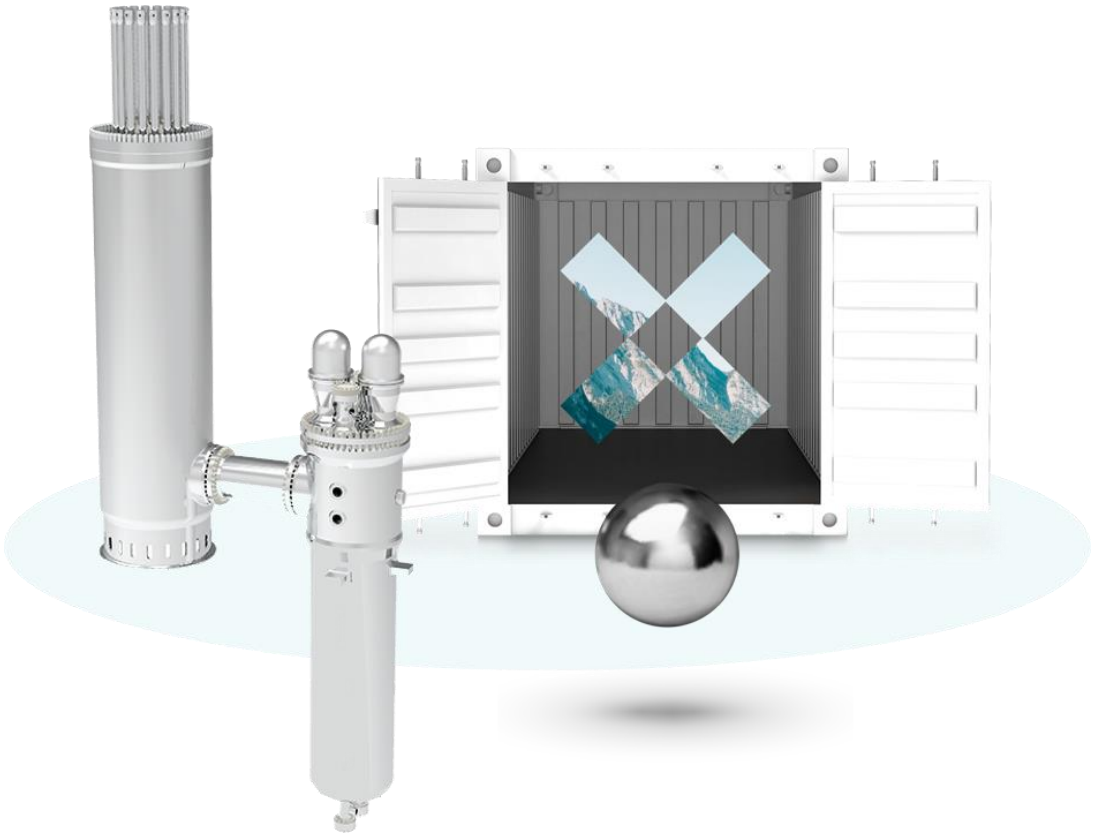

energy
Clean • Safe • Secure • Affordable

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.

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.

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.

