



Clean • Safe • Secure • Affordable

Carol Lane
Vice President,
Government Relations

March 16, 2023



Dr. Kam Ghaffarian,
Founder and
Executive Chairman

“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 is a globally recognized technology visionary across energy, space and information technology.
- Created and grew Stinger Ghaffarian Technologies (SGT), Inc. to \$650 million in annual revenue and 2,400 employees. SGT was ranked as the U.S. National Aeronautics and Space Administration’s second largest engineering services company prior to being acquired by KBRwyle, subsidiary of KBR, Inc.
- Founded X-energy in 2009 to address innovation in critical energy solutions. X-energy was awarded ~\$53M from DOE to focus on an advanced nuclear reactor and TRISO fuel.
- Founded Intuitive Machines in 2016 to leverage NASA technologies for commercial space and terrestrial applications. Intuitive Machines won its first Commercial Lunar Lander Contract from NASA in 2018 with first landing scheduled for mid-2023
- Founded Axiom Space in 2017 to develop the first commercial space station, to be launched by 2022.

Founded in 2009

13 years of investment and development

Rockville, MD Headquarters

Rooted in the nuclear community with proximity to the DOE and Nuclear Regulatory Commission ("NRC")

50+ Years of R&D

Built upon years of R&D in high temperature gas reactors

~400 Employees

Leading Gen IV nuclear development and licensing team⁽¹⁾

\$1.2bn Federal Funding

Selected for DOE's Advanced Reactor Demonstration Program⁽²⁾

~\$580mm Investment

Capital invested to date with \$120 million of committed capital⁽³⁾

X-energy's Advanced Nuclear Technology



Our High Performing Reactor: Xe-100

- Gen-IV High-Temperature Gas-cooled Reactors (HTGR) have advantages in sustainability, economics, reliability, safety, and versatility in application
- Each reactor will be engineered to operate as a single 80 MWe unit and is optimized as a four-unit plant delivering 320 MWe



Our Clean and Safe Fuel: TRISO-X

- Our reactors will use tri-structural isotropic (TRISO) particle fuel, developed and improved over 60 years
- TRISO is designed not to melt and can withstand extreme temperatures that are well beyond the threshold of current nuclear fuels
- We manufacture our own proprietary version (TRISO-X) to ensure supply and quality control



Other Strategic R&D Initiatives

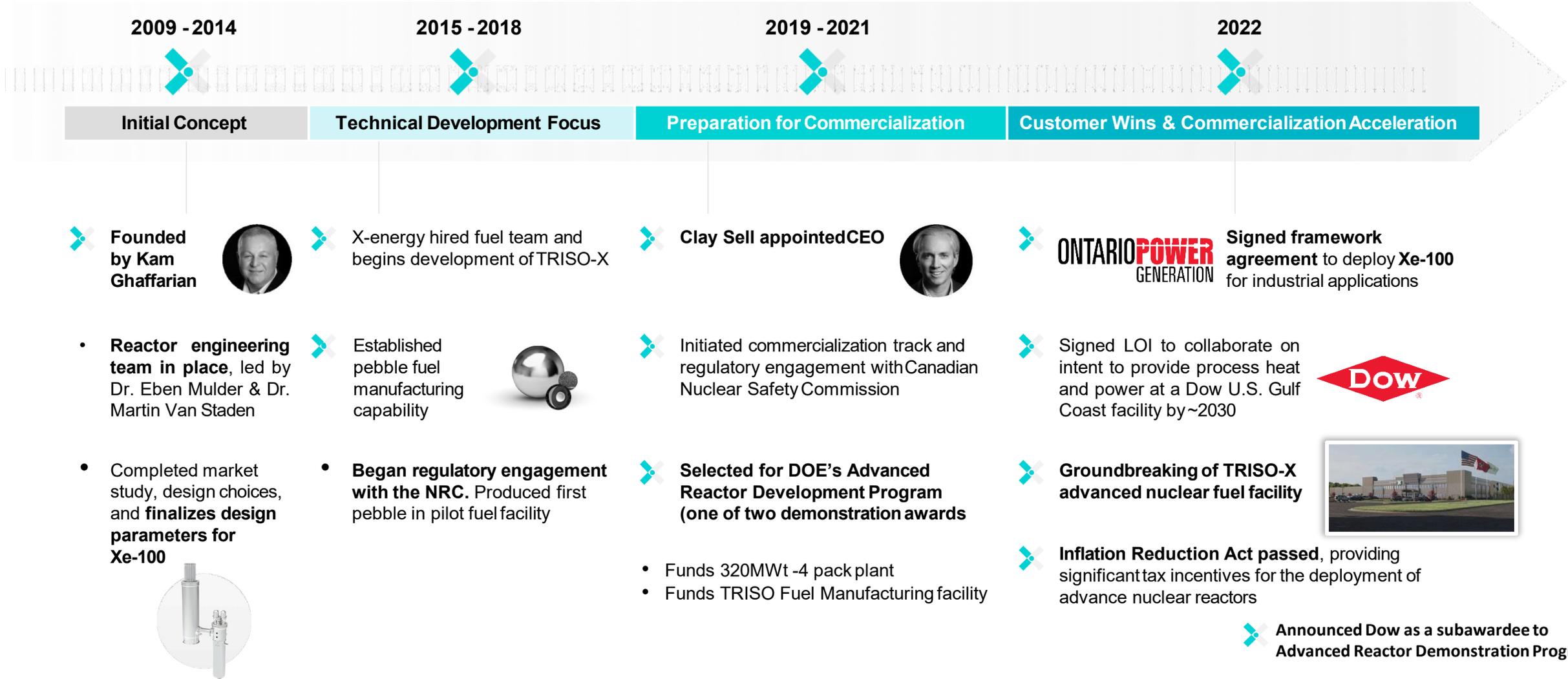
- We're developing advanced concepts for nuclear power and propulsion for potential military, critical infrastructure and space applications

