



The Advanced Reactors Technical Summit IV



Jeff Harper

February 8, 2017





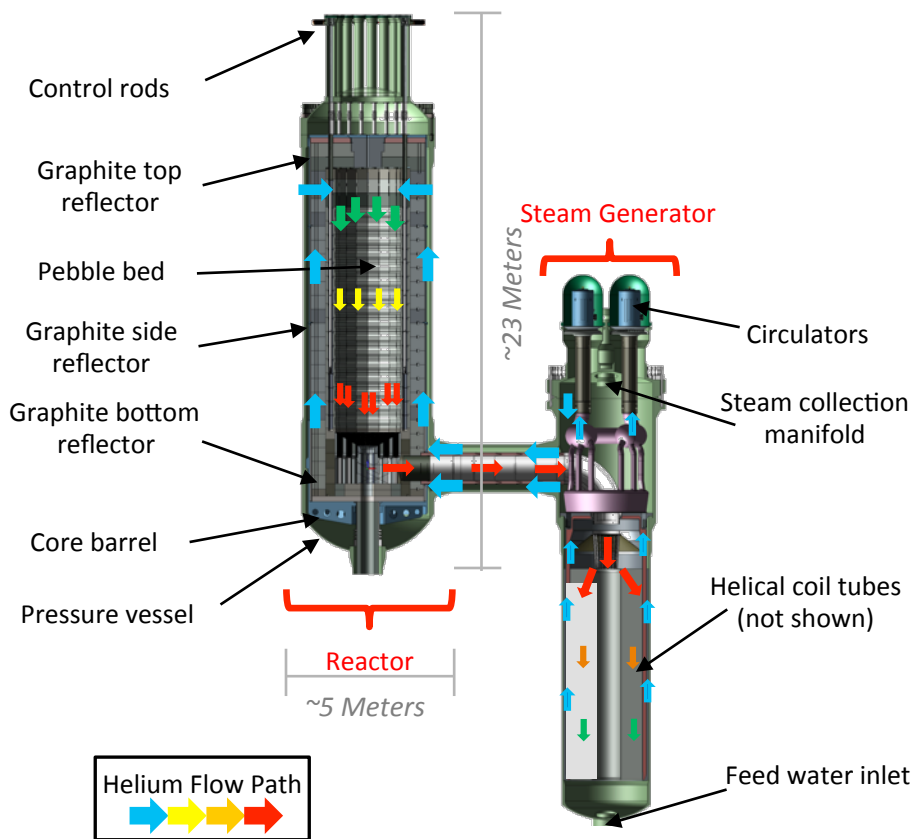
X-energy 2016 Achievements

- Conducted \$1 million Trade Study evaluated pros and cons for prismatic and pebble fuel types relative to US market. Committed to Pebble Bed Technology.
- Study led to a new Xe-100 Design and Strategy:
 - 200MWth, LCOE \$81 MWhr,
 - 163,000 MWd/t burn-up, 15.5% enrichment level**Note:** 125 MWth design = 83,000 MWd/t burn-up, 10% enrichment level
- US DOE Cooperative Agreement began in July 2016
- First pebble fabricated at Oak Ridge
- MOUs: Southern Nuclear (potential owner/operator/customer) and Burns & McDonnell (EPC/AE services)





The Xe-100 Reactor



Technology

- The Xe-100 is a 200MWth/80MWe helium cooled power plant that features a 15.5% LEU fuel cycle
- Small size and modular construction result in relatively low cost – single reactor plant of <\$1B, expandable to 8 reactors on plant site
- On-line fueling allows for continuous operations with minimal down times for maintenance and refurbishment

Benefits

- The Xe-100 has the ability to perform rapid load following in real time with the power range of 100-40-100% and can replace and supplement other fuel sources (coal, wind, solar) to leverage existing transmission and distribution infrastructure
- The heat source is based on pebble bed technology which has a proven meltdown proof core
- The Xe-100 is a CO₂-free nuclear thermal power source that can be utilized for power generation, process heat applications, and water desalination

