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2026 DLA Energy Worldwide

Nuclear: Small but Mighty Potential

April 21, 2026

U.S. DEPARTMENT OF ENERGY
BATTELLE

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PNNL-SA-196778

Nuclear:
Small but Mighty Potential

- Jim Cabe, Pacific Northwest National Laboratory
- Marc Nichols. Nuclear Energy Institute
- LTC Mark Williams, Army Regulatory Office

Where are we now in the development cycle for small and micro scale nuclear, where do we hope to be, and when? What are the biggest challenges and opportunities that we are only now beginning to understand? Want answers? Our distinguished speakers will provide information but also lead a discussion about this emerging technology. The speakers will co-lead this session: Topics of discussion will include a description of the technology, expectations both now and in the future from the DoD and DOE perspectives, and legal issues and impacts particularly for OCONUS.

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DOE’s 17 National Laboratories

DoW Microreactors Not a Novel Concept

Study	Key Findings
2011. Feasibility of Nuclear Power on US Military Installations. Center for Naval Analysis.	Small modular reactors (SMRs) – commercial status, regulatory challenges, average energy use, cost of energy, and delineation by location
2011. National Defense University. SMRs for Military Installations	Integration of nuclear power plants for improved resilience and reduction of logistics vulnerabilities
2017. DOD Installation Energy Resilience Approaches. Massachusetts Institute of Technology.	Methodology for critical load evaluation, mission requirements, and performance
2018. Roadmap for Deployment of microreactors for DOD domestic installations. Nuclear Energy Institute.	Proposed actions include identifying site requirements, contracting with design agent, fuel quals (and packaging), regulatory engagement, timelines, and schedