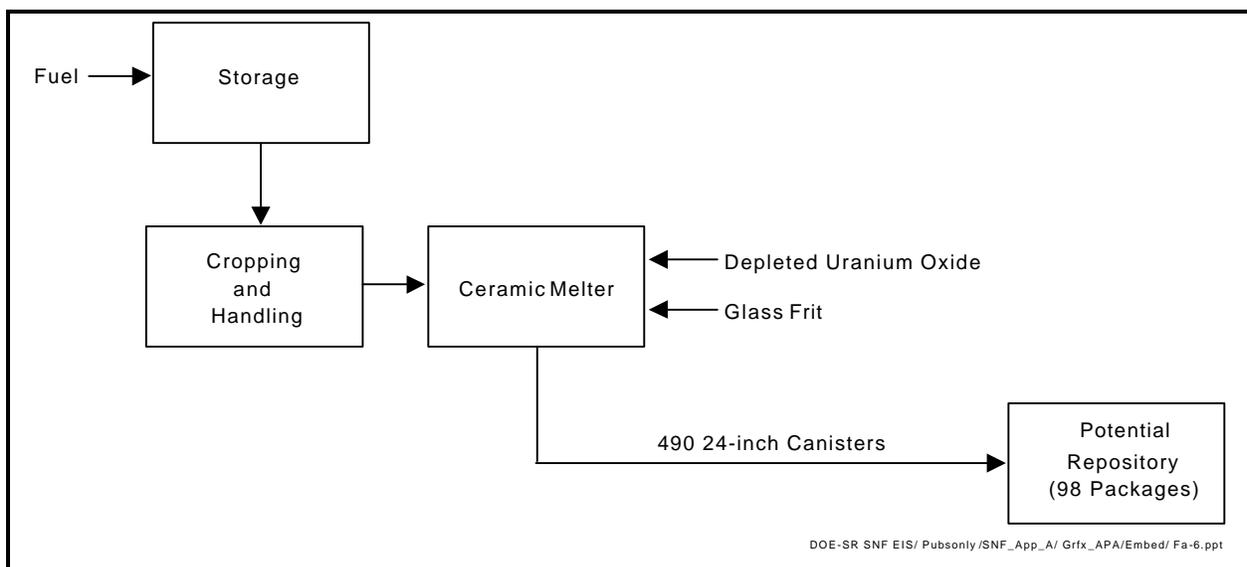


Figure A-6. Plasma Arc Treatment process flow diagram.

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