Nuclear Energy: Public-Private Partnerships

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U.S. DEPARTMENT OF ENERGY | Office of NUCLEAR ENERGY

Accelerating the Next Generation of Nuclear Deployment

Generation IV: Nuclear Energy Systems Deployable no later than 2030 and offering significant advances in sustainability, safety and reliability, and economics

Generation I

Early Prototype Reactors

–Shippingport
–Dresden, Fermi I
–Magnox

Generation II

Commercial Power Reactors

–LWR–PWR, BWR
–CANDU
–VVER/RBMK

Generation III

Advanced LWRs

–ABWR
–System 80+
–AP600
–EPR

Near-Term Deployment

Generation III+ Evolutionary Designs Offering Improved Economics

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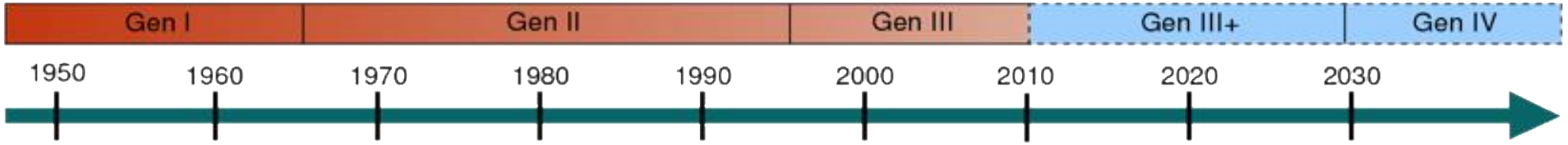
Generation IV

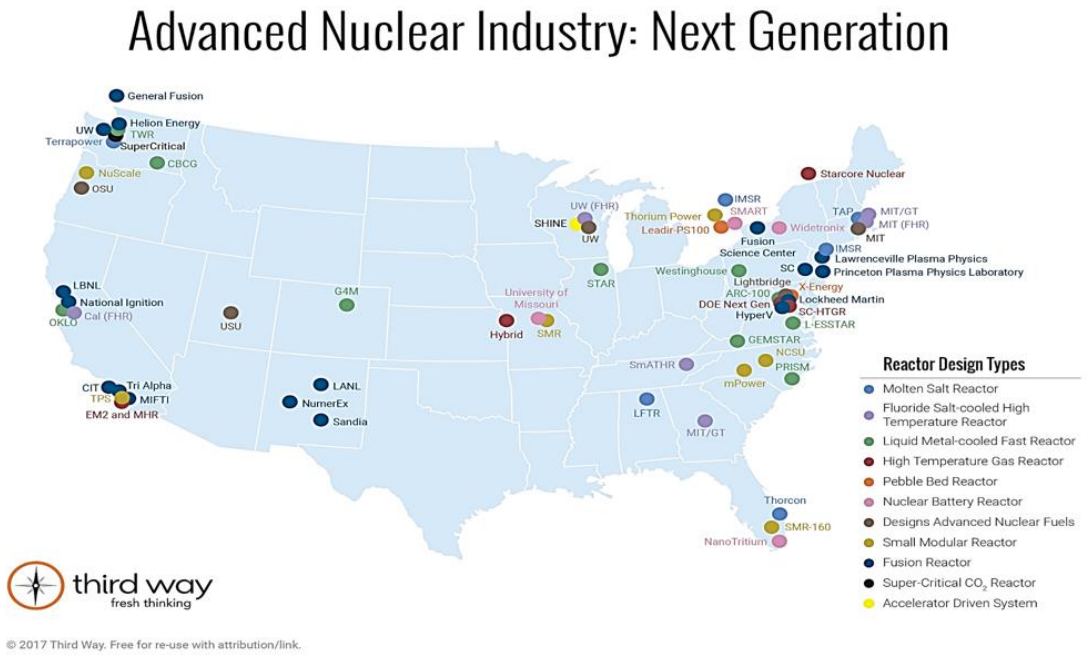
–Highly Economical
–Enhanced Safety
–Minimal Waste
–Proliferation Resistant



Nuclear Energy: Transition to Public-Private Partnerships

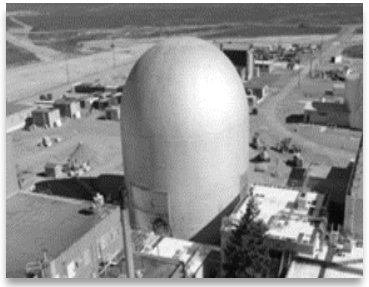
- In the middle of last decade, DOE Office of Nuclear Energy made transition to more public-private partnerships.
- White House Summit on Nuclear Energy held in November 2015.
- Gateway for the Accelerated Innovation in Nuclear (GAIN) announced at Summit.

