NUCLEAR ENERGY INSTITUTE

Small Nuclear Reactors Outlook Roundtable:

U.S. SMR Development

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LAS-ANS Symposium
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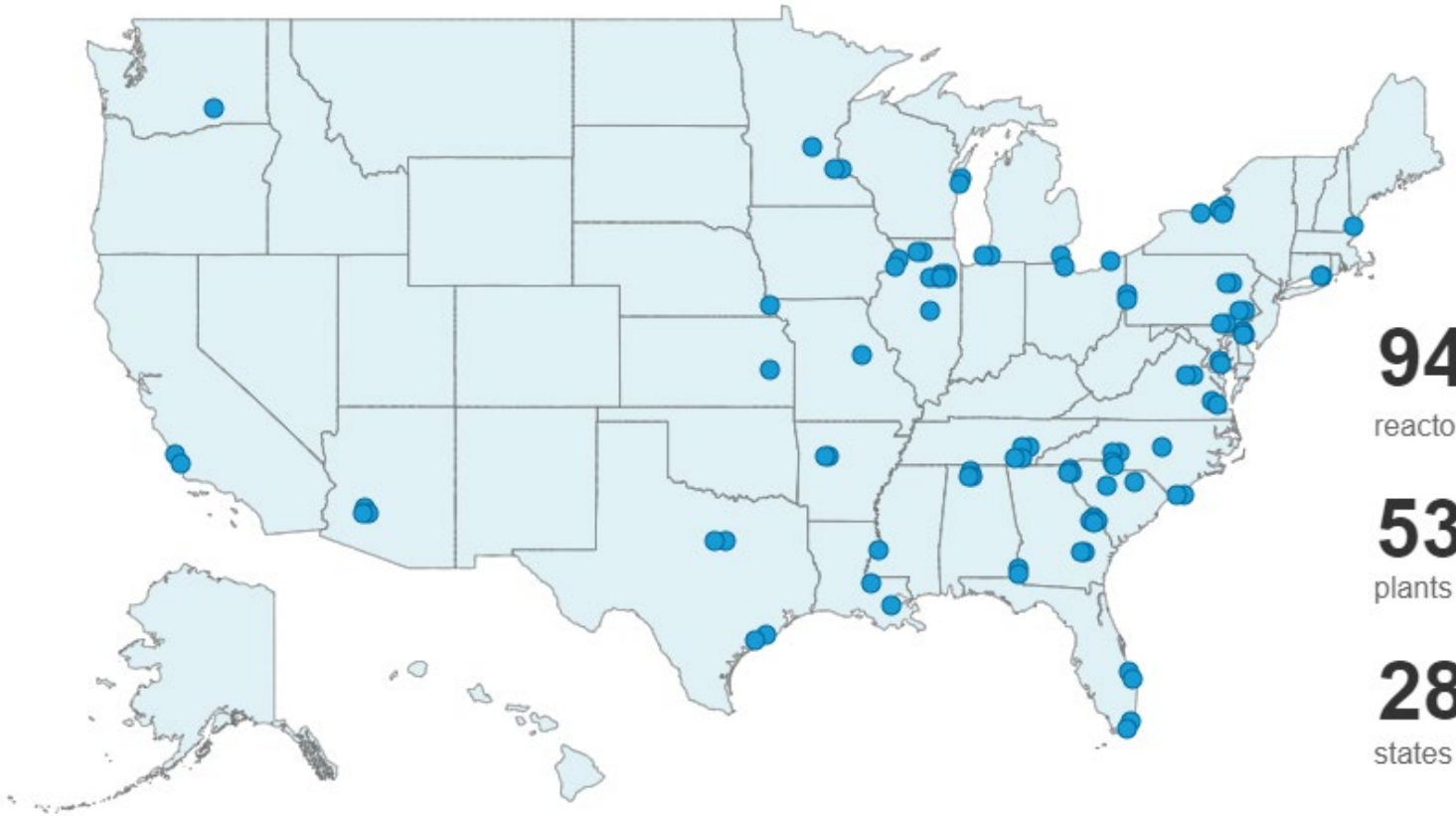
Key Takeaways

- U.S. nuclear energy market poised for major expansion
- Range of advanced reactor designs to meet diverse market needs
- International partnerships have geopolitical implications

