NORTH AMERICA REGION

Advanced Reactor Development

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Prepared for:

International Nuclear Societies Council

Workshop

September 17, 2025

Driving Factors for Advanced Nuclear Development in North America

Canda

- *Decarbonization / Net-zero electricity production*
- *Phasing out fossil fuels*
- *Providing consistent power to remote communities*

Near-term Goals

- *Reduced regulatory barriers*
- *Continued government support through tax credits*

United States

- *Reduced reliance on foreign sources of energy*
- *Support U.S. manufacturing*
- *Developing commercial nuclear products for a global market*
- *Satisfying a rapidly increasing demand*

Near-term Goals

- *Similar concerns with reducing regulatory barriers and continued government support through tax credits*

Recent Milestones in North America

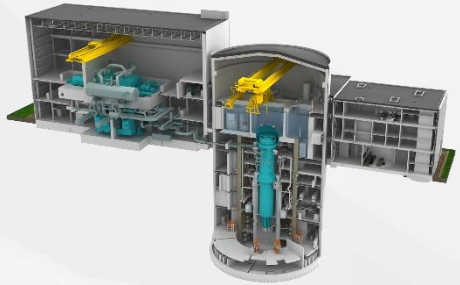
- Completion of for U.S. advanced reactors with Vogtle Units 3 and 4
- Approval of GE Hitachi's construction license by the Canadian Nuclear Safety Commission for one reactor at the Darlington site
- U.S. passage of the ADVANCE Act
- U.S. DOE's program to bring 3 advanced reactors critical by July 4, 2026
- Private investment by leading tech firms of over $1 billion to produce an additional 30 GW of new nuclear capacity

Advanced Reactors Currently Under Construction in North America

- **Oak Ridge, Tennessee**
  Kairos Power Hermes 2
  - *Demonstration plant, fluoride salt-cooled, high-temperature reactor*
  - *50 MWe (Commercial design will be 2 x 75 MWe)*
  - *ARDP Risk Reduction Award ($629 million)*
  - *Demonstration Date: 2027*

- **Kemmerer, Wyoming**
  TerraPower Natrium
  - *Sodium-cooled fast reactor (with molten salt energy storage system*
  - *345 MWe (Storage system allows for boosts up to 500 MWe)*
  - *ARDP Demonstration Award ($160 million)*
  - *Demonstration Date: 2030*

- **Bowmanville, Ontario**
  GE Vernova BWRX-300
  - *Light-water SMR*
  - *300 MWe*
  - *Canada Infrastructure Bank Investment ($713 million)*
  - *Demonstration Date: 2029*



Steps Needed Now to Support Our First Movers

- Ensure government funding is stable and reliable
- Identify unexpected complexities and establish best practices for addressing these issues
- Educate both investors and the general public
- Lay the groundwork now for fast followers to encourage next round of development before first round is completed

Recent Steps for Kairos

Kairos Power

- Already working in collaboration with the utility Tennessee Valley Authority and Google
- Working to manufacture TRISO fuel, one of five companies the DOE is planning to provide with HALEU, and is partnering with BWX to develop fuel fabrication facilities
- Has installed the reactor vessel on it's third non-nuclear test unit, which will eventually become a training and testing center
- Has partnered with Oak Ridge National Laboratory to 3D print "cast-in-place" molds for unique structural components

Recent Steps for GE Vernova

GE VERNOVA
Our portfolio of energy businesses

- Construction permit for the TVA Clinch River site is currently under review

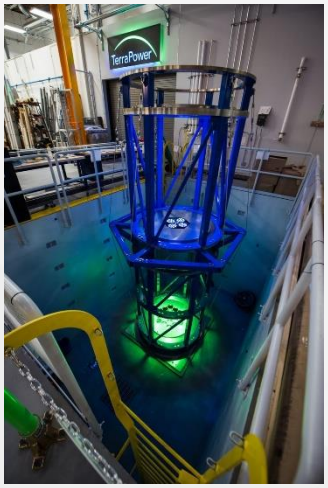
- New accident tolerant, high-burnup fuel rod design being tested at Pacific Northwest National Lab. Would extend fuel cycle from 36 to 48 months

