

New Nuclear Energy

July 17, 2023

NASUCA

Marc Nichol
Senior Director, New Reactors

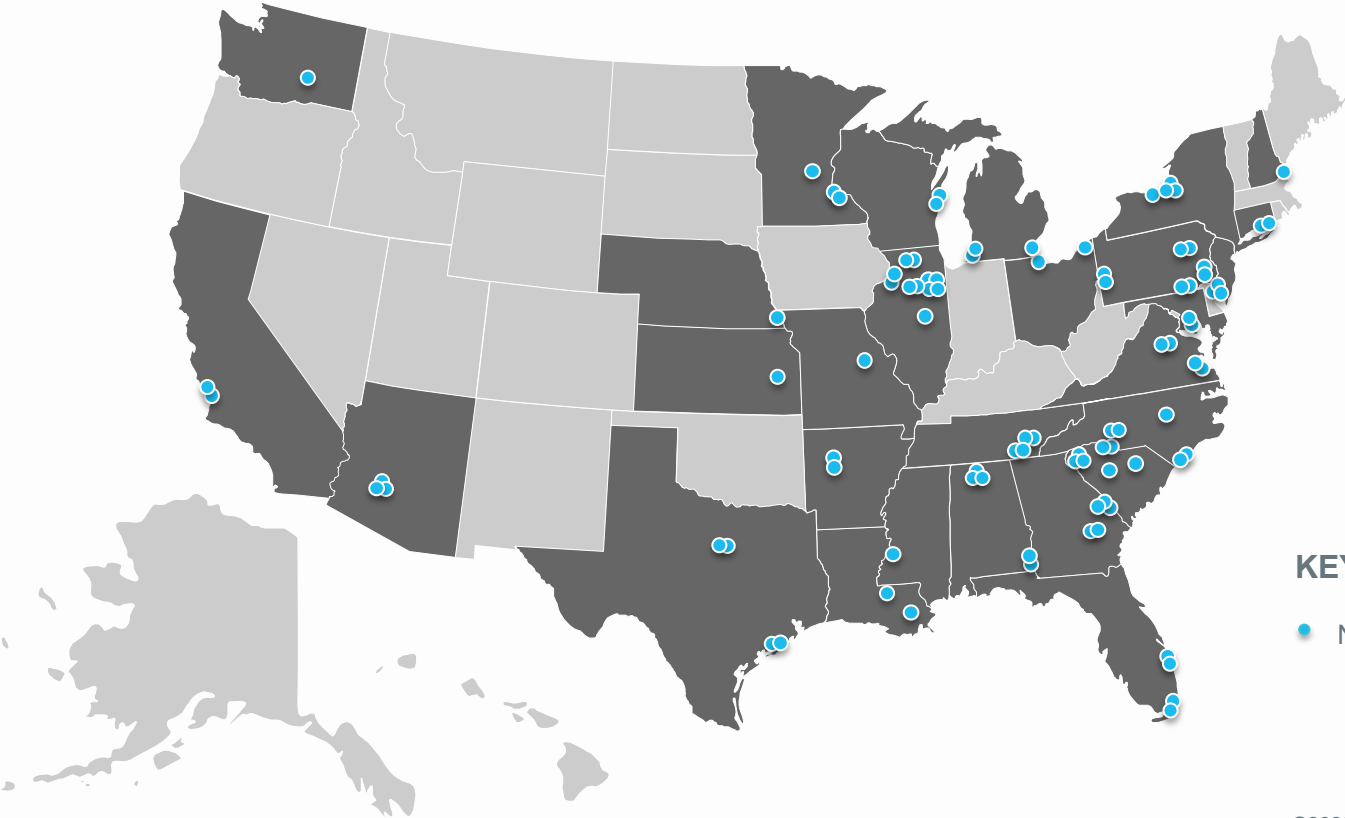


Nuclear Provided Majority of Emissions-Free Electricity



Nuclear generated 19% of electricity in the U.S.

