# X-energy's Space Nuclear Portfolio

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## We design & build reactors and the fuel that powers them

#### Reactor: Xe-100

We're focused on Gen-IV High-Temperature Gas-cooled Reactors (HTGR) as the technology of choice, with advantages in sustainability, economics, reliability and safety.



350 full-time employees 35 full-time PhDs 45 full-time Masters Degrees 60+ employees with Secret Clearance



#### Fuel: TRISO-X

Our reactors use tri-structural isotropic (TRISO) particle fuel, developed and improved over 60 years. We manufacture our own proprietary version (TRISO-X) to ensure supply and quality control. TRISO-X Pilot Fuel Facility Oak Ridge National Laboratory



TRISO-X R&D Center – Oak Ridge, TN

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#### **Reactor: Xe-Mobile**

To address the need for ground, sea and air transportable small power production. We've developed reactor concepts with potential civilian, government, remote community, and critical infrastructure applications.



#### **Space Applications**

NASA, DOE, and DOD are exploring our technology and fuel for nuclear thermal propulsion and fission power for the lunar surface.



320 MWe Xe-100 Deployment in Washington State by 2028 under \$2.43B DOE Advanced Reactor Demonstration Program



TRISO-X Fuel Fabrication Facility (TF3) – Oak Ridge, TN by 2025



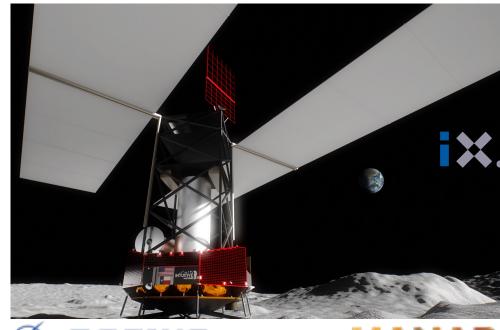


## **Establishing Permanent Human Presence on the Moon**

Lunar temperatures range from 233 °F(112 °C) in daylight down to -276 °F (-171 °C) during the lunar night. Sustainable power is required to enable permanent habitats and activities on the Moon.







**DBOEING** 

MAXAR

Artemis Habitat Concept NASA

Intuitive Machines mission control room Houston, TX

A joint venture of Intuitive Machines (IM) and X-energy, two companies founded by Dr. Kam Ghaffarian, IX assembled a best-of-industry team for a 1-year NASA funded study, combining capability in reactor design and operations, power conversion design, thermal management systems, and integrated space flight systems design with agility and an innovative culture to deliver a complete Fission Surface Power solution ready for spaceflight in the late 2020s.

IM has won three of the seven NASA Commercial Lunar Payload Services (CLPS) contracts, developed a lunar lander in 38 months, integrating 21 NASA and 6 commercial payloads.

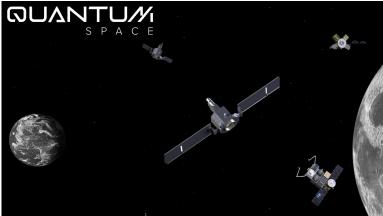




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# **Cislunar Space Opportunities**

As of September 1, 2021, there were 4,550 operating satellites in proximate space to the Earth and only 2 satellites proximate to the Moon. Unique science, distinctive observations, untapped markets all await companies willing to venture into that blue ocean.

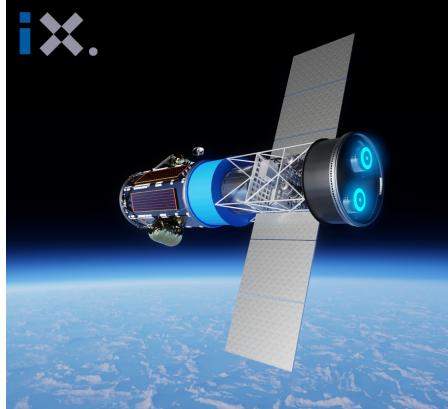


Quantum Space QS-1 mission is deploying to Earth-Moon L1 in 2024 and establishing a robotic outpost afterwards.

Axiom Space hosted the first commercial mission to the International Space Station and is developing Axiom Station with the first modules launching in 2024.







When integrated with a spacecraft and plasma ion thrusters, our mass efficient, long-lived FSP reactor also supports nuclear electrical propulsion (NEP) cislunar activities.

Our deep space NTP concept is also scalable to meet cislunar activity requirements.



## Interplanetary and Deep Space Exploration





Our comprehensive modeling and simulation capabilities, advanced materials and nuclear fuels with TRISO-X, and digital twin simulators provide the needed expertise for mass efficient reactors and missions for sustainable power and propulsion.

**Quality Assurance Program** Modeling and Simulation Toolkit Neutronics, Shielding, & Activation Thermal-Hydraulics System Design Star-CCM+ CED SCALE Requirements Nuclear criticality Component & sub-system analysis Control Interplanetary MW-class NEP System Detailed spatial temperature distributions parameters Reactor burnup Reactivity coefficients Pressures and flow rates Radionuclide inventories Neutron and gamma sources Thermal / Structural Dose rates Abagus FEA MCNP System, sub-system & component analysis Power distribution Modes and States Spatial stress, strain, and deformation Radiation damage Assembly Transient analysis Integrated power Normal Operation Upset Conditions conversion system Plant Performance and Digital Twin Transportation Reactor Dynamics Flownex Serpent System analysis Neutron cross-sections Reactor, heat exchanger, power conversion AGREE-Xe Control variables High temperature HTGR transients SimuPact Point kinetics gas-cooled reactor Safety and Plant physics Spatial kinetics Performance Simulink Power distributions Assurance Reactivity computer Temperatures

X-energy's uniquely capable nuclear thermal propulsion technology solves numerous historical complications by taking a first principles approach to achieving a 900s  $I_{sp}$  and sustaining 12,500 lbs<sub>f</sub> of thrust while avoiding core damage.

Our long-lived MW class HTGR with integrated direct Brayton power conversion system provides sustained power for interplanetary NEP missions.

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