1) As of December 2022

2) Awarded in December 2020

3) As of December 2022, includes \$210mm of government funding, \$75mm committed capital of Series C-2 financing, including a \$30mm commitment from Ares Management and \$45mm PIPE commitment from Ares Management

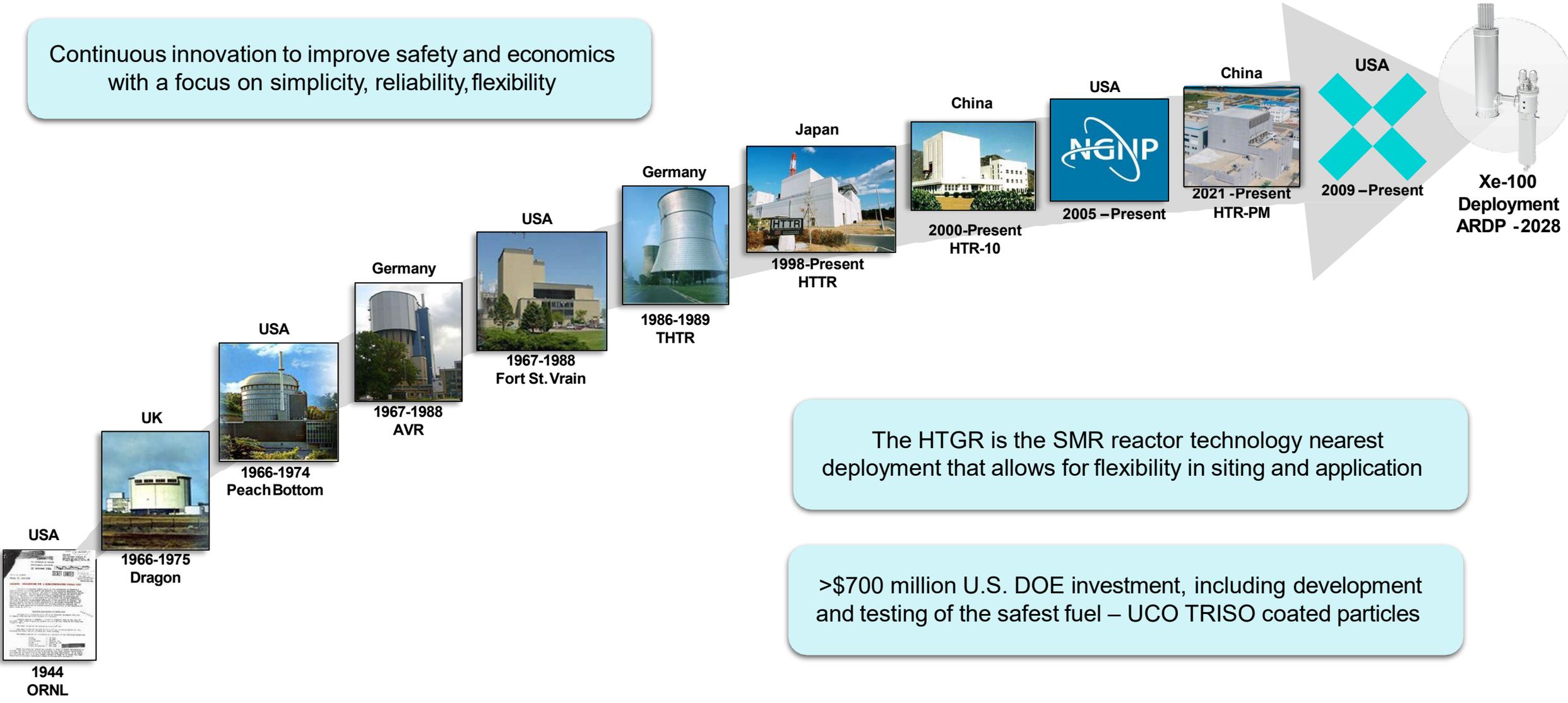
Our Traction, Accomplishments & Risk Reduction to Date



Note: Commercialization assumes regulatory permitting approvals have been obtained to permit construction of a facility as projected. The regulatory permitting process, including necessary NRC approvals and licensing, is a lengthy, complex process and projected timelines could vary materially from the actual time necessary to obtain all the required approvals. While there is some possibility of an expedited approval process for SMR technology, there is presently no clear path for expedited permitting

HTGRs Leverage Proven Technology with Novel Flexibility

Continuous innovation to improve safety and economics with a focus on simplicity, reliability, flexibility



The HTGR is the SMR reactor technology nearest deployment that allows for flexibility in siting and application