Nuclear Provides Majority of Emissions-Free Electricity



94 reactors

53 plants

28 states

45.5%
share of carbon-free electricity generated by nuclear energy

437M
metric tons of carbon emissions avoided in 2023

475,000
well-paying, sustainable direct and indirect jobs in the nuclear industry

93.0%
capacity factor of U.S. nuclear plants in 2023 as a reliable electricity source

The Global Energy Challenge

Standard of Living

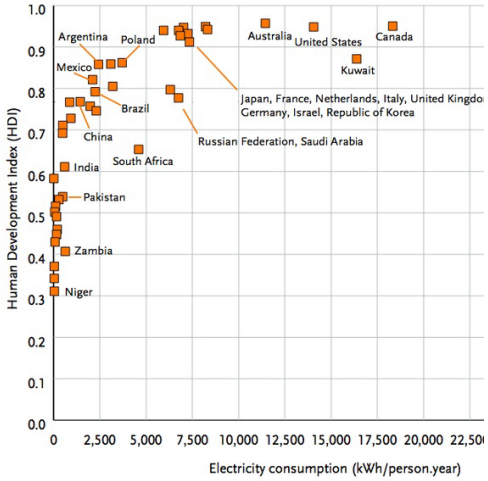
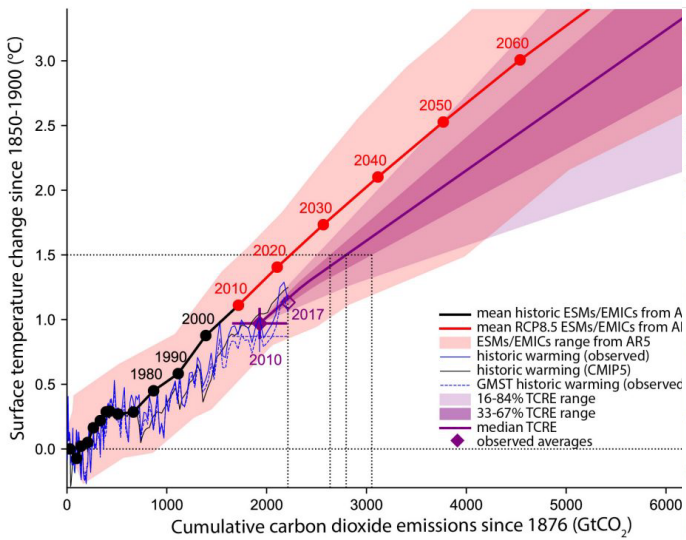


Figure 1.6 Relationship between human development index (HDI) and per capita consumption, 2003 – 2004

Note: World average HDI equals 0.741. World average per capita annual electricity at 2,490 kWh per person.year, translates to approximately 9 gigajoules (GJ)/perso kilowatts (kWh) = 36 GJ]

Source: UNDP, 2006.