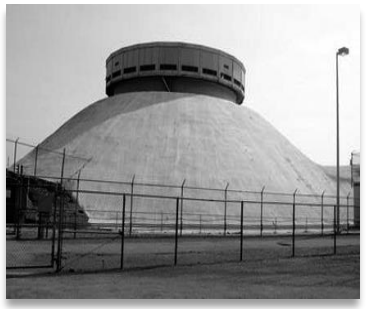
GAIN
Gateway for Accelerated Innovation in Nuclear



Nuclear Energy: Transition to Public-Private Partnerships

NRIC National Reactor Innovation Center





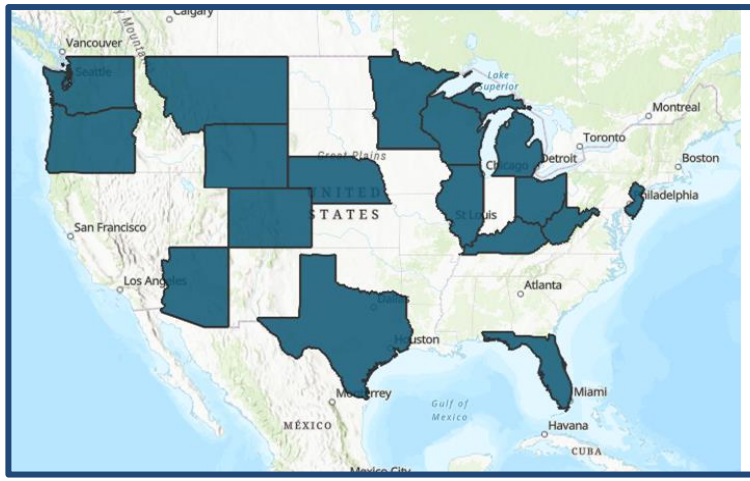
NUSCALE™
Power for all humankind

- Collaborations funded through:
  - Small Modular Reactor Program
  - iFOAs
  - Advanced Reactor Concepts (ARC) 15
  - GAIN
- National Reactor Innovation Center (NRIC) established via Nuclear Energy Innovation Capabilities Act (September 2018).
- Nuclear Energy Innovation and Modernization Act (January 2019) focused on regulatory improvements.

Gateway for Accelerated Innovation in Nuclear

- Initiative from Department of Energy: Office of Nuclear Energy
- Mission is to simplify private industry's access to the assets of the DOE complex: expertise, historical data and facilities.
- Accelerated - must match advanced nuclear developer pace and reflect the market window (next 5-10 years).
- Innovation is not just about technology. Be creative in all spaces with a bias toward taking risks.
- Focus on initiating and completing projects that support commercial deployment.

Gateway for Accelerated Innovation in Nuclear – 2022 Activities



State Level Outreach

- Policymakers, NGOs, Utilities, Regulators, Industrials, Commissioners
- Introduce Advanced Nuclear through direct conversation or testimony
- Help connect states to financial or technical resources across DOE complex
- Looking at state level regs

Coal to Nuclear Transitions

- Leading Industry Research Group
- Specific Case Studies: WY, AZ, MD, KY
- Coordinated with Interagency WG