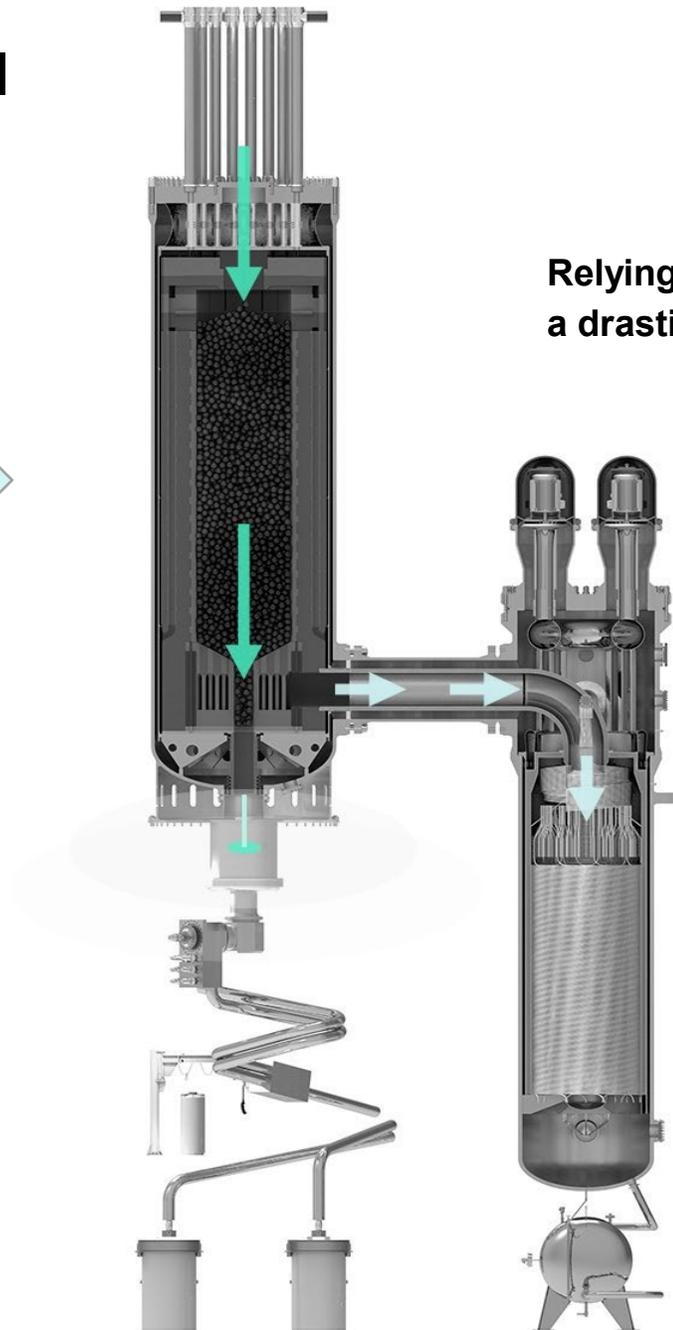
>\$700 million U.S. DOE investment, including development and testing of the safest fuel – UCO TRISO coated particles

Intrinsic Safety: Our Fuel

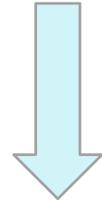


Pebble Fuel Element
(60mm)

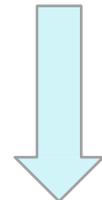
TRISO Fuel particle
(≈1mm)



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



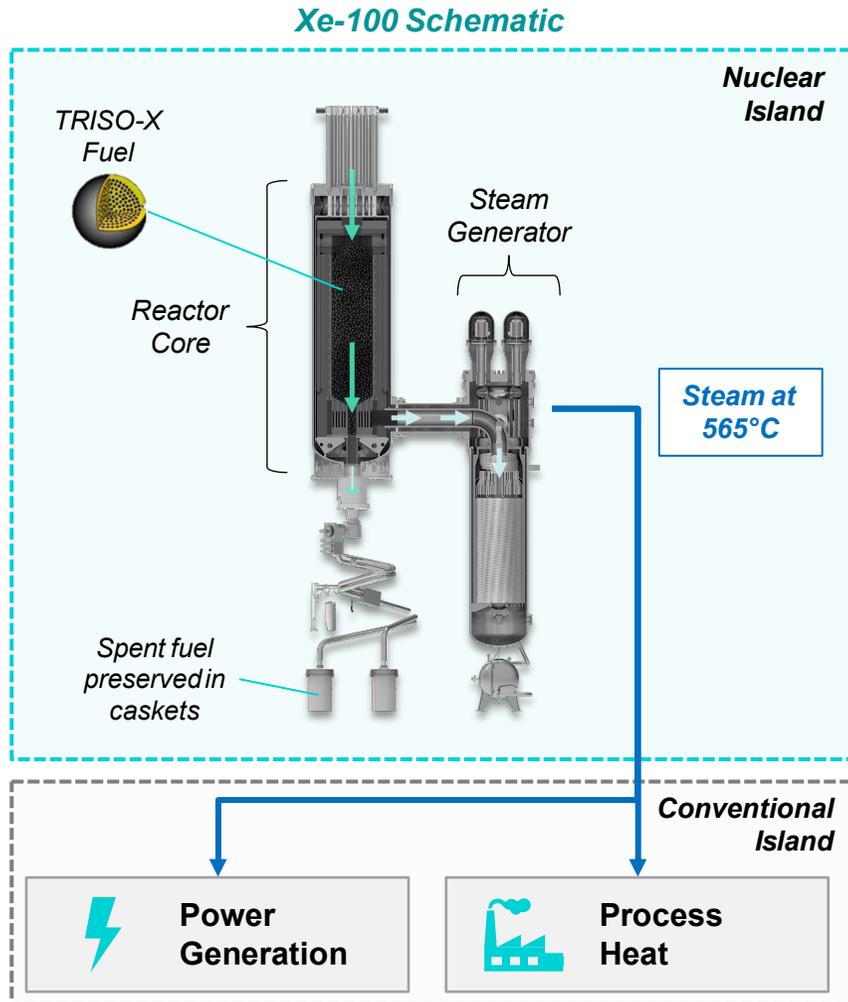
Reduction of components enables predictability on costs & significant reduction of regulation barriers, as well as a much smaller physical plant footprint.



1/10th the components of a traditional nuclear plant

Xe-100 – A Pioneering Gen IV Nuclear Reactor

80 MWe modular design & manufactured components designed to drive scalability, accelerated timeline and cost control



Modular & Standardized



- Each reactor module is connected to its own steam turbine generator or process heat offtake, so **modules can be constructed / operated independently, and even added as demand grows**

- Onsite work is reduced, and a significant portion of quality control is shifted to centralized fabrication & integration facilities

Manufacturable, Road-Shippable Components



- Simpler, standardized design allows for **mass production of road-shippable components**

- In contrast, the complex design of traditional nuclear construction has required on-site construction

Intrinsically Safe



- **Xe-100 is designed to avoid the need for additional safety systems**

- Intrinsically safe design means **1/6th the safety systems of a traditional reactor** and fewer materials (e.g., ~95% less concrete than legacy nuclear plants)

- Simple control system with only 4 variables expected to allow for more automated operations & fewer personnel

The X-energy Project Delivery Model (X-PDM): A fully designed plant with constructors and suppliers working alongside the X-energy engineering team.