Carbon Reduction



Energy Security

The New York Times

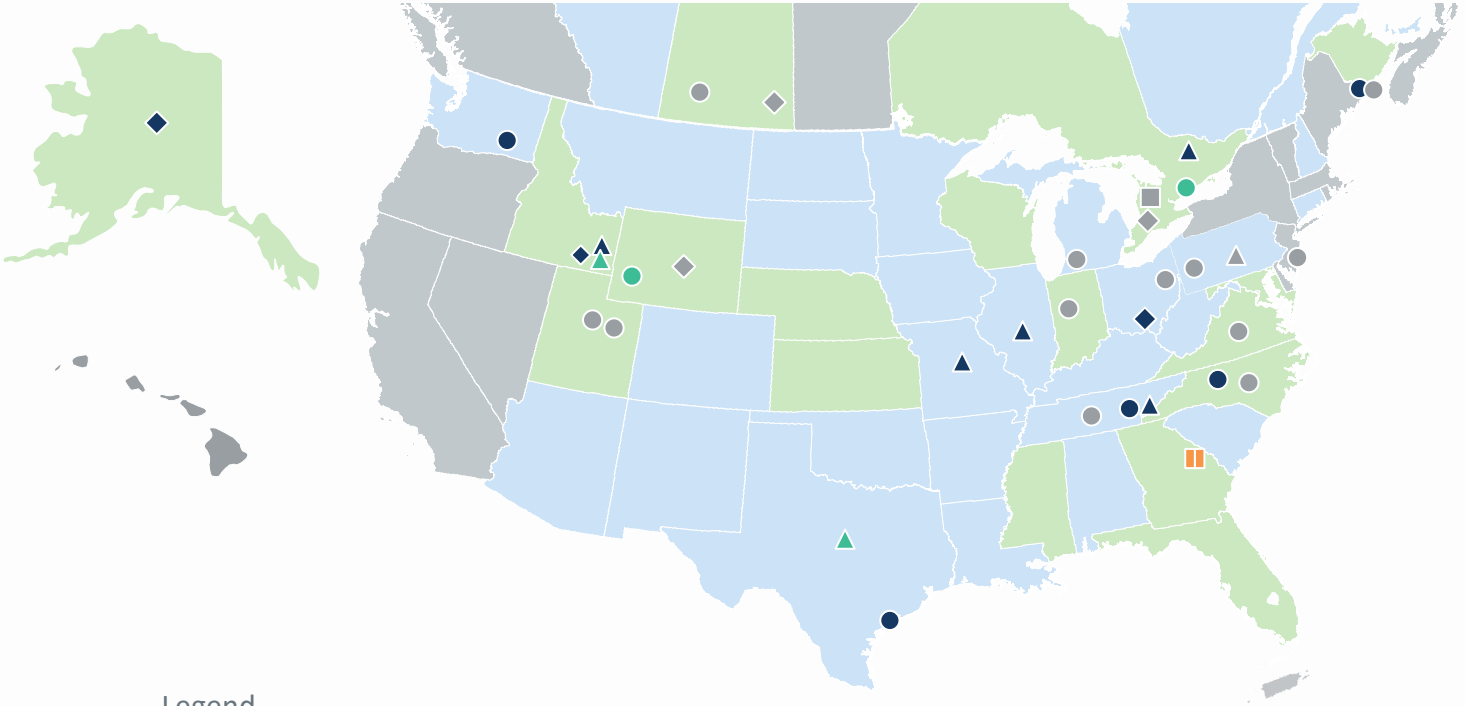
The European Union seeks independence from Russian oil and gas.

Europe had long trusted in what many thought was a mutually beneficial business relationship. That has changed.

Advanced Nuclear Deployment Plans

State support and projects that may be in operation by early 2030s

Updated 07/05/2024



Legend

State Actions – Substantive Incentives

State Actions – Supportive and Exploring

Considered project

Planned project

Under construction

Operating

Large (1,000 MWe)

Small (<300 MWe)

Micro-reactor (<50 MWe)

University / Research / Test

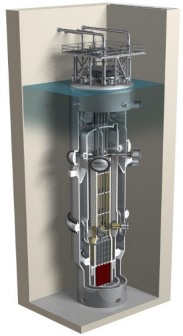
Types of Advanced Reactors

Range of sizes and features to meet diverse market needs

Micro Reactors < 50MWe

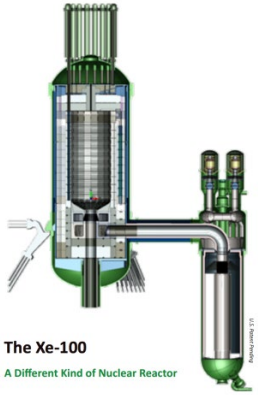
Oklo (shown)
Approximately a dozen in development

LWR SMRs <300MWe



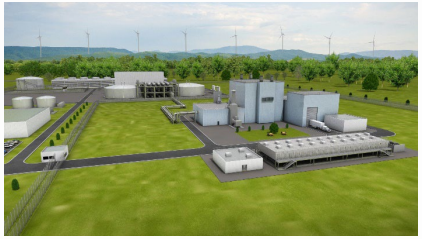
NuScale (shown)
GEH BWRX-300
Holtec SMR-300
Westinghouse AP300

