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Developing the Technical Basis for Extended Long Term Dry Storage and Subsequent Transportation of Used Nuclear Fuel

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ABSTRACT

Licensing support for the used fuel repository in the U.S. at Yucca Mountain, Nevada, was discontinued in 2009. This decision was made in order to evaluate advanced fuel cycle and repository options that may offer better long term sustainability of the nuclear fuel cycle than the current U.S. approach of once-through, direct disposal. In part, this decision was supported by the fact that the current methods for storing used fuel are safe and secure. However, current licensing for dry storage in the U.S. is limited to 80 years. It is expected with the new policy to evaluate other fuel cycles and disposal technologies, dry storage of used fuel will need to be accommodated for times well past 80 years. While dry storage of used fuel beyond 80 years is considered safe and secure, the U.S. Nuclear Regulatory Commission (NRC) needs to have the technical justification to judge the ability of used fuel and associated storage systems to maintain safety and security for extended periods.

The U.S. Department of Energy (DOE), Office of Nuclear Energy (NE) is managing a program designed to develop the technical justification to store used fuel for extended periods of time. The focus of this program is to understand material degradation mechanisms over extended periods of time for the entire dry storage system; fuel, cask internals, canister, cask overpack, closure components, and storage pad.

Initial efforts in this program have focused on identification and prioritization of the data gaps that need to be addressed to make the technical justification for long term storage and transportation. Initial technical gaps that have been identified include hydride effects in the fuel cladding, neutron poison material degradation, stress corrosion cracking in stainless steel canisters, and concrete degradation. Succeeding project plans include initiation of testing and analyses to address the data gaps and long term material behavior of these storage system components.

To ensure that all available knowledge and resources are used, the DOE has developed a strong collaborative relationship with industry and the international community. The main vehicle for this industry collaboration is through the Electric Power Research Institute (EPRI) Extended Storage Collaboration Program (ESCP). This committee is comprised of representatives from industry (utilities, fuel and cask vendors), regulators (US NRC), and the DOE laboratories. Sharing of project information and data acts to strengthen individual programs as well as leverage local resources by accessing the broader international efforts.

This paper will provide an overview and status of the DOE/NE program designed to provide the technical justification to long term storage and subsequent transportation.

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