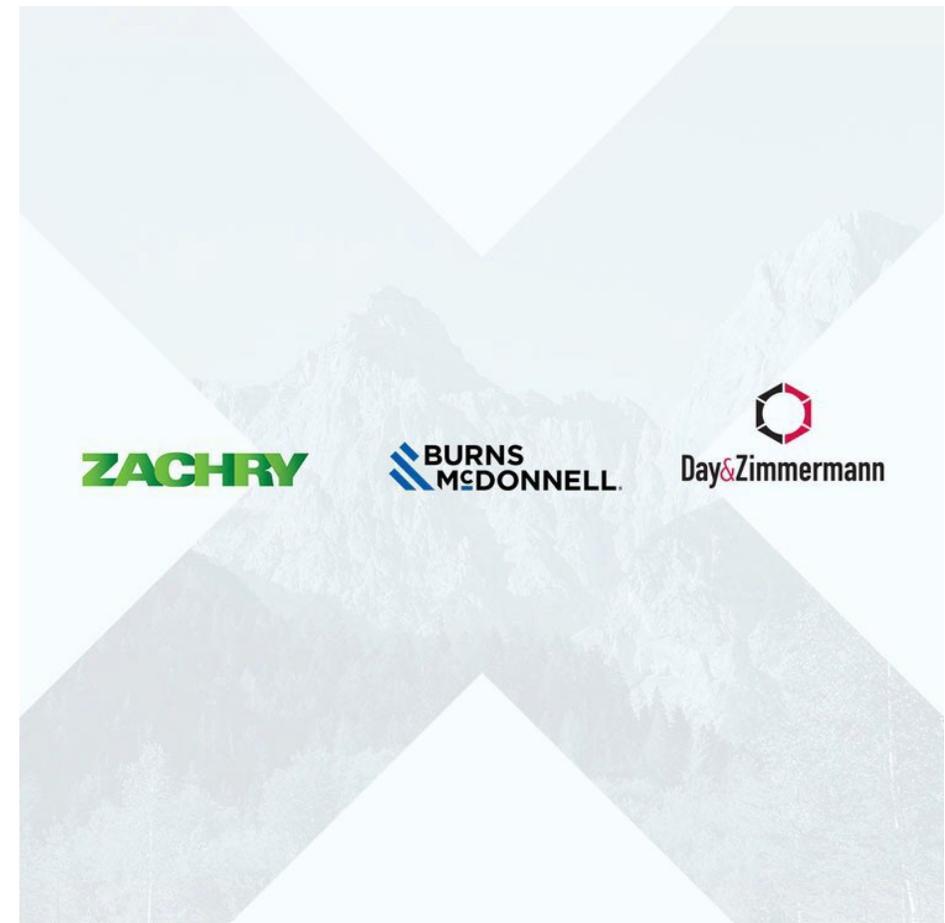
Previous new nuclear projects have utilized standard methods of contracting for construction services, with owners often engaging constructors after, or in the late stages of, project development. Under the X-PDM constructors and suppliers work with the X-energy team in all phases of design, equipment supply, fabrication, and construction to develop detailed project costs, project schedules, advanced work plans and four-dimensional modeling prior to the start of safety-related construction.

Selected two construction teams:

- Zachry Group
- Burns & McDonnell + Day & Zimmermann

Why is this important?

- Breaking the paradigm of past nuclear projects – delivery on time and on budget.
- Ensuring we get it right the first time.
- Increasing the value of repeated projects – coming down the cost curve and enabling fleet deployments.



We are a frontrunner in the deployment of advanced reactors



The Company is pursuing a **well-established, risk-informed licensing process** in the U.S., pursuant to regulations at 10 C.F.R. Part 50, that has been used by more than 100 reactors (including nearly all currently licensed reactors), and the design review process in Canada, each to enable an efficient and timely evaluation of the design

- This approach enables X-energy to seek approval efficiently for its advanced reactor design in the U.S. within the existing regulatory framework
- The NRC has familiarity with high temperature gas cooled reactors from the Next Generation Nuclear Plant project and ongoing advanced reactor activities



Topical reports address aspects of the Xe-100 that may be new or different for the agency. Submitting reports early in the process is meant to increase the overall efficiency of the licensing process

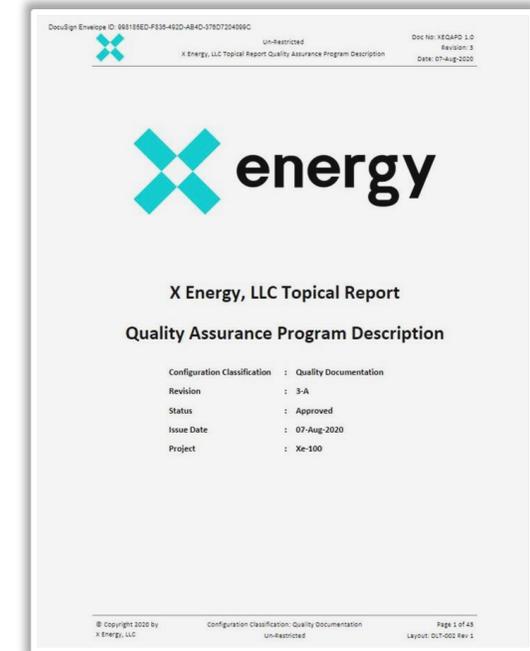
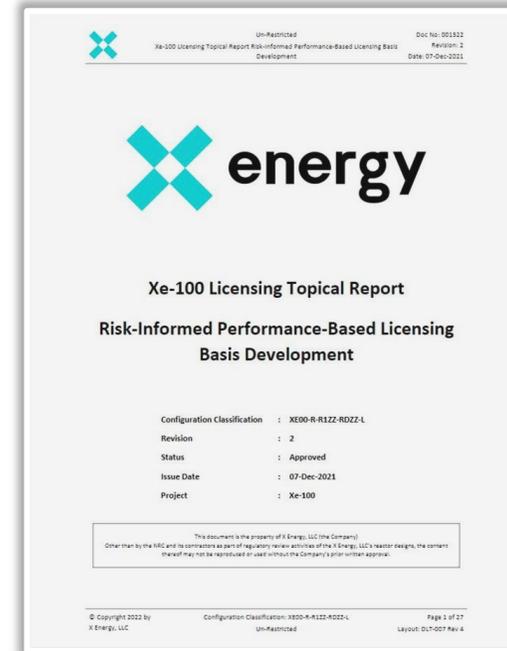
- Once the NRC has approved a topical report, it can be relied upon in a plant-specific licensing action (subject to applicability)