High Temp Gas Reactors



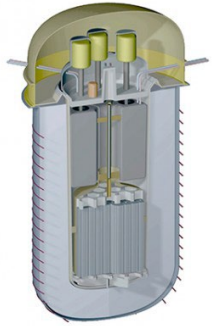
X-energy (shown)
Several in development

Liquid Metal Reactors



TerraPowerNatrium™ (shown)
Several in development

Molten Salt Reactors

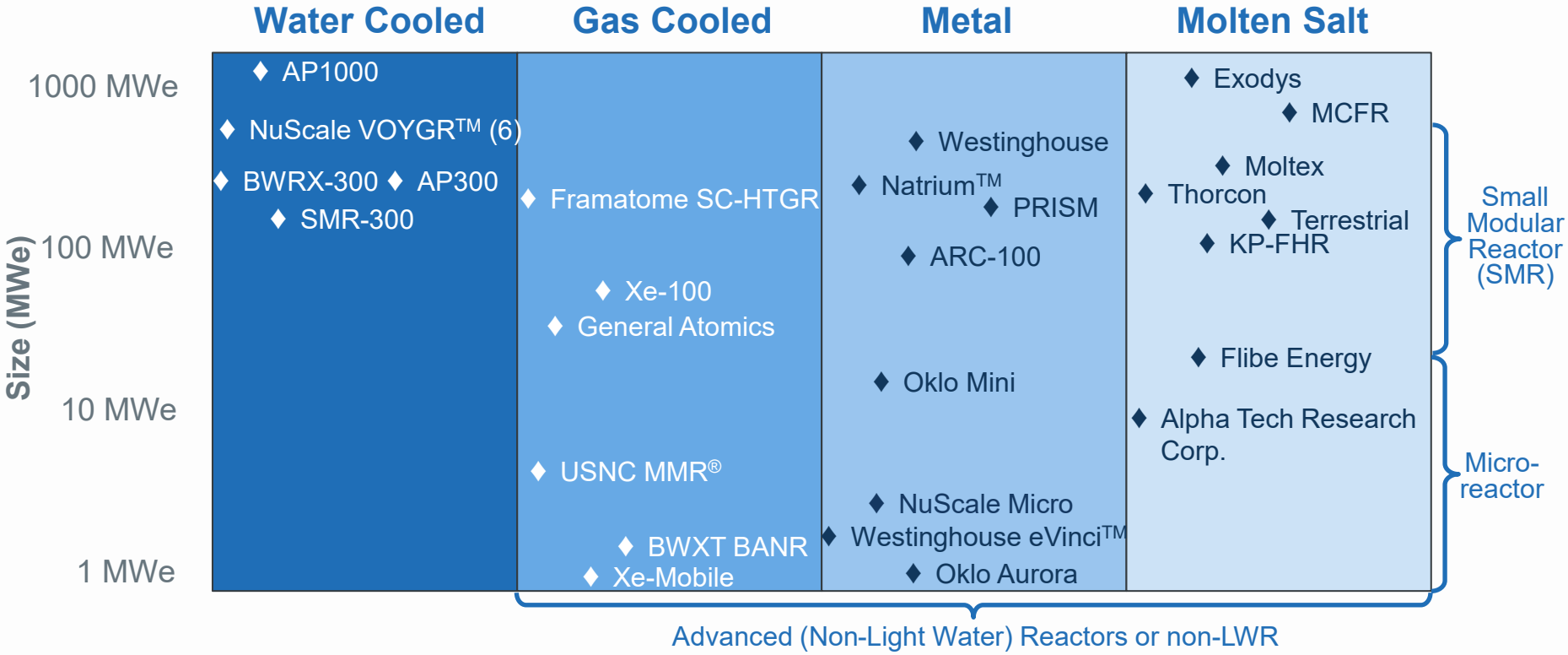


Terrestrial (shown)
Several in development

Non-Water Cooled
Most <300MWe, some as large as 1,000 MWe

Learn more about innovative technologies with the Nuclear Innovation Alliance.