Space Applications

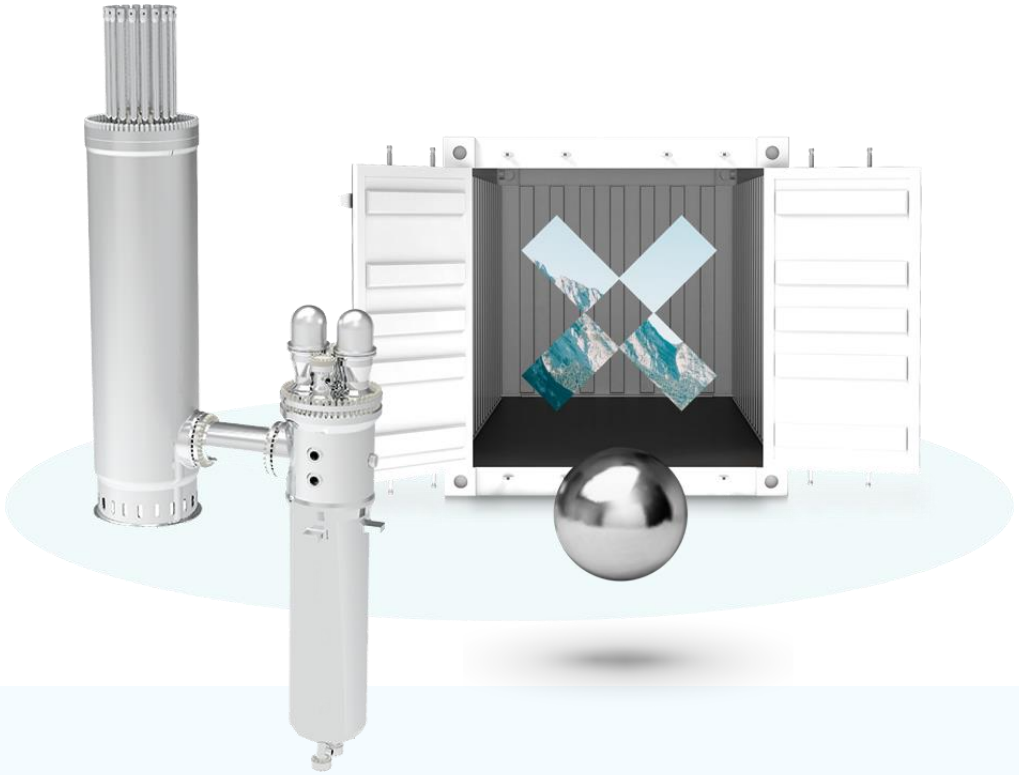
NASA, DOE, and DOD are exploring our technology and fuel for nuclear thermal propulsion and fission power for the lunar surface.

We've pinpointed the technology & revolutionized its approach

We are capitalizing on decades of learning & best practices in High Temperature Gas-cooled Reactor design.

>$700 million U.S. DOE investment, including development and testing of the safest fuel – UCO TRISO coated particles

Our optimized, meltdown-proof Xe-100 is the only Gen IV reactor deployable within 5 years.



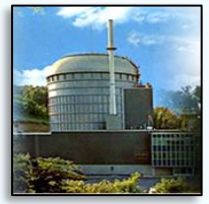
We are leveraging proven technology & billions of dollars of prior investment

USA

1944
ORNL

UK

1966-1975
Dragon

USA

1966-1974
Peach Bottom

Germany

1967-1988
AVR

USA

1967-1988
Fort St. Vrain

Germany

1986-1989
THTR

Japan


1998-Present
HTTR

China

2000-Present
HTR-10

USA
2005 – Present

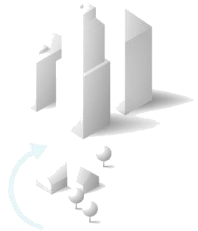
The Ladder of Innovation

X-energy's innovations compound, with the benefits accruing to our customers

Our innovation story results in more safety, lower cost, and a more reliable product delivery platform

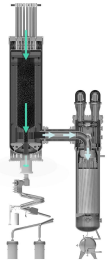
1. Intrinsically Safe Fuel

X-energy produces its own fuel that is intrinsically safe – it cannot melt down



2. Intrinsically Safe Reactor

Because the fuel can't melt down, the reactor does not require mechanical safety systems – it relies on physics and intrinsic safety features



3. Simplified Reactor Design

Because the Xe-100 is dependent on intrinsic safety, rather than complex mechanical safety, the design is radically simpler with 1/10th the components of a traditional reactor

4. Simplified Licensing Case

Because the reactor is simplified and relies on intrinsic safety, licensing is less complex and faster

5. Road-Shippable & Modular

Because the licensing is not prescriptive and the reactor is simplified, it is easier to produce modular components. These can be road-shipped and assembled on-site

6. Standardization & Integrated Delivery

Because X-energy produces its own Triso fuel and the Xe-100 is a radically simplified reactor, X-energy can disrupt the broken nuclear product delivery model and create more value for customers

Xe-100 Reactor
80 MWe per unit
320 MWe Standard Plant 4-pack

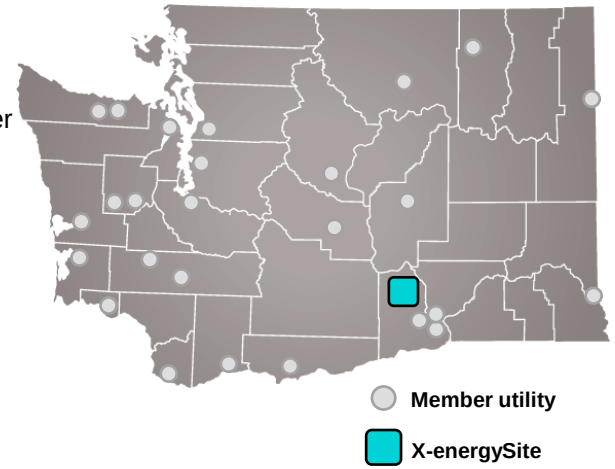
Advanced Reactor Demonstration Program & Nominal Timeline