Key NRC Milestones

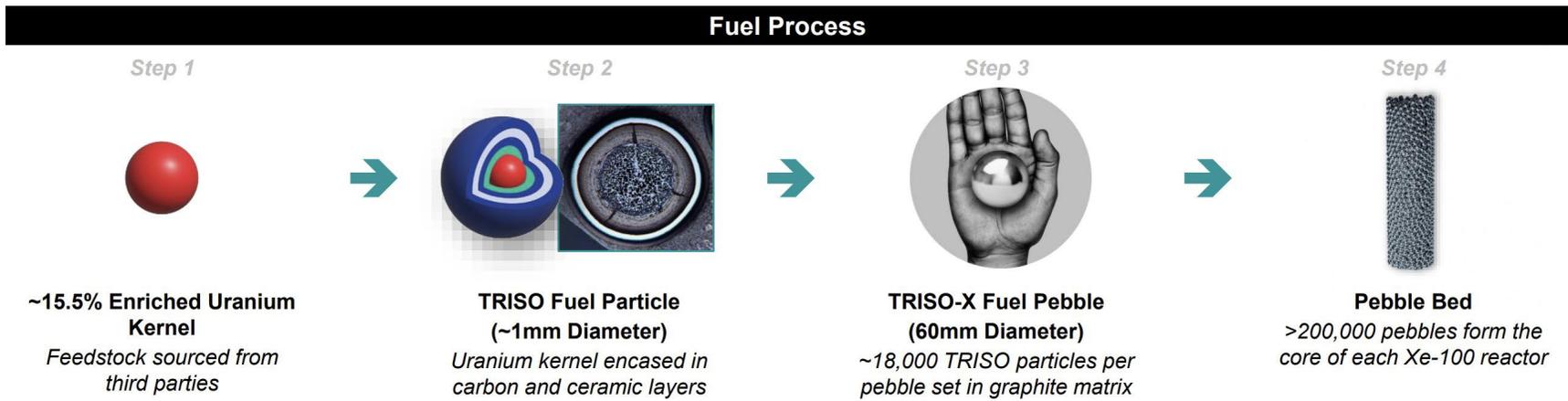
Q2 2022: X-energy submitted first ever Category II Fuel Fabrication facility license application to the NRC

Submitted 7 topical reports and 7 white papers to the NRC to date

Example Topical Reports



Pilot Fuel Fabrication Facility Operating Since 2018



April 6, 2022

- Submitted license application to the NRC for the first-ever HALEU fuel fabrication facility
- Will be operational in 2025 and initially have the ability to supply 20 advanced reactors
- Sited at the Oak Ridge Tennessee's Horizon Center Industrial Park

October 13, 2022

- X-energy broke ground and began construction activities on North America's first commercial-scale advanced nuclear fuel facility in Oak Ridge, Tennessee



Xe-100 Operator Training Simulator in Frederick, MD

- Full size Xe-100 Operator Training Simulator
- 2 x Classrooms for initial Operator Training (22 Operators)
- Space for 18 Employees



Xe-100 control room simulator in Rockville, MD



- 200MWt / 80 MWe pebble-bed helium gas-cooled reactor
- Scalable from 1-12 modules, 4-unit standard plant sited on 26 acres.
- No reliance on onsite or offsite power to perform any required safety functions
- Highly competitive First-of-a-Kind (FOAK) Levelized Cost of Electricity (LCOE) and significant Next-of-A-Kind (NOAK) cost improvements
- 1/10th the components of a traditional nuclear plant