Advanced Nuclear Industry Milestones

Purdue University and Duk...
DATE
4/27/2022

VA Legislature Passes Bill ...
DATE
4/11/2022

Indiana Passes SMR Bill
DATE
3/18/2022

NuScale Power and KGHM ...
DATE
2/14/2022

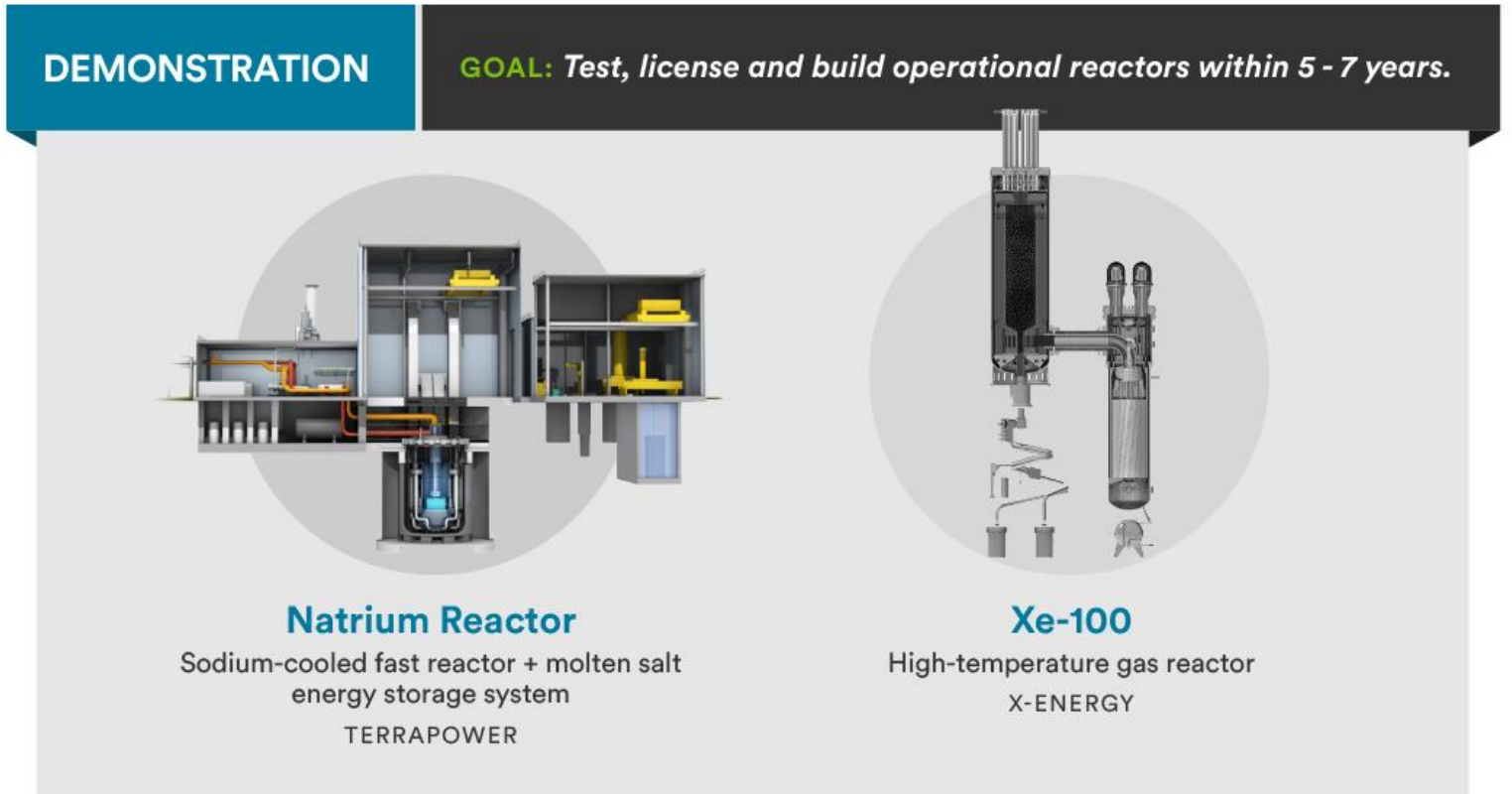
West Virginia Repeals New...
DATE
2/8/2022

Oklo Partners with Argonn...
DATE
2/8/2022

USNC Partners with Coppe...
DATE
2/2/2022

Advanced Reactor Demonstration Program

- Program established via the *Further Appropriations Act of 2020* (December 2019).
- Much of the structure for the program defined in the law.
  - Operation in 5 to 7 years
  - Evaluation board
  - General criteria
  - Demonstrations and risk reduction
- An industry day was held to gain feedback.



Demonstration awards announced in October 2020. (FOA released in May 2020)

ARDP Evaluation Criteria Defined in Law

- Technical feasibility that the demonstration can be operational in five to seven years
- Likelihood that the design can be licensed for safe operations by the Nuclear Regulatory Commission
- Use of certified fuel design or demonstration of a clear path to certification within five to seven years
- Affordability of the design for full-scale construction and cost of electricity generation
- Ability of the team to provide its portion of the cost share
- Technical abilities and qualifications of teams desiring to demonstrate a proposed advanced nuclear reactor technology

