

NUCLEAR ENERGY RESEARCH INITIATIVE

Identification and Analysis of Critical Gaps in Nuclear Fuel Cycle Codes Required by the SINEMA Program

PI: Adrian Miron, University of Cincinnati

Project Number: 07-071

Collaborators: Idaho National Laboratory;
Idaho State University

Program Area: AFC R&D

Project Description

The focus of this project will be to 1) carry out a detailed review of the existing codes describing aspects of the nuclear fuel cycle and 2) identify the research and development (R&D) needs required to develop a comprehensive model of a global nuclear energy infrastructure and associated nuclear fuel cycles. Researchers will analyze the gaps in the nuclear fuel cycle computer codes that will be integrated into the Simulation Institute for Nuclear Enterprise Modeling and Analysis (SINEMA) pyramid architecture, a simulation network that will model the global nuclear energy infrastructure, associated fuel cycles, and components. SINEMA will provide an integrated tool-box to support the global and domestic assessment, development, and deployment of nuclear energy systems at various levels of detail. The toolbox will contain multiple analysis codes aimed at different parts of the fuel cycle enterprise and cover a wide range of mechanistic models at multiple temporal and spatial scales. The plan is to implement SINEMA using interconnected and interactive pyramid architecture.

The project's initial effort will be to evaluate existing models that describe various aspects of the nuclear fuel cycle. The review will include domestic and international top-level nuclear enterprise model codes down to micro-scale model codes dealing with all aspects of the nuclear fuel cycle. The codes will be assessed through a systematic approach that will focus on input/output data, functional and design requirements, method of solution, strengths and weaknesses, computer language and platform, and capability to link with other codes.

Workscope

This project will consist of the following three primary tasks:

- 1) Review nuclear fuel cycle codes
 - Develop appropriate questionnaires and typical letters to be submitted to code developers and their organizations.
 - Conduct systematic and detailed review of nuclear fuel cycle codes
 - Develop relational database.
- 2) Identify R&D needs and gaps in nuclear fuel cycle computer codes
- 3) Identify best code packages to be linked within the SINEMA framework