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Title: The Reprocessing Plant Toolkit: A Unified Framework for Modeling and Simulation of Spent Nuclear Fuel Reprocessing

Name: McCaskey, Alexander

Affiliation: Oak Ridge National Laboratory (ORNL)

The application of modeling and simulation to the research and development of novel sustainable energy sources has proven to be invaluable, and promises to decrease energy costs, environmental impact, and national security concerns. Nuclear energy is a great example of a sustainable energy source that has benefited from intensive modeling and simulation tools and techniques. A particular area of nuclear energy that presents significant challenges and has not benefited from nuclear energy modeling and simulation activities is used nuclear fuel recycling, which hopes to reduce waste, preserve natural resources, and prevent proliferation. The current modeling and simulation capabilities for physicochemical recycling processes are uncoupled and often focused solely on one particular process system. We will present a unified framework ? the Reprocessing Plant Toolkit ? capable of coupling these disparate and disjoint physicochemical processing codes. The framework is dynamic, integrated, and extensible, and allows the insertion and coupling of user-developed codes. It enables the exploration of novel and existing reprocessing options that aim to accelerate research, drive real-world experimentation, and improve the overall sustainability of the nuclear fuel cycle. This presentation will describe the framework, its development, and the targeted applications.