Xe-100 Standard Plant

Construction: Creates approximately 800 – 1200 jobs

Operations: Creates approximately 100-200 jobs

Allows skilled power plant workforce to transition to the new plant technology





Maryland
Energy
Administration



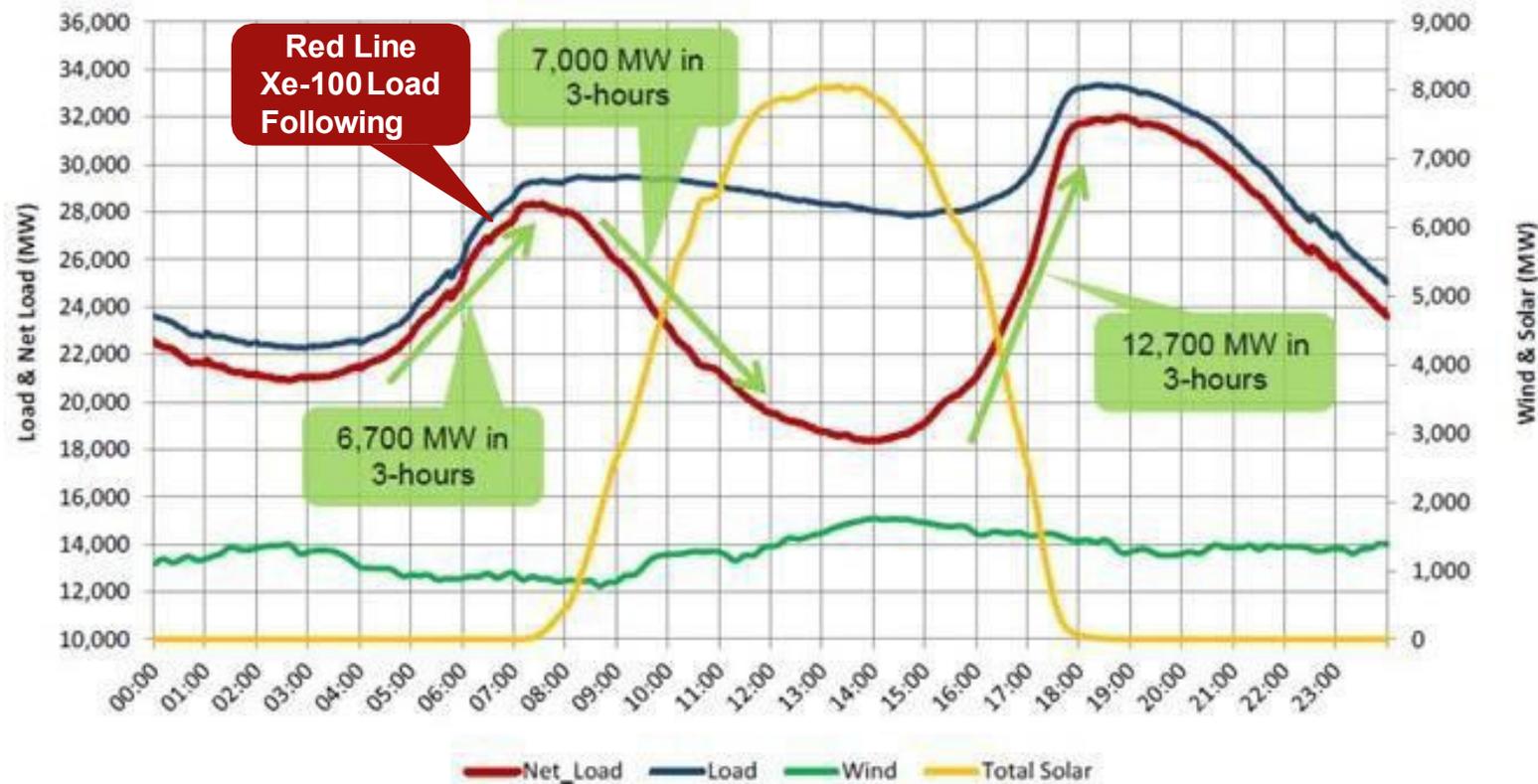
Feasibility study
Maryland Generating Station
Coal Cogeneration Plant

Technical Assessment

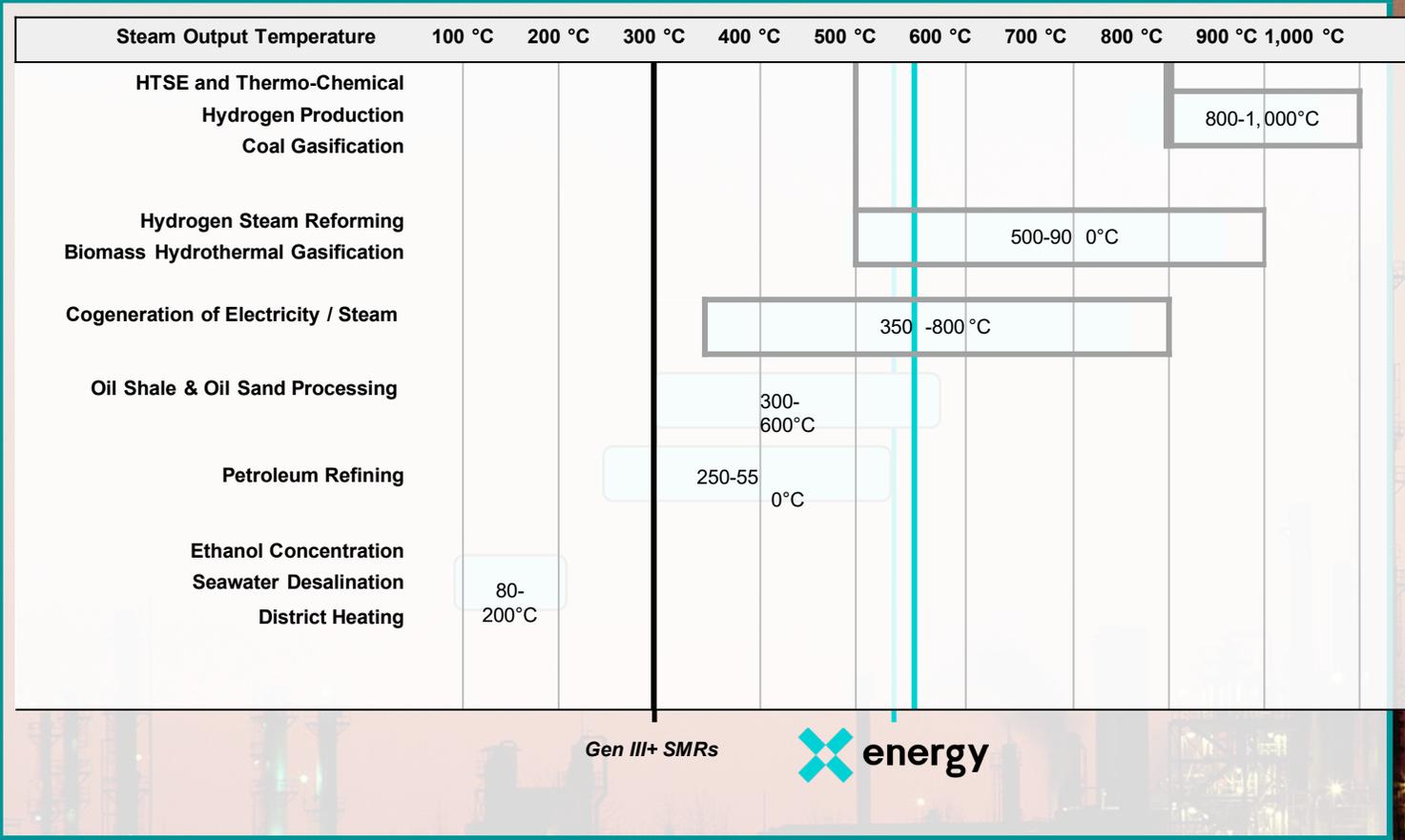
- Overall site suitability
- Existing site infrastructure
- Site plot plan of an Xe-100
- Key regulatory considerations
- Implementation schedule
- Electricity Market Assessment
- Consideration of products and revenue beyond electricity
- Assess plant investment and operating costs
- Key risks and opportunities that can measurably impact economics

