



# Micro Nuclear Reactors - Energy for Multi-Domain Operations

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In the modern scenario of high-intensity conflicts and multi-domain operations, operational continuity is inextricably linked to energy resilience. The technological evolution of weapon systems, the massive deployment of unmanned assets, drone swarms, mesh networks for command and control (C2), and C-UAS (Counter-Unmanned Aerial Systems) systems require an energy demand that traditional fossil fuel-based logistics chains struggle to sustain. In this context, next-generation nuclear energy emerges not only as a strategic resource but as a fundamental requirement for the very survival of deployed forces.

## The vulnerability of the logistical cordon

Historically, fuel supply convoys represent one of the most vulnerable targets on the battlefield. Relying on long and complex lines of communication (LOC) to power diesel generators in remote outposts or fortified installations exposes troops to unacceptable risks in an environment where the adversary possesses long-range interdiction capabilities. This is where the introduction of

small modular reactors (SMR) and micro-reactors radically changes the paradigms of adherence logistics. A containerized system capable of providing uninterrupted energy for years frees tactical commands from the need for continuous resupply, effectively safeguarding the survival of the base.

## **The race for strategic autonomy and the role of the private sector**

As recently highlighted by Christo Liebenberg, industry expert and head of LIS Technologies, national uranium enrichment capacity is directly proportional to Defense security and resilience. Currently, control of a large portion of global enrichment capacity is in the hands of Russia, while China is rapidly expanding its infrastructure across the entire fuel cycle. Dependence on foreign suppliers in this critical sector generates a strategic risk not only for civilian power grids but especially for military applications.

To bridge this gap, there is a rapid entry of the private sector into an area historically dominated by slow government programs. Similar to what has happened in the aerospace industry, private capital is accelerating development cycles, enabling the creation of smaller, more agile, and efficient enrichment technologies.

## **The importance of HALEU for Multi-Domain**

At the heart of this revolution is the production of High-Assay Low-Enriched Uranium (HALEU), the essential fuel for advanced reactors. The implementation of flexible and localized enrichment systems will ensure the supply for micro-reactors intended for military installations. The capacitive impact is direct: having HALEU micro-reactors means being able to power energy-hungry defense systems, such as directed energy weapons, early warning radar sensors, and tactical data centers for artificial intelligence, directly on the front line, without suffering logistical bottlenecks.

## **Conclusions**

Restoring and protecting the nuclear supply chain is no longer a purely commercial issue but a national Defense priority. The integration of tactical nuclear systems will ensure the energy independence of critical infrastructures and the projection of power in hostile scenarios. The adoption of these technologies will mark the dividing line between forces capable of sustaining

prolonged efforts in isolated environments and those destined to succumb to logistical collapse. Nuclear energy is not just a power source: it is the new center of gravity for resilience and survival in future combat operations.