Nuclear Reactors on the Moon: NASA and Dept. of Energy Take First Step with MOU

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On 13 January 2026, NASA and the US Department of Energy ("DOE") announced a memorandum of understanding to develop a lunar surface nuclear reactor by 2030, a milestone that could fundamentally change the strategy for sustained human presence beyond Earth. The joint initiative aims to deploy a fission surface power system capable of producing safe, continuous electrical energy on the Moon, regardless of solar availability or lunar night cycles. This effort directly supports NASA's Artemis campaign and future missions to Mars, while reinforcing a broader national space policy focused on technological leadership.

Unlike solar arrays or batteries that depend on sunlight or limited stored energy, a nuclear reactor could offer continuous, high-density power for habitats, scientific instruments, resource processing systems, and communications infrastructure. Early concepts envision reactors producing tens to hundreds of kilowatts, enough to support a small lunar base and potentially expandable for larger installations. Uch power would also support life-support systems and fuel production for deeper space missions, capabilities that solar power alone cannot reliably sustain during the 14-day lunar night.

The policy backdrop for this technical push is the December 2025 *Ensuring American Superiority in Space* Executive Order

(read more here). The order articulates a comprehensive national strategy to affirm US leadership in space and directs federal agencies to coordinate goals that extend beyond simple exploration. Among its provisions is a specific call for deploying nuclear reactors on the Moon and in Earth orbit, with at least one lunar surface reactor ready for launch by 2030.

This policy reflects a pivotal shift in space strategy, away from episodic missions with limited infrastructure toward a persistent lunar economy. Continuous, abundant power transforms what is feasible on the Moon. It enables high-energy activities such as using lunar ice to produce water, oxygen, and rocket propellent (in-situ resource utilization) and supports long-duration research facilities that could operate independently of Earth-based power. Robust energy also creates opportunities for private sector participation in lunar services and infrastructure development, aligning with the Executive Order's broader emphasis on commercial engagement in space.

Technical challenges, however, remain significant. Designing a reactor that can be safely launched, remotely deployed, and operated in the harsh lunar environment requires innovation in thermal management, radiation shielding, and autonomous control. Fission systems are inherently complex, and mission success depends on rigorous testing and validation on Earth followed by robust safeguards against accidental radiation exposure. Beyond engineering, international treaties like the Outer Space Treaty impose obligations to avoid harmful contamination and to ensure that space activities benefit all of mankind, adding a geopolitical dimension to nuclear deployment.

Even so, the potential rewards are substantial. A reliable nuclear power source on the Moon could act as a foundation for a sustainable cislunar economy, anchoring science stations, commercial outposts, and refueling hubs that extend human reach to Mars and beyond. It would signal a transition from exploration missions subject to short stays and limited infrastructure to an era of long-term habitation and industrial activity off Earth.

For NASA and its partners, this is about staying on the Moon and exploiting that experience as a springboard deeper into the solar system. If all goes well, the Artemis III astronauts could be scouting spots for installation of the nuclear reactor during their lunar surface exploration. As NASA and DOE progress toward their 2030 goal, the integration of nuclear power into lunar strategy will be watched closely by governments, commercial entities, and international partners. How the US executes this initiative under the Executive Order framework will shape the next decade of lunar exploration and the broader geopolitical and economic landscape of space.

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