From 93 reactors at 53 plant sites across the country



KEY

● Nuclear power reactor

Voices for Nuclear



“The United States views nuclear energy as a pivotal technology in the global effort to lower emissions, expand economic opportunity, and ultimately combat climate change. We have been supporting the development of SMRs for decades.”

Jennifer Granholm

Secretary
U.S. Department of Energy
November 4, 2021



Republicans have plans to reduce those emissions while investing in clean energy technology that will lead to less emissions, lower costs, and produce as much or more power. Chief among them is advanced nuclear technology.”

Rep. Kevin McCarthy

(R-CA)
February 26, 2020



“If we’re going to continue to move and talk about decarbonization and not going to move forward with nuclear we’re [going to have] serious problems.”

Sen. Joe Manchin

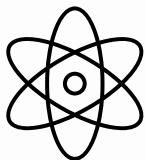
(D-W.V.)
June 4, 2020



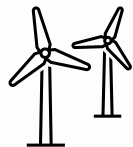
Scan to see what everyone is saying about America's largest clean energy source.

Consumer Benefit: Lowest System Cost Achieved by Enabling Large Scale New Nuclear Deployment

Lowest Cost System

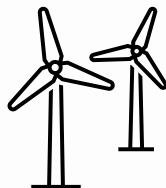


Nuclear is 43% of generation (>300 GW of new nuclear)

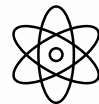


Wind and solar are 50%

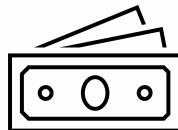
Energy System with Nuclear Constrained



Wind and Solar are 77% of generation



Nuclear is 13% (>60 GW of new nuclear)



Increased cost to customers of \$449 Billion

Both scenarios are successful in achieving 95% clean electricity grid by over 95% by 2050 and economy-wide GHG by over 60%

System Benefits of Advanced Reactors

Long term price stability

- Low fuel and operating costs

Reliable dispatchable generation

- 24/7, 365 days per year, years between refueling (Capacity factors >92%)

Integration with renewables and storage

- Paired with heat storage and able to quickly change power

Efficient use of transmission

- Land utilization <0.1 acre/TWh (Wind =1,125 acre/TWh; Solar 144 acre/TWh)

Environmentally friendly

- Clean energy
- Many SMRs are being designed with ability for dry air cooling

Black-start and operate independent from the grid

- Resilience for mission critical activities
- Protect against natural phenomena, cyber threats and EMP

Recent Survey of NEI's U.S. Utilities

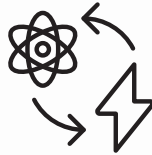
Nuclear power's potential role in meeting their company's decarbonization goals:

SLR



>90% of fleet expects to operate to at least **80 years**

GW



100 GW of new nuclear opportunity by **2050s**

SMRs



Translates to roughly **300 SMR-scale plants**

NEI utility member companies produce nearly half of all US electricity.

Advanced Reactor Developers



HITACHI



Muons, Inc.
Innovation in Research



NANO
Nuclear Energy Inc.



Expanding Versatility through Advanced Technology

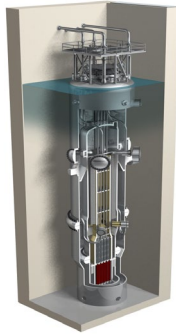


Micro Reactors
($< 20\text{MWe}$)



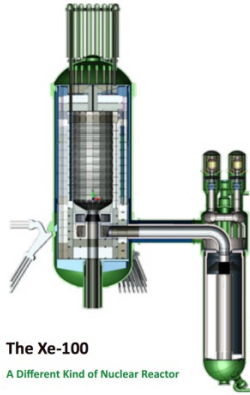
Oklo (shown)
Approximately a dozen in
development