Advanced Nuclear Technologies*



* - partial list of technologies

Advanced Nuclear Developer Members

Advanced Nuclear Versatility

Spectrum of Sizes and Options

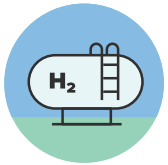
Micro

Small

Large

Variety of Outputs

Electricity



Hydrogen

Process Heat

Multitude of End Users

Homes

Vehicles

Businesses

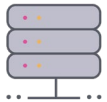
Concrete

Steel

Agriculture

Petrochemical

Oil & Gas

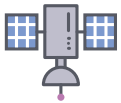


Data Centers

Energy Transitions

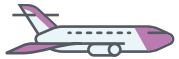
Maritime

District Energy



Space

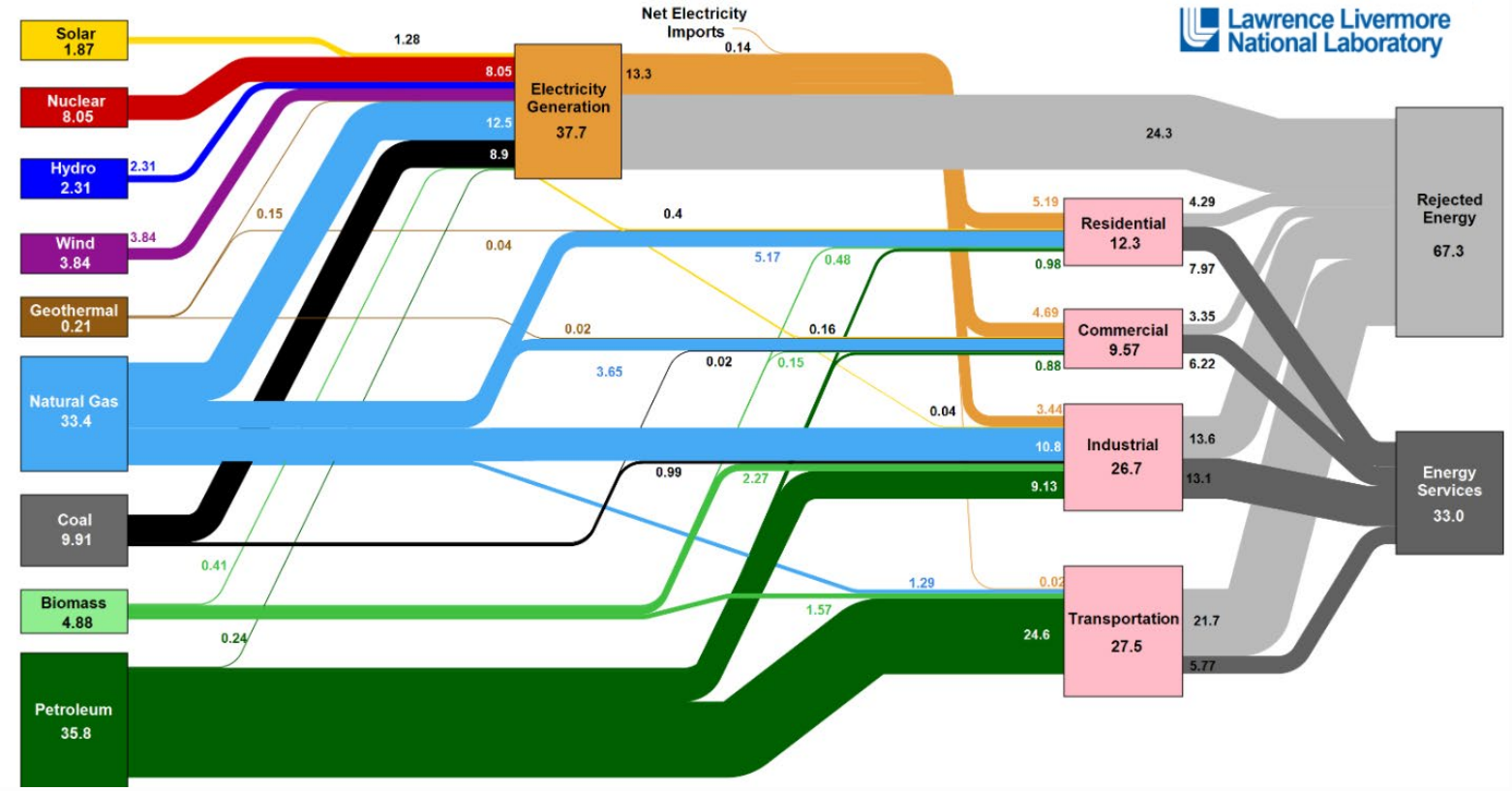
Mining



Aviation

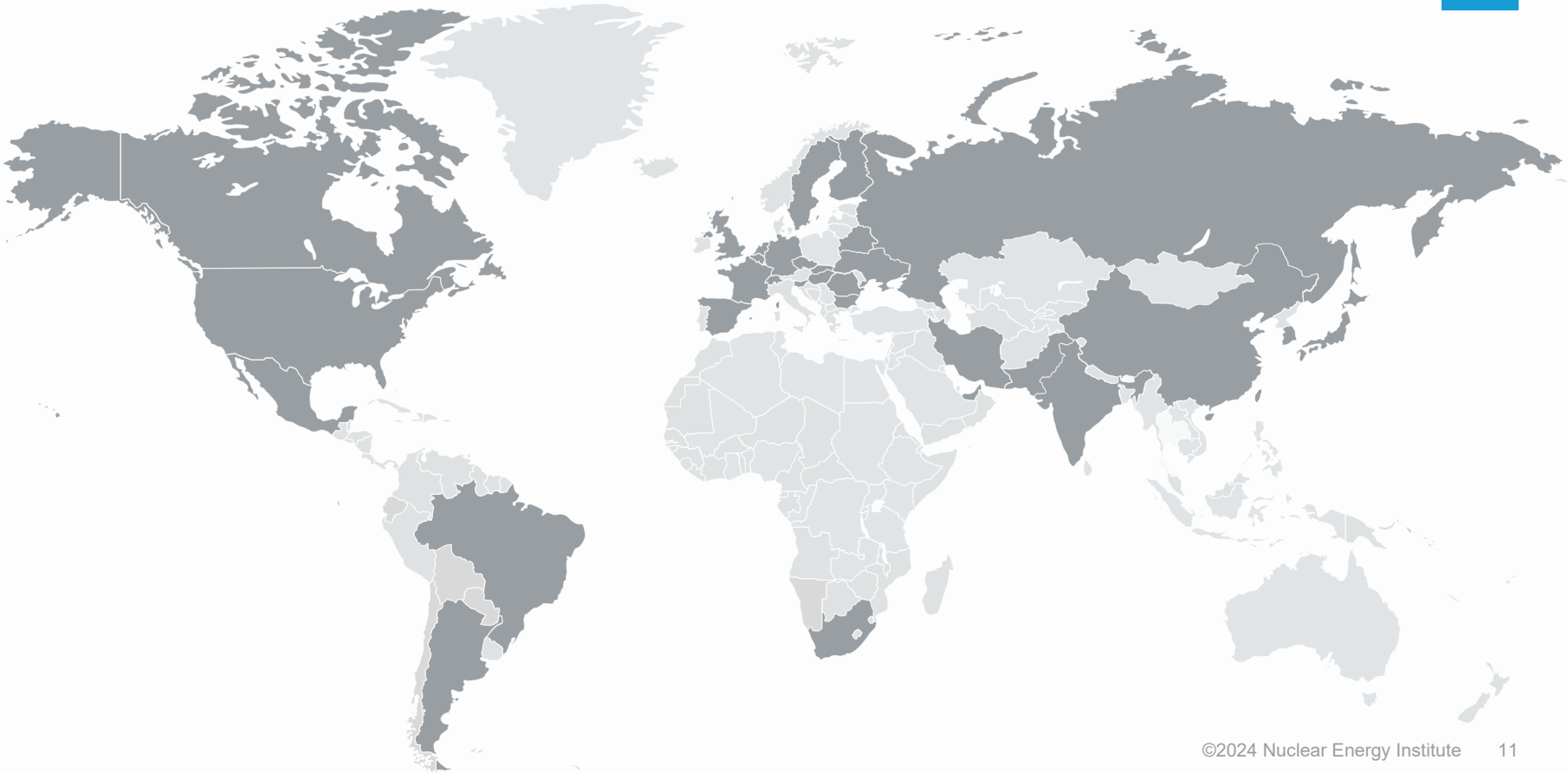
Rail

US Energy Flow (2022): 100.3 Quads



Source: LLNL July, 2023. Data is based on DOE/EIA SEDS (2021). If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant heat rate. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 0.65% for the residential sector, 0.65% for the commercial sector, 0.49% for the industrial sector, and 0.21% for the transportation sector. Totals may not equal sum of components due to independent Rounding. LLNL-MI-410527