- One of two companies being considered by Sweden and UK. Would be Sweden's fist new nuclear plant in over 40 years

- In early planning stages with Finland, Poland, Estonia, Hungary, Slovakia, and UAE

Recent Steps for TerraPower

- In early planning stages with Utah and Texas
- Recently obtained a $650 million investment from NVIDIA
- NRC has agreed to “fast track” the Kemmerer, Wyoming construction permit, with plans to complete the review by the end of the year. Has also given TerraPower permission to begin construction on the energy storage system
- Has already secured 100% of the long-lead items, including the entire reactor enclosure system



Recent Steps for NuScale

- Recently received NRC approval for second 77-MW design
- Tennessee Valley Authority agreed to deploy 6 GWs of NuScale SMRs across seven states
- Has opened 11 computer modeled YOYGR-12 simulators in college campuses across the US and internationally through grants from the DOE
- Has developed a model desalination plant that would provide water to 2.3 million while still producing enough electricity for 400k homes. Worked with the PNNL to develop a decomposition method to convert leftover brine to clean hydrogen

Other North American Advanced Nuclear Companies

- **Oklo**
  Aurora – Liquid Metal-Cooled Fast Reactor
  - *Has begun work on site selection at Idaho National Laboratory*
  - *DOE has already approved the Conceptual Safety Design report for Onklo's fuel fabrication facility, also to be deployed at INL*
  - *Reselected to develop microreactor for Eielson Airforce Base in Alaska*

- **X-Enery**
  Xe-100 SMR – High-Temperature Gas-Cooled Pebble-Bed Reactor
  XENITH – Road-Transportable Microreactor
  - *NRC reviewing construction permit for Texas site with Dow Chemical*
  - *Working with Amazon, Energy Northwest, and Korea Hydro & Nuclear Power Corporation to develop Xe-100s for data centers*
  - *Working with DOD to develop microreactors for military bases and deployment*

energy

- **Natura Resources**
  Natura MSR-100 - Liquid Fueled Molten Salt Reactor
  - *Developing two deployments in Texas for desalination*

Natura Resources

Other North American Advanced Nuclear Companies

- **Westinghouse**
  eVinci – Transportable Microreactor
  - *First microreactor to receive Preliminary Safety Design Report from the DOE*

- **Radiant**
  Kaleidos - Microreactor
  - *Developing portable 1.2 MWe high-temperature gas-cooled microreactor that could replace portable diesel generators*

- **Antares**
  R1 - Microreactor
  - *Developing remote operating microreactor that could be used on Earth or in outer space*

U.S. Nuclear Reactor Pilot Program

These companies have been selected by the DOE to construct at least 3 nuclear test reactors that will attempt to achieve criticality by July 4, 2026

- Aalo Atomics Inc.
- Antares Nuclear Inc.
- Atomic Alchemy Inc.
- Deep Fission Inc.
- Last Energy Inc.
- Oklo Inc.
- Natura Resources LLC
- Radiant Industries Inc.
- Terrestrial Energy Inc.
- Valar Atomics Inc.

U.S. DOD Advanced Nuclear Power for Installations Program

These companies have been selected by the DOD to design, license, build, and operate one or more microreactor nuclear power plants on military installations

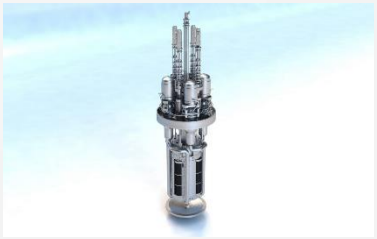
- Antares Nuclear, Inc
- BWXT Advanced Technologies LLC
- General Atomics Electromagnetic Systems
- Kairos Power, LLC
- Oklo Inc
- Radiant Industries Incorporated
- Westinghouse Government Services
- X-Energy, LLC