Light-Water SMRs
 $< 300\text{MWe}$



NuScale (shown)
GEH BWRX-300
Holtec SMR-160

High Temp
Gas Reactors



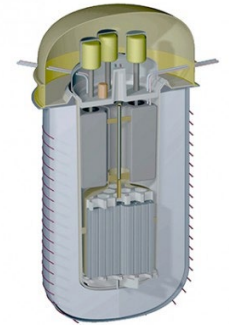
The Xe-100
A Different Kind of Nuclear Reactor
X-energy (shown)
Several in development

Liquid Metal Reactors



TerraPower Natrium™
(shown)
Several in development

Molten Salt Reactors

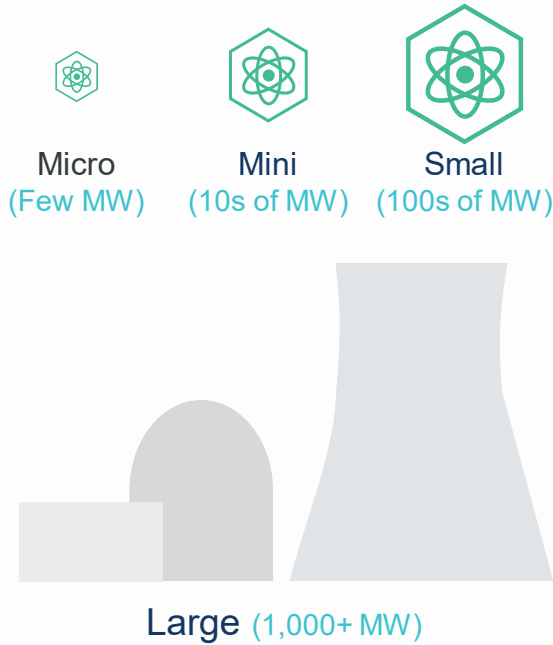


Terrestrial (shown)
Several in development

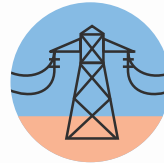
Non-Water Cooled
Most $< 300\text{MWe}$, some as large as $1,000\text{ MWe}$

Advanced Nuclear Versatility

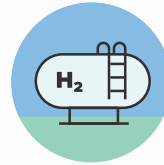
Spectrum of Sizes and Options



Variety of Outputs



Electricity



H₂ Hydrogen



Process Heat

Multitude of Uses



Homes



Vehicles



Businesses



Aviation



Rail



Shipping



Concrete



Steel



Factories



Water



Space

Strong Federal Support for Advanced Reactors

- DOE funding 12 different designs, >\$5B over 7 years
- Infrastructure Bill
 - \$2.5B funding for two demonstration projects
- Inflation Reduction Act
 - PTC: At least \$30/MWh for 10 years
 - ITC: 30% of investment
 - Both can be monetized, include 10% bonus for siting in certain energy communities
 - Loan Guarantees – up to \$40B in expanded authority
 - HALEU Fuel - \$700M
- CHIPS Act
 - Financial assistance to States, Tribes, local governments and Universities

September 2022

Current Federal Policy Tools to Support New Nuclear

The following is a list of current policy tools that could directly support the deployment of new nuclear, could potentially indirectly support the deployment or planning for new nuclear, and that currently support the deployment of new nuclear.

Programs that Could Directly Support Deployment of New Nuclear

Clean Electricity Production Credit – 45Y

The Inflation Reduction Act created a new technology-neutral tax credit for all clean electricity technologies, including advanced nuclear and power uprates that are placed into service in 2023 or after. The bill does not change the existing Advanced Nuclear Production Tax Credit but precludes credits from being claimed under both programs. The value of the credit will be at least \$30 per megawatt-hour, depending on inflation, for the first ten years of plant operation. The credit phases out when carbon emissions from electricity production are 75 percent below the 2022 level. The following is a link to the statutory language.

<https://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title26-section45Y&freesort&fq=true&num=2&histrue&edition=prelim>

Clean Electricity Investment Credit – 48E

As an alternative to the clean electricity PTC, the Inflation Reduction Act provided the option of claiming a clean electricity investment credit for zero-emissions facilities that is placed into service in 2025 or thereafter. This provides a credit of 30 percent of the investment in a new zero-carbon electricity facility, including nuclear plants. Like the other credits, this investment tax credit can be monetized. The ITC phases out under the same provisions as the clean electricity PTC.