New designs are expanding the nuclear energy map



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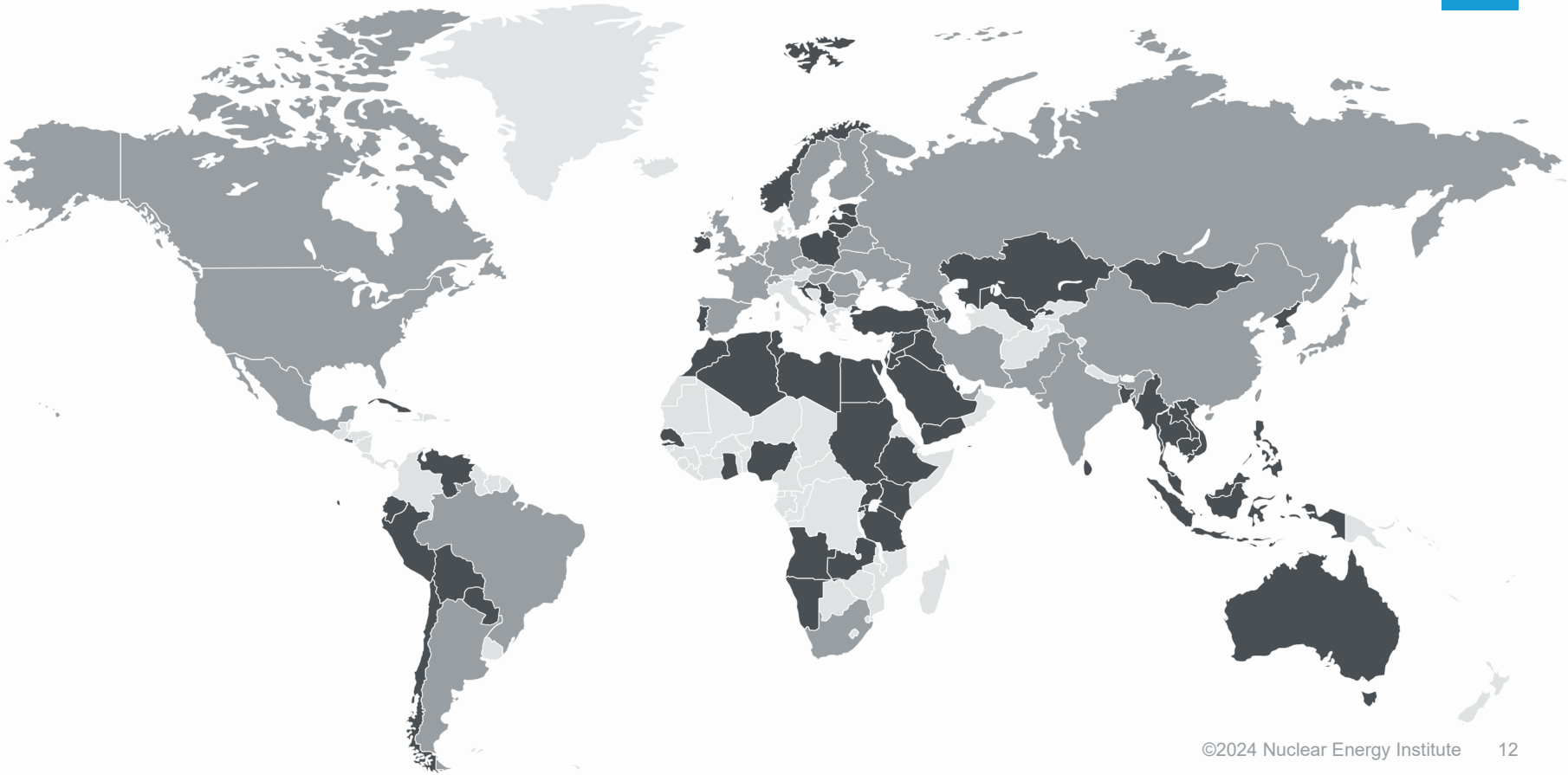


Nuclear Energy Strengthens Security

- **Reliable, resilient power:** 24/7/365 electricity supply to pair with intermittent renewables. Resistant to weather conditions and disruptions to other generation sources.