NASA’s Push to Put a Nuclear Reactor on the Moon

- Reactors are necessary because, while orbiting spacecraft have the option to use solar, any stationary Moon-based settlement would be subjected to the 2-week long periods of lunar night
- Plan to launch a 100kWe reactor by 2030
- Estimated cost of around $3 billion over 5 years
- A number of nuclear companies have already been involved in research and design studies, including Westinghouse, X-energy, Intuitive Machines, Rolls-Royce, and BWX Technologies

Advanced Reactors Currently Under Construction in North America

- **Aalo-X, Aalo Atomics**
  - *Demonstration of the extra modular, sodium cooled reactor, the Aalo Pod*
  - *10 MWe, Commercial version will be 50 MWe*
  - *Plans to achieve criticality July 4, 2026*
- **Project Pele**
  - *Demonstration of an ultra portable, high-temperature gas microreactor built by BWX*
  - *1.5 MWe, Commercial versions will produce between 1-5 MWe*
  - *Currently under construction in Virginia, will be delivered to INL next year for testing*
- **MARVEL**
  - *Sodium-potassium-cooled microreactor testbed*
  - *10-20 kWe plus 85 kWth*
  - *Operational by 2027*
- **Molten Chloride Reactor Experiment (MCRE)**
  - *Uses a mixture of molten chloride salt and uranium as its fuel and coolant*
  - *Developed by TerraPower and Southern Company*
  - *200-300 kWth*
  - *Operational by 2028*



Nuclear Power in Africa

Africans with Electricity Access

~40%

Lowest Rate Globally

African Nations Going Nuclear

13

Countries actively considering or planning nuclear energy programs

Nuclear Power Plants in Africa

2

1 Operating (South Africa) and 1 Under Construction (Egypt)

Projected Nuclear Growth (2050)

x5

Africa's nuclear capacity could triple by 2030 and low estimates say fivefold by 2050

Milestones

1957

IAEA Founded & African Membership

Africa joins the International Atomic Energy Agency at its inception, gaining access to nuclear technology cooperation and safety standards.

1984

Koeberg NPP Begins Operation

South Africa connects Koeberg nuclear power plant to the grid – Africa's first (and for decades, only) commercial nuclear plant.

2009

African Nuclear-Weapon-Free Zone Treaty

Treaty of Pelindaba enters force, establishing the African Commission on Nuclear Energy (AFCONE) to promote peaceful nuclear applications in Africa.

2018

ANS–Morocco Cooperation Agreement

ANS signs bilateral agreements (e.g., with Morocco's nuclear society) to foster mutual collaboration, marking formal engagement with African nuclear professionals.

Milestones

2023

‘Atoms for Africa’ & Revitalized Momentum

World Nuclear Association and AFCONE sign an MoU to boost nuclear energy in Africa. ANS publications spotlight Africa’s nuclear potential, aligning with a surge of interest across the continent.

2024

ANS Hosts Africa Nuclear Panel

ANS holds the webinar “Unlocking Africa’s Potential with Nuclear Energy,” bringing global experts to discuss African nuclear initiatives.

2025

IAEA’s Africa Outlook & G20 Support

IAEA publishes *Outlook for Nuclear Energy in Africa*, projecting significant nuclear growth and highlighting international support (IAEA-World Bank partnership) for Africa’s nuclear future.

Nuclear Energy Efforts in Africa

- **DOE-NE** and the **Ghana Atomic Energy Commission (GAEC) Nuclear Power Institute** partner to create a regional **Clean Energy Training Center.**
- **US-Africa Nuclear Energy Summit** held in 2023
- **IAEA** hosts SMR Workshop in Kenya
- **ANS** hosted **"Unlocking Africa's Potential with Nuclear Energy"** Webinar in 2024