<https://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title26-section48E&freesort&fq=true&num=4&histrue&edition=prelim>

Both the clean electricity PTC and ITC include a 10-percentage point bonus for facilities sited in certain energy communities such as those that have hosted coal plants. The following is a link to the statutory language.

Credit for Production from Advanced Nuclear Power Facilities – 45I

The nuclear production tax credit 26 USC 45I provides a credit of 1.8 cents per kilowatt-hour up to a maximum of \$125 million per tax year for 8 years. Only the first 6000 MW of new capacity installed after 2005 for a design approved after 1988 are eligible for the tax credit. The credit does not include a direct pay provision, so the owner will need to have offsetting taxable income to claim the credit or transfer the credit to an eligible project partner. The following is a link to the statutory language.

<https://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title26-section45I&freesort&fq=true&num=5&histrue&edition=prelim>

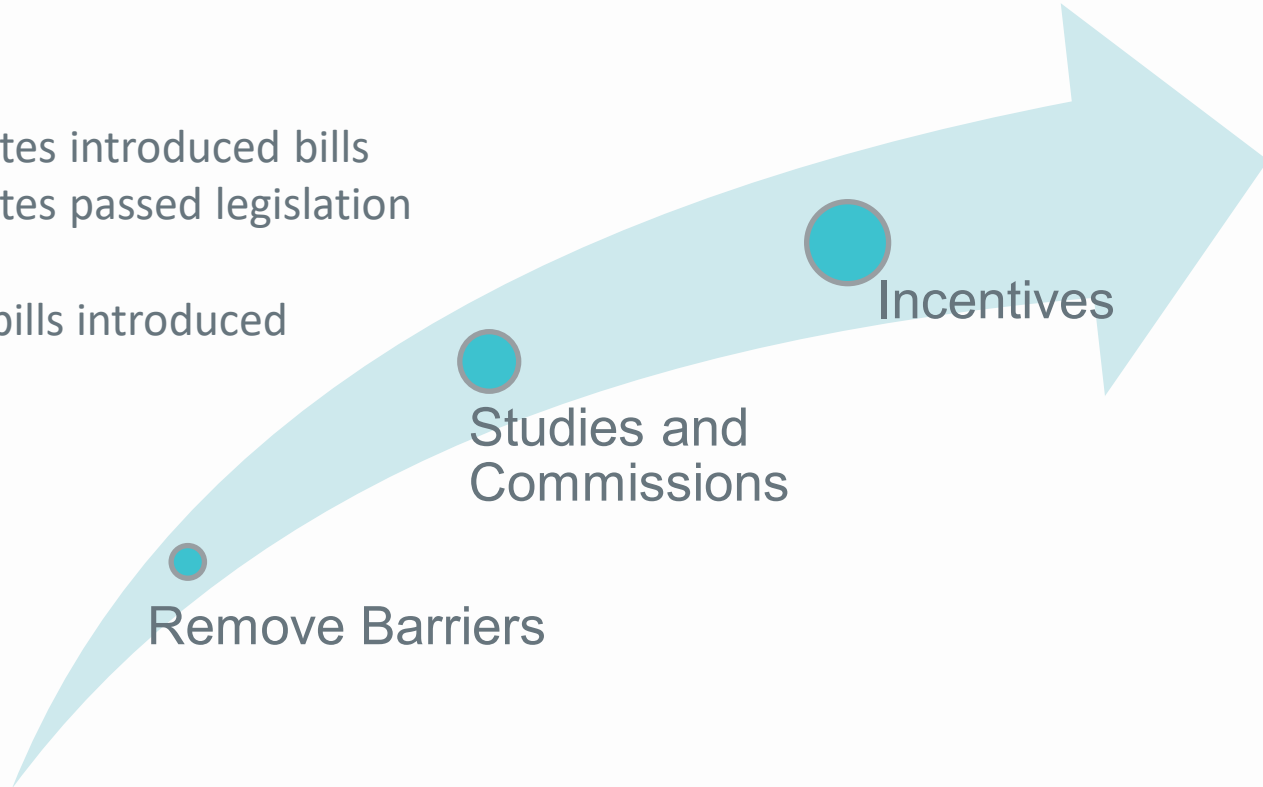
State Action for Advance Reactors

2022

- 19 States introduced bills
- 11 States passed legislation

2023

- 100+ bills introduced



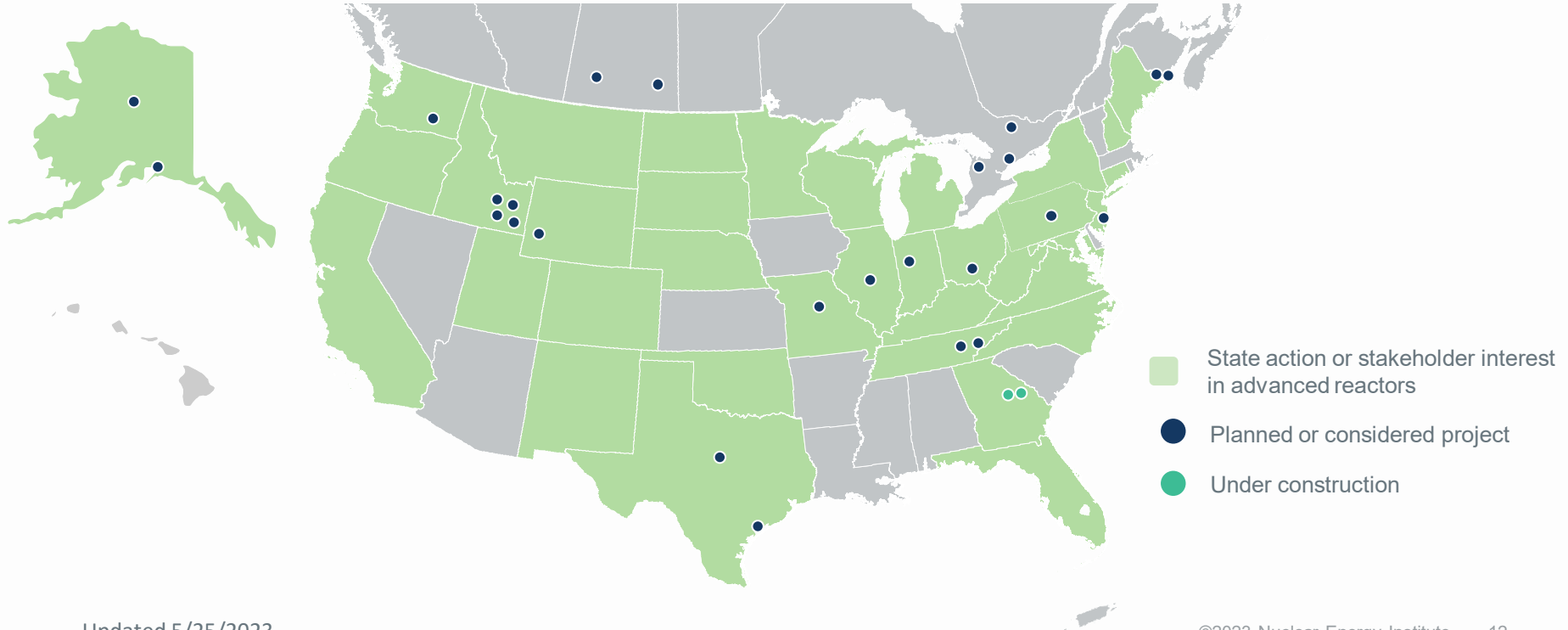
Remove Barriers

Studies and
Commissions

Incentives

Advanced Nuclear Deployment Plans

Projects in planning or under consideration in U.S. and Canada >20; Globally >30



QUESTIONS?