Xe-100 Reactor Specifications

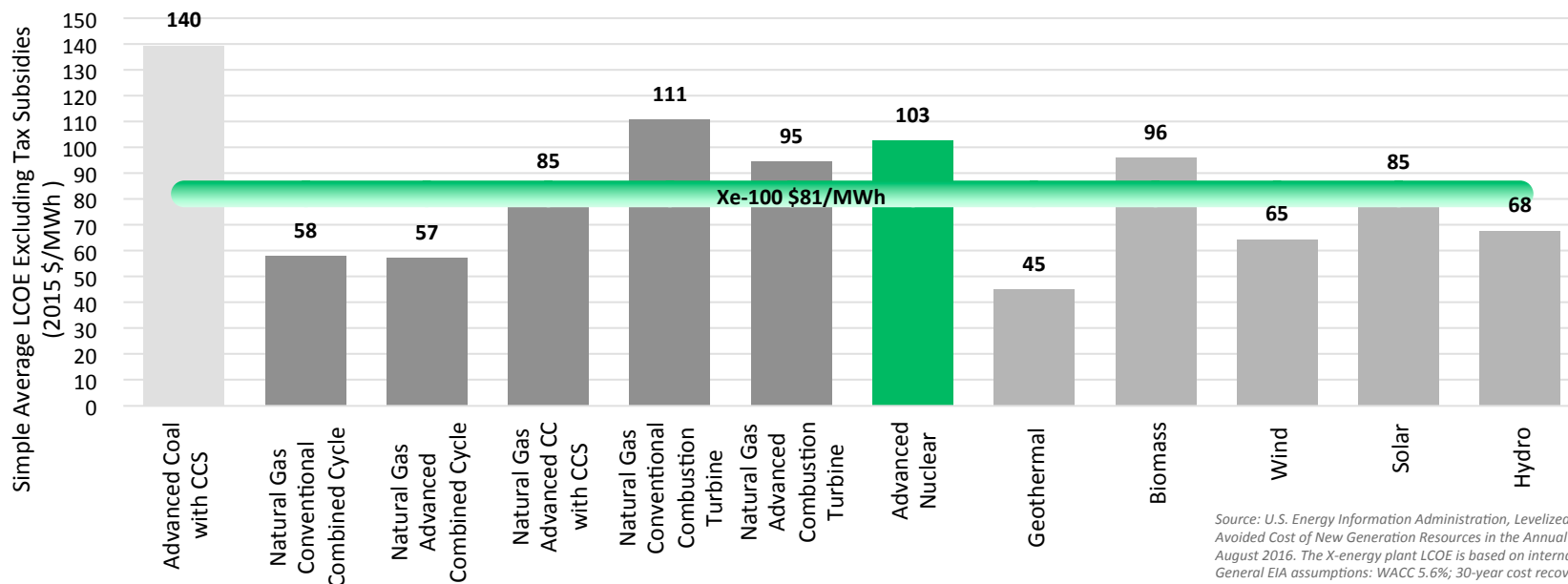
Thermal Output	Steam Temperature	Steam Pressure	Electric Output
200MW	540°C	14MPa	~80MW





