NE-26-38851 Verification of Autonomous Operation and Remote Monitoring Capabilities of the NuCube Microreactor

NuCube Energy, located in Idaho Falls, ID, is developing the DeccaCell™ heat pipe microreactor to deliver high-temperature process heat (>1000°C) and reliable electricity for industrial, remote, and off-grid applications. For microreactors, fixed staffing costs can dominate operating expenses, adding an estimated $60–$100/MWh and threatening commercial viability. Demonstrating safe, reliable autonomous operation with substantially reduced on-site staffing is therefore critical to deployment.

NuCube proposes to partner with Argonne National Laboratory (ANL) to verify an autonomous control architecture using a Digital Twin of the DeccaCell reactor. ANL will adapt its existing autonomous operation and diagnostics framework to demonstrate automated startup, remote monitoring, islanding-mode transitions, and predictive maintenance within a validated simulation environment. The project will generate a technically defensible basis for reduced staffing models and support future DOE and NRC licensing engagement.

Successful completion will lower operational costs, enhance safety through advanced automation and fail-safe responses, and enable commercialization of high-temperature nuclear process heat for industrial decarbonization and remote energy applications.