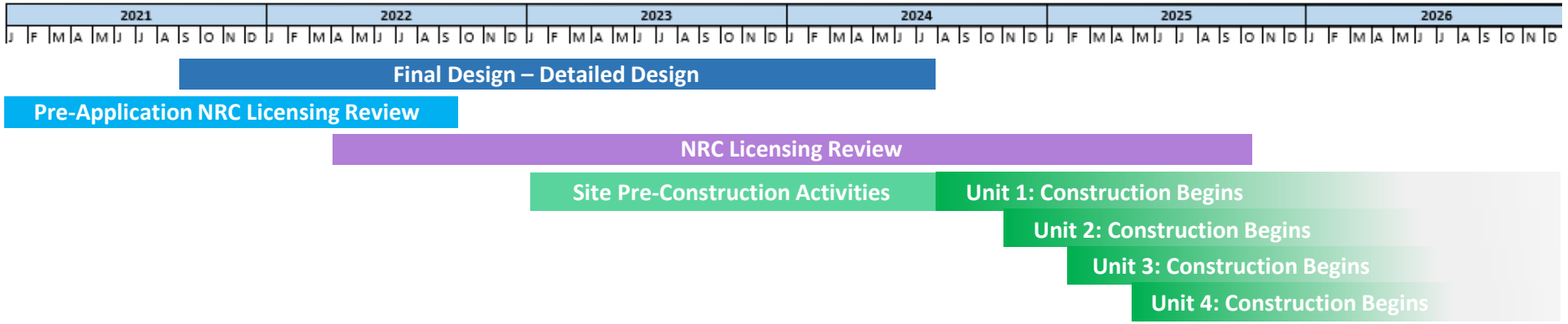
ARDP Details

- In May 2020, the Department of Energy announced the Advanced Reactor Demonstration Program (ARDP)
- X-energy and TerraPower were selected as program winners in October 2020
- Program designed as a public-private partnership:
  - Government provides winning bids with 50% cost share for first-of-a-kind advanced nuclear plant
  - Plant must be commercial (*not* demonstration)
  - Plant must be ready for deployment by 2027
  - ✓ Government motive? Kick-start advanced nuclear industry
- X-energy partnered with Energy Northwest, a top-tier customer

Energy Northwest

- Membership includes 28 public power utilities, including 23 of Washington state's 29 public utility districts.
- State law mandates zero carbon grid by 2045, with limited additional upside in Washington state for renewables.
- EN is a public agency with tax-advantaged capital access.



