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The Need for Integrating the Back End of the Nuclear Fuel Cycle

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The recognition that the endpoint of spent fuel management practices will be deep geologic disposal of radioactive wastes leads to questions about how alternative options for spent nuclear fuel (SNF) management might affect performance of a geologic repository. Do some options for SNF management simplify the siting and design of a geologic repository? Do some geologic disposal concepts favor specific SNF management practices? Do some SNF management options favor specific geologic disposal concepts? Are some waste forms inherently preferable than others for geologic disposal? Given the historical difficulty in many nations associated with siting and licensing geologic repositories for permanent disposal of SNF and high-level radioactive waste (HLW), are there activities that the spent fuel management community could or should undertake today to facilitate future disposal operations?

Long-term repository safety is, in general, independent of specific treatments of SNF or HLW other that its packaging. However, multiple aspects of the form in which the waste will be disposed are relevant to repository design and performance, including waste volume, radionuclide content, thermal power, waste package size, and waste form and package lifetime in a range of geologic environments. Consideration of how these factors impact repository performance suggests that choices made now regarding SNF management may affect future flexibility in repository siting and design.

In the U.S., due to the absence of a final disposal site (since the suspension of the Yucca Mountain Project in 2009), nuclear utilities have been storing SNF at their nuclear reactor sites using dual-purpose casks. These casks are large and, depending on the burn-up of the SNF contained therein, can also be very hot. This current practice can have significant implications for transportation and, ultimately, disposal. This paper shall discuss these implications based on the current U.S. practice and will suggests ways in which these implications can be addressed.
The principal message that we intend to convey is the need for careful planning while implementing upfront and temporary SNF management practices because of their potential costly implications to transportation and disposal. An integrated view of the entire back end of the nuclear fuel cycle (interim storage, transportation, and disposal) upfront during the planning phases is paramount to develop and implement an effective SNF management program.

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Summary

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