Advanced Reactor Demonstration Program

RISK REDUCTION

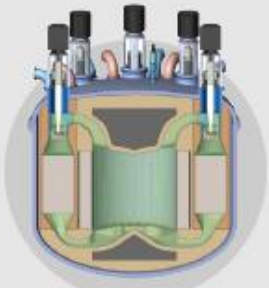
GOAL: *Solve technical, operational and regulatory challenges to support demonstration within 10 - 14 years.*

KP-FHR
Fluoride salt-cooled high-temperature reactor
KAIROS POWER

eVinci
Heat pipe-cooled microreactor
WESTINGHOUSE NUCLEAR

BWXT Advanced Nuclear Reactor (BANR)
High-temperature gas-cooled microreactor
BWX TECHNOLOGIES

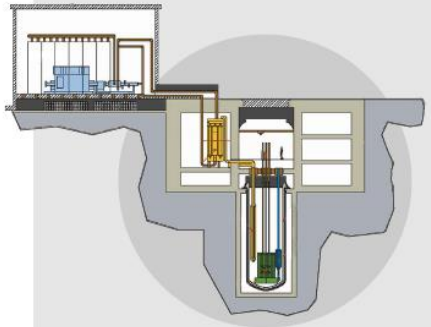
SMR-160
Advanced light-water small modular reactor
HOLTEC INTERNATIONAL



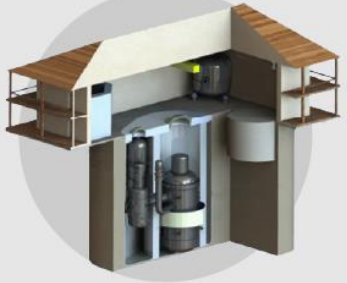
Molten Chloride Fast Reactor
SOUTHERN COMPANY

CONCEPT DEVELOPMENT

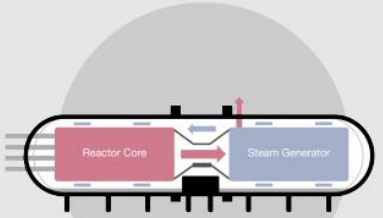
GOAL: *Solidify concept to mature technology for potential demonstration by mid-2030s.*



Advanced Sodium-Cooled Reactor Facility
ADVANCED REACTOR CONCEPTS



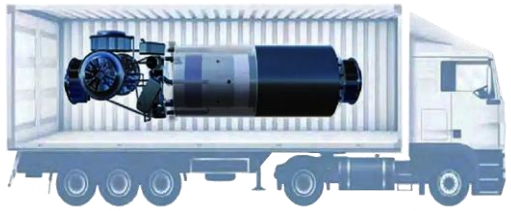
Fast Modular Reactor
GENERAL ATOMICS



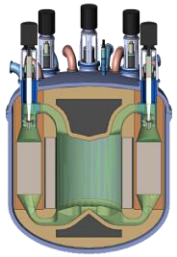
Horizontal Compact High-Temperature Gas Reactor
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

2020 – 2030: An Important Decade for Nuclear Energy in the United States

MARVEL
DOE
2022-2023



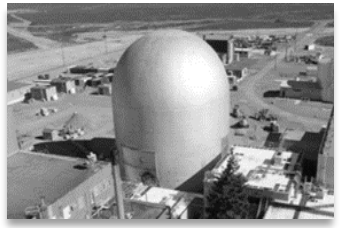
Project Pele Microreactor
DoD
2023-2024



MCRE
Southern Co. & TerraPower
2025

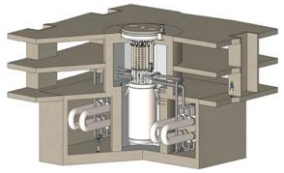
TerraPower
Southern Company

DOME Test Bed
NRIC
2023-2024



LOTUS Test Bed
NRIC
2024

NRIC National Reactor Innovation Center

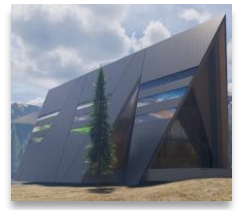


Hermes
Kairos
2026

Kairos Power

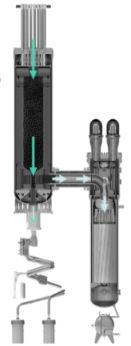
Aurora
Oklo Inc.
TBD

OKLO



Xe-100
X-energy
2027

energy



Natrium Reactor
TerraPower & General Electric
2028

TerraPower
HITACHI

2030

SMR
UAMPS &
NuScale
2029

UAMPS
NUSCALE
Power for all humankind

Clean. **Reliable. Nuclear.**