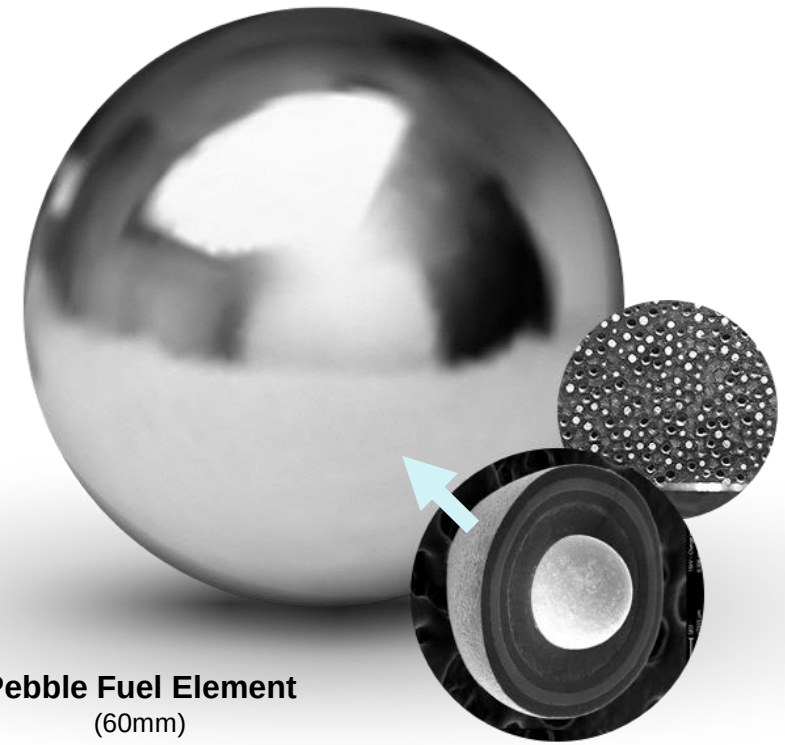


2027
4 Units Operating

Appendix

energy

Intrinsic Safety: Our Fuel



Pebble Fuel Element
(60mm)

TRISO Fuel particle
(≈1mm)

We manufacture our own proprietary TRISO encapsulated fuel (TRISO-X) to ensure supply & quality control.

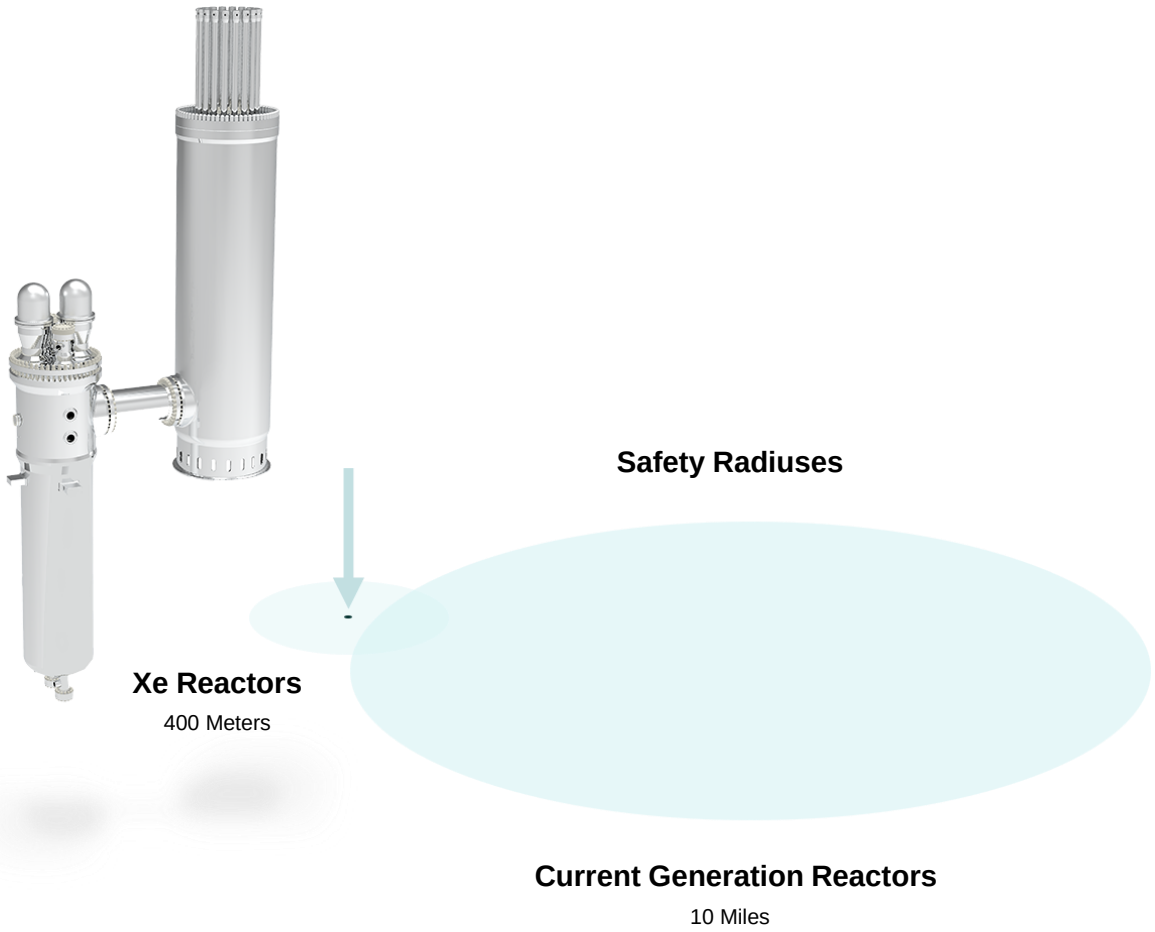
The U.S. DOE describes TRISO fuel as “the most robust nuclear fuel on Earth,” it retains waste and fission products within the fuel during ALL conditions, even worst-case accidents and cannot melt.