Xe-100 Flexible Operations

- ➔ Ramp rate of 5% per minute, up or down between 40-100% power
- ➔ Provides stability for customers with variable electricity and/or heat demands



X-energy's Thermal Output is Well Positioned to Satisfy Most Industrial Applications



“[High Temperature Gas-Cooled Reactors] have the most market potential for supplying industrial heat applications”

— **BREAKTHROUGH** INSTITUTE

Source: Steam output temperatures based on respective SMR technology and selected public company disclosure

Xe-100 could enable bespoke solutions for the world's most challenging decarbonization efforts

Repurposes Coal Facilities



DOE identified ~315 operating and retired coal plant sites (~260 GWe) in 2022 as candidates for a coal-to-nuclear transition

- Nuclear overnight costs could decrease by ~15-35% vs. greenfield construction projects through reuse of coal facility infrastructure
- Potential to increase regional economic activity by up to \$275 million and add hundreds of permanent jobs to the region while decreasing greenhouse gas emissions by 80%+

Supports Industrial Applications



X-energy can provide cost-competitive, carbon-free process heat and power to industrial facilities

- Transportation and industry comprise >50% of US emissions, 2x that of the electricity grid

Enables Clean Hydrogen Production



X-energy can provide clean electricity to power Hydrogen Hubs

- Hydrogen has the potential to become one of the principal fuels in a low-carbon economy, but it is highly energy intensive to produce
- Compared to the intermittent sources of wind and solar energy, the Xe-100 can provide a reliable source of energy to power the production of pink hydrogen

Policymakers Recognize the Importance of Nuclear to Address the Global Need for Clean Power

United States

I have long supported the commercialization of **advanced nuclear technologies** as a **zero-emission source of baseload energy**.



Senator Joe Manchin
(D-WV) (2021)



It can't be done with wind and solar alone. We have to be a country that steps up and says it has to be...new advanced nuclear energy.



Senator Cory Booker (D-NJ)
(2019)



Nuclear energy is a very clean, very reliable way to generate energy safely - as we do every single day in this country in multiple sites.



Senator Marco Rubio
(R-FL) (2022)



Nuclear has to be part of the array of clean energy technologies, zero-carbon emitting baseload power.



Jennifer Granholm, U.S.
DOE Secretary
(2022)



Billions allocated to nuclear in every recent significant energy-related legislation (e.g., Inflation Reduction Act, Infrastructure Act) with strong bipartisan support under both Republican and Democratic Presidential Administrations