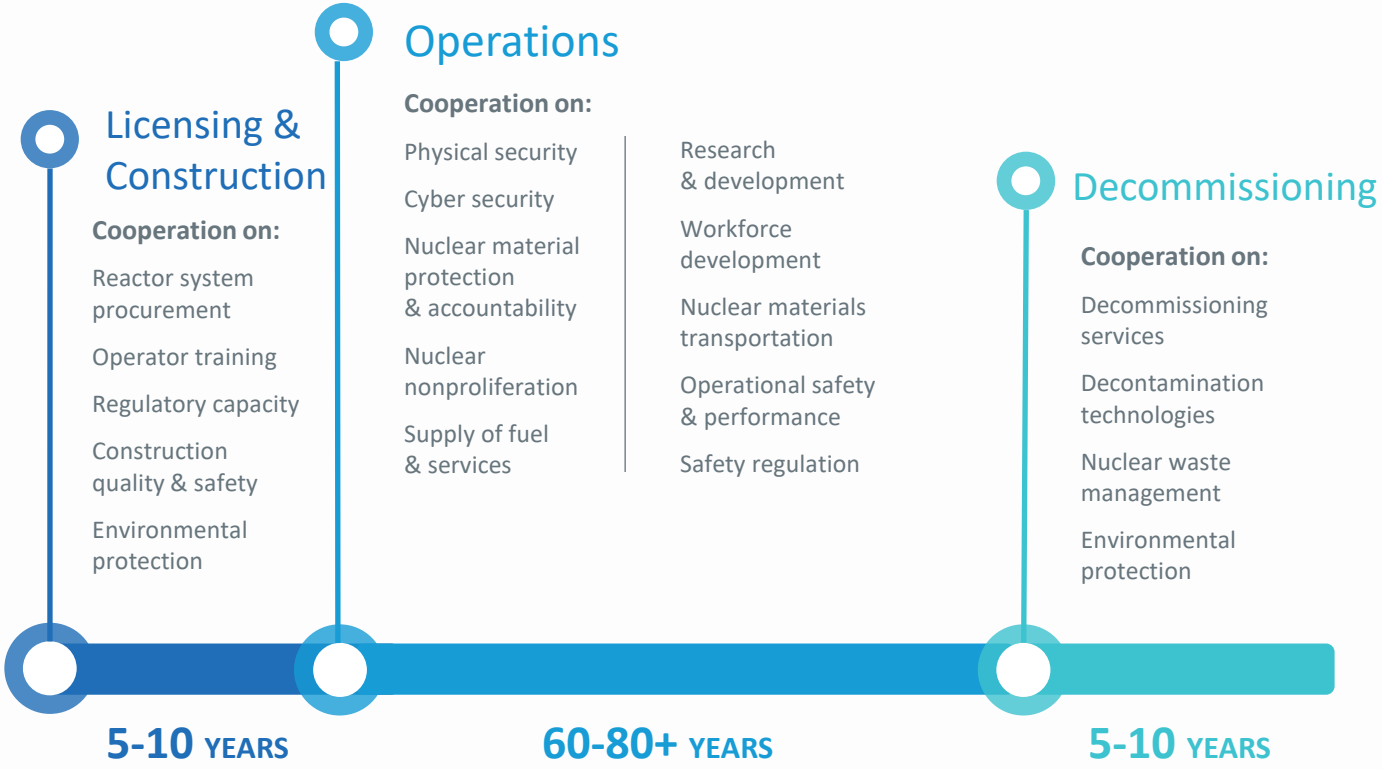
- **Energy independence:** Fuel is abundant, widely distributed and a small component of the electricity price. Fuel on site and 12-24 months between refueling outages.

- **Economic stability:** Promotes economic growth and technological advancement with large number of high-paying jobs.

Nuclear Energy Strengthens Bilateral Ties

- **Strategic partnership.** Nuclear energy cooperation is a hallmark of the closest U.S. alliances.
- **Strengthened nuclear energy enterprise.** Commercial agreements lead to deep and extensive relationships between regulators, universities, and national labs.
- **Industrial partnership.** U.S. nuclear energy industry has an unmatched record of technology transfer, localization and industrial partnership.

Nuclear Energy is Long-term



Thank You