Why is this important?

- Because TRISO-X Fuel IS the containment vessel we will have no more expensive, gigantic concrete & steel structures to build, maintain and decommission.
- TRISO Fuel has 40+ years of prototype and full-scale demonstration reactors. **This is a proven safety approach.**
- The low reactor power density and self-regulating core design (i.e., if cooling stops, the core shuts down), ensures the reactor is always ‘walk-away safe.’

Physics, not mechanical systems, ensures 100% of safety.

Intrinsic Safety: Our Reactors



Xe-100 does not need additional systems to ensure safety. All safety functions are intrinsic to the design.

Current-generation reactors require 10 times as many safety systems as our Xe-100—operator action, water pumps, back-up electric power, etc.—to prevent the reactor from melting down.

Why is this important?

- Uncomplicated layout utilizing natural features to ensure safety. No need for complex safety systems.
- Simple control system with only 4 variables allows for more automated operations & fewer personnel.
- Turbine generator can be air- or water-cooled—affording geographic siting flexibility.
- The low reactor power density and self-regulating core design (i.e., if cooling stops, the core shuts down), ensures the reactor is always ‘walk-away safe.’

Physics, not mechanical systems, ensures 100% of safety.

Simple Design

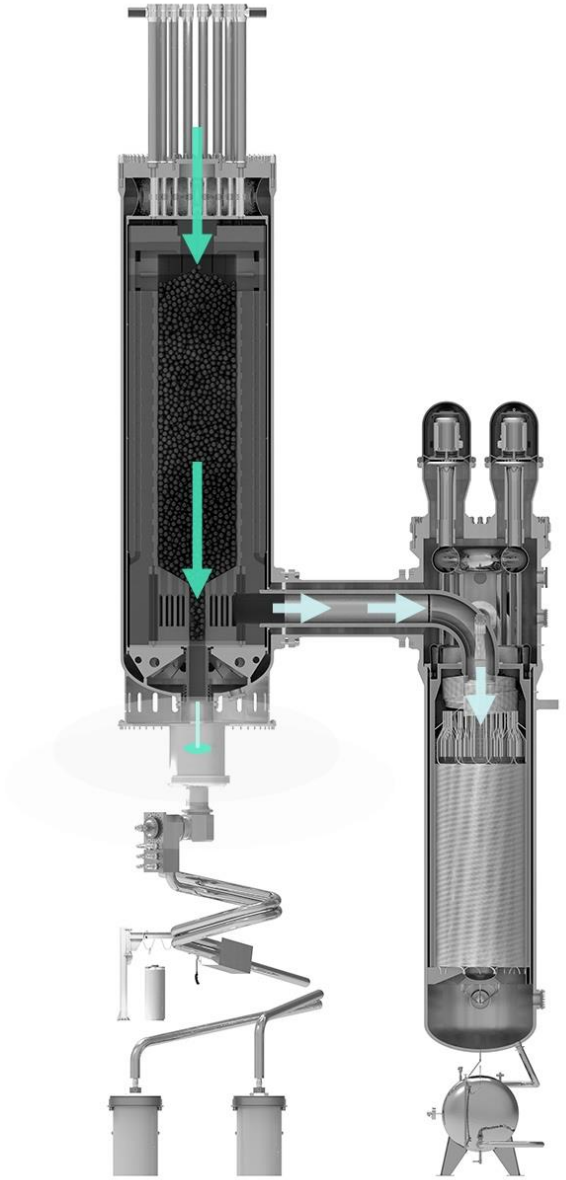
Relying on inherently safe designs allows for a drastic reduction of components.

Reduction of components enables predictability on costs & significant reduction of regulation barriers.

Why is this important?

- Allows us to revolutionize the way turnkey nuclear reactor solutions are delivered.
- Reduced cost of upfront engineering effort.
- Higher certainty on construction cost and timelines equates to lower risk.
- 4 modules optimized for the ‘sweet-spot’ size—320 MWe with load-following capabilities similar to a natural-gas plant.
- Deployment for electricity or process heat supports **Deep Decarbonization.**

1/10th the components of a traditional nuclear plant



Xe-100 Reactor (80 MWe)