X-energy Strategy

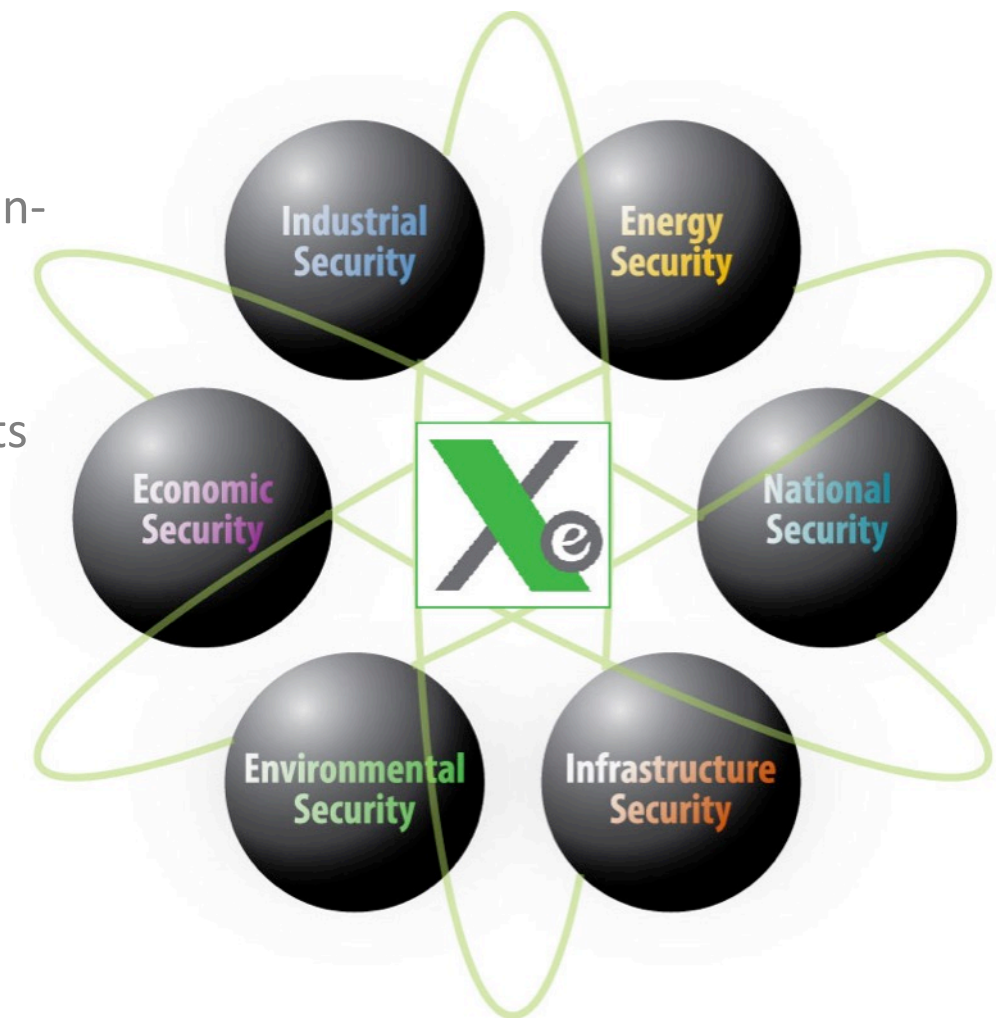
- **Be first to market**
 - Leverage U.S. government (i.e., DOE funding for advanced reactor development), Canadian government and strategic partners to bring Xe-100 to the market by 2030
- **Leverage existing knowledge**
 - License existing HTGR technology where possible (subsystems, components, fuel)
 - Leverage past lessons learned (South Africa/Germany)
- **Simple Product design**
 - Technically simple to design and operate
 - Lowest possible plant/operational cost
- **LCOE competitive with alternative fuel sources**
 - Natural gas combustion turbines
 - Advanced nuclear
 - Coal
- **Obtain NRC “Gold Standard” for safety**





Fresh Beginnings for 2017

X-energy is developing an innovative nuclear power plant design solution, the Xe-100 and U.S.-made, proliferation-resistant fuel, which provides security sustainability for the global energy and process heat markets



"I am convinced that advanced reactors will become the backbone of our energy mix as we move through this century and develop clean carbon-free energy. President Kennedy once said that we are in a space race and my work with NASA reflects the progress he had hoped for.

Today, I believe we are in an energy race. Providing clean energy across the world is my vision for X-energy and I believe that clean, safe, reliable nuclear energy is necessary to making this possible."

Dr. Kam Ghaffarian, Founder and Chief Executive Officer, X-energy



Fresh Beginnings for 2017

- **Energy Security**

- X-energy offers a secure and clean alternative to coal/natural gas and is more reliable than renewables.

- **National Security**

- The Xe-100 design and performance perfectly matches the need for grid independence and energy reliability at defense and security facilities.

- **Infrastructure Security**

- Xe-100 is well suited to replace coal-fired power plants, provide infrastructure improvements and improve standards of living.

