

NE-26-39141 Development of EMERALD Modifications to Support Economic Generational Risk Analysis and Design Decision Capabilities

Aalo Atomics, located in Austin, TX, is developing the Aalo-1 advanced microreactor to be deployed in a pack called a pod. Aalo uses Idaho National Laboratory's (INL) Event Modeling Risk Assessment using Linked Diagrams (EMERALD) software to perform Generational Risk Analysis (GRA) for reactor availability, economics, and safety optimization. The current EMERALD capabilities need enhancements to better represent uncertainty quantification, automated sensitivity analysis, and evolving reactor design details needed for engineering tradeoff decisions.

Aalo will work with INL to expand EMERALD's modeling and simulation capabilities so Aalo can optimize reactor design, economics, and operational reliability. INL developed the EMERALD dynamic risk assessment software and has extensive expertise in advanced reactor modeling, reliability analysis, and microreactor development.

The project will improve advanced reactor economics, plant availability, and safety analysis capabilities by enabling more sophisticated uncertainty and sensitivity analyses during reactor design. The enhanced EMERALD tools could help reduce regulatory uncertainty, support more economically competitive microreactor deployments, and enable dispatchable nuclear energy systems rather than only traditional baseload generation.