Advanced Reactor Demonstration Program

Additional \$2.5 billion from the Bipartisan Infrastructure Law



Inflation Reduction Act

*Investment / Production Tax Credits
\$700mm HALEU Support*



Enacted in 2018 -2022

Nuclear Energy Innovation and Capabilities Act

Nuclear Energy Innovation and Modernization Act

Nuclear Energy Leadership Act

Infrastructure Investment and Jobs Act

- Funding for ARDP out to 2026 – 90% of the program forward funded

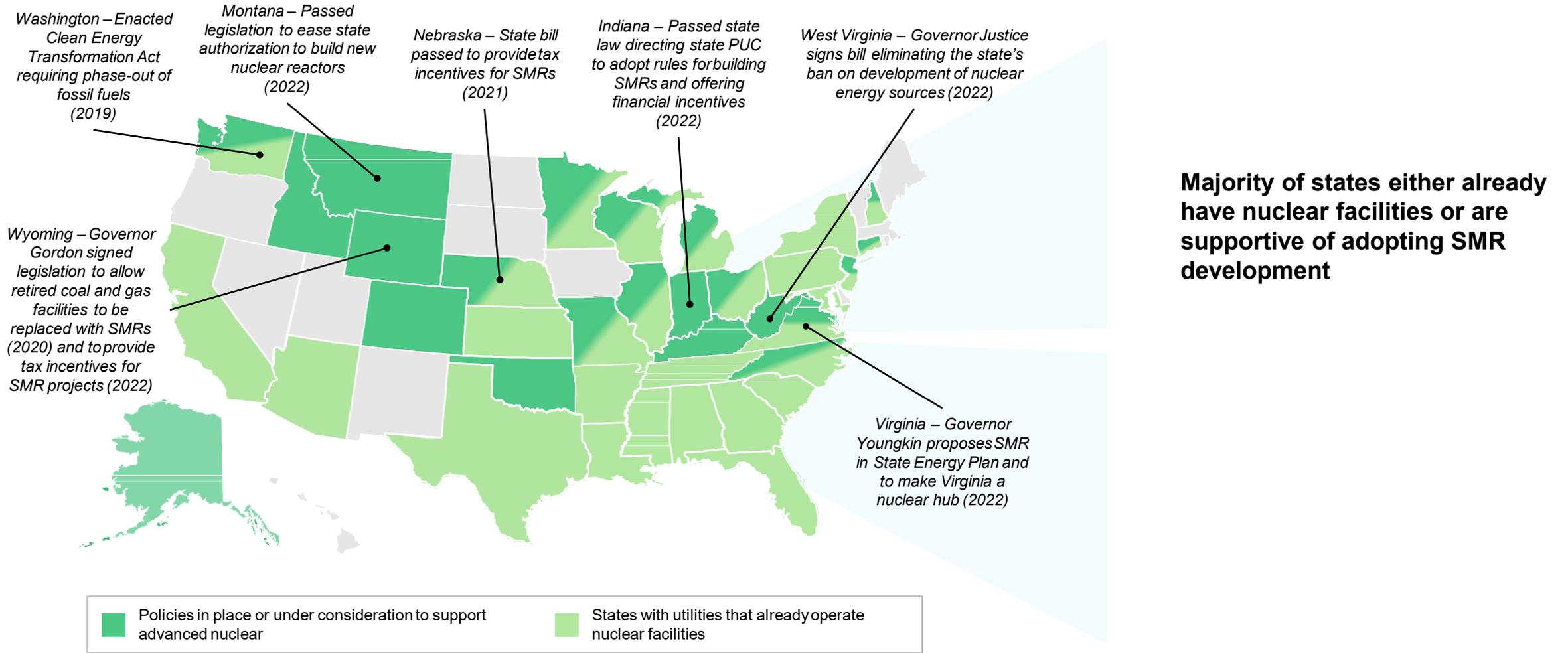
Inflation Reduction Act

- Investment and Production Tax Credits for clean energy treats nuclear on level playing field with wind and solar energy
- Incentives for coal replacement and energy communities

Other Legislation

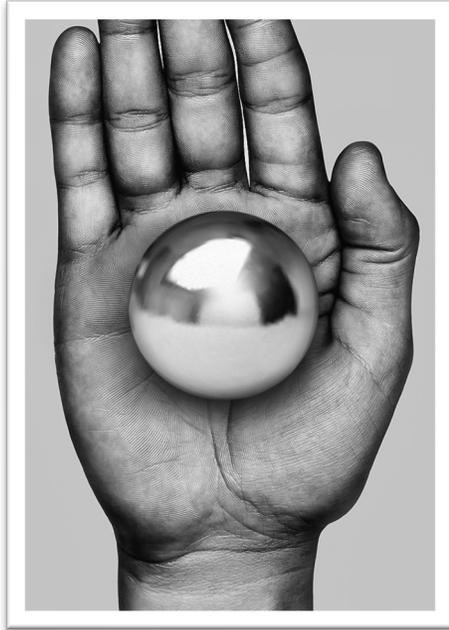
- Licensing reform
- Exports – financing and regulatory issues
- Microreactors - for military bases, remote locations, and disaster relief
- Integration of nuclear reactors with industrial applications and hydrogen production

Support for Nuclear Continues to Gain Momentum

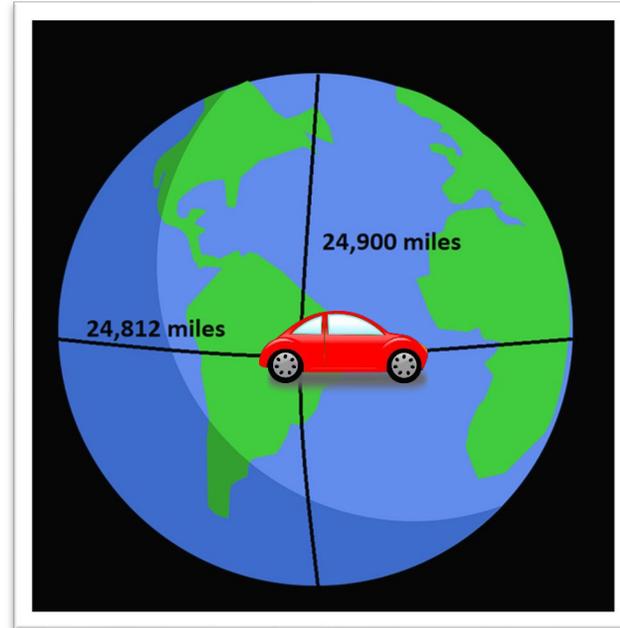


Source: PA Consulting (October 2022)

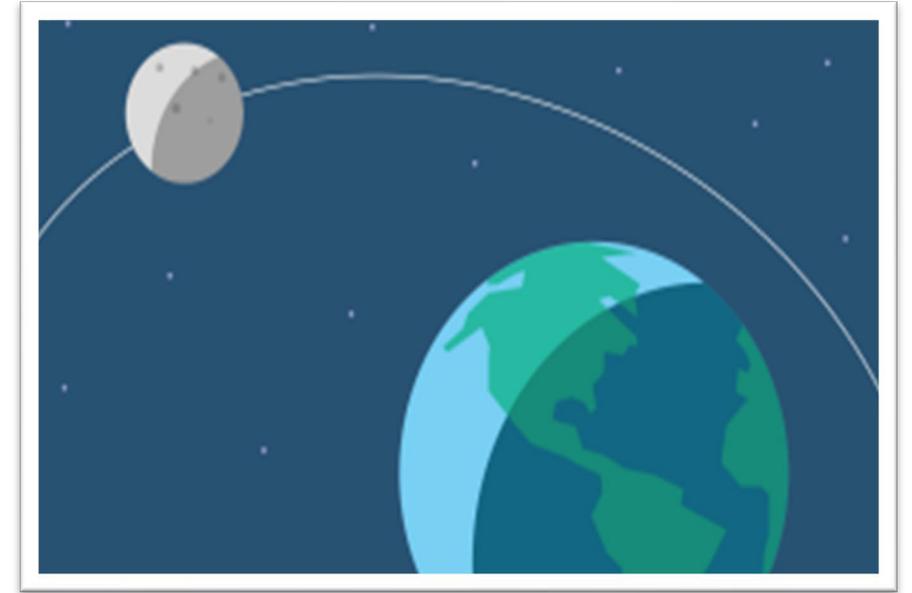
The Power of the Pebble



1 pebble produces 27.4 megawatt hours thermal



This is enough electricity to power an electric car for 98,640 miles which is 4 times the circumference of the Earth



Two-fifths of the way to the moon

Photo sources:

- <https://www.quora.com/How-many-miles-around-is-the-earth>
- <https://www.pexels.com/search/houses/>