- **Environmental Security**

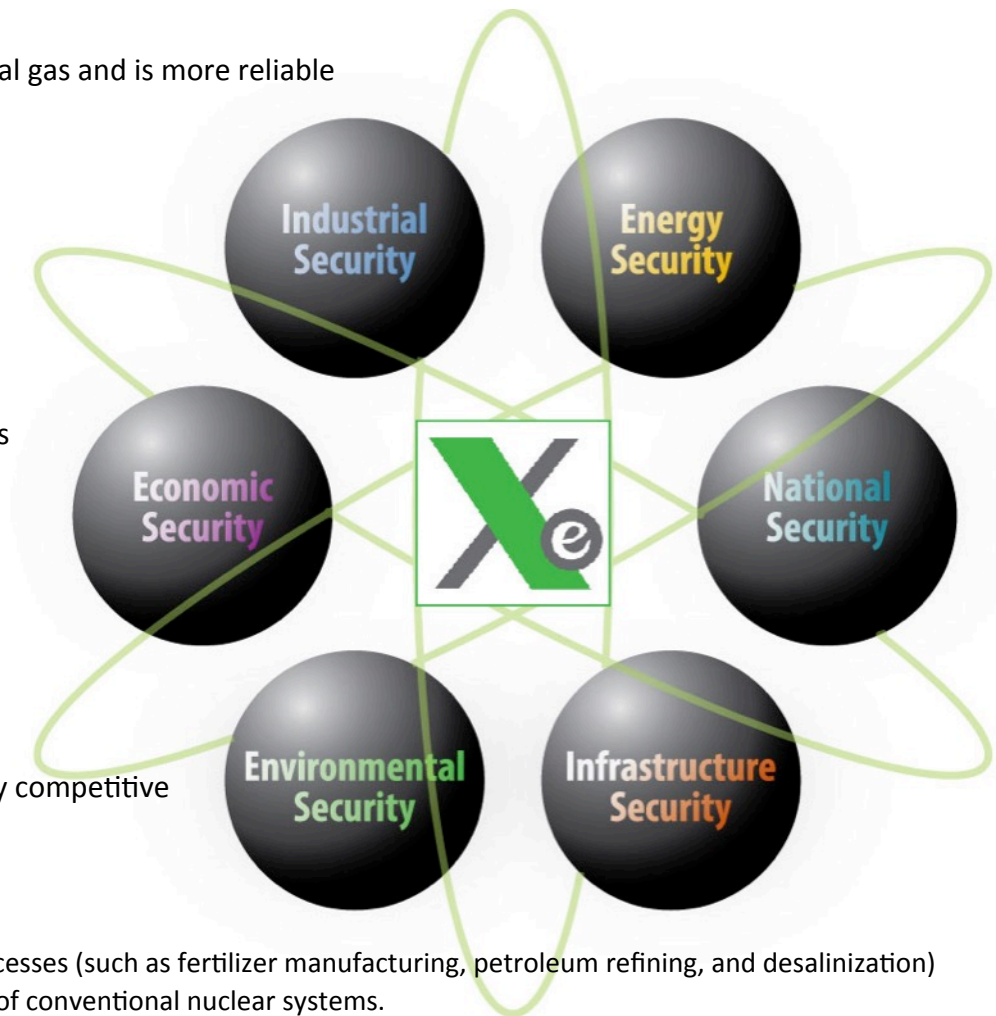
- Nuclear energy produces zero carbon emissions.

- **Economic Security**

- With an LCOE in the range of \$81/MWh, the Xe-100 is highly competitive with the cost of conventional nuclear and coal.

- **Industrial Security**

- The Xe-100's high operating temperature supports industrial processes (such as fertilizer manufacturing, petroleum refining, and desalination) that require steam at high temperatures beyond the capabilities of conventional nuclear systems.





Fresh Beginnings for 2017

“I began X-energy because the world **needs** energy solutions that are safe, clean, secure, and affordable. With so much at stake, we cannot continue down the same path.” – Dr. Kam Ghaffarian, Founder & CEO

Vision for 2017:

- Success with DOE Co-op Agreement
- Kick-off Conceptual Design
- Enter into Strategic Partnerships
- Kick off Customer Advisory Committee
- Potential Customer Engagements – Driving toward that first project

Xe-100 Key Attributes:

- Meltdown proof
- On-line Refueling
- Small/Scalable
- Load following
- Carbon Free
- Process Heat

Follow us at: [@xenergynuclear](https://twitter.com/xenergynuclear)





Contact Information

Nuclear energy.
Reimagined.



X Energy, LLC

7701 Greenbelt Road, Suite 320

Greenbelt, MD 20770

Phone: 301.358.5600

www.x-energy.com

[@xenergynuclear](https://twitter.com/xenergynuclear)

