NUCLEAR ENERGY RESEARCH INITIATIVE

The Adoption of Advanced Fuel Cycle Technology Under a Single Repository Policy

PI: Dr. Paul Wilson, University of Wisconsin-Madison

Project Number: 05-157

Collaborators: None

Related Program: AFCI

Project Description

This project will develop models to study the impact of a policy that retains a single spent fuel storage repository (Yucca Mountain). An increasing amount of technology-driven analysis is being done to determine how reprocessing and separation technologies can improve the loading of Yucca Mountain while maintaining the same general design concept and licensing basis. However, little policy-driven analysis has been conducted to study the adoption of new reprocessing and separation technologies assuming only a single repository is constructed. Given the current mismatch between the legislative limit for capacity of Yucca Mountain and the expected spent fuel inventory from the existing reactor fleet, a single-repository policy would likely improve the economic attractiveness of advanced fuel cycle technologies. In addition, this project will study the relationship between fuel cycle advances driven primarily by repository performance and those advances necessary for a transition to a sustainable fuel cycle that is both economical and feasible. This project supports the Department of Energy's evaluation of additional geologic repositories for spent nuclear fuel (beyond Yucca Mountain), which is one of the near-term goals of the Advanced Fuel Cycle Initiative.

Work Scope

This project consists of four primary tasks:

- Develop economic models to evaluate limited repository space for various scenarios.
- Define technical specifications for waste forms and packages with arbitrary contents, based on long-term repository performance.
- Develop fuel cycle modeling to track and relate waste forms to the nuclear energy produced by the particular reactor that produced it, and couple results to the economic model.
- Integrate these concepts and models into the DANESS code package (a framework for dynamic modeling of a national nuclear energy enterprise) to assess the consequences of this strategy on other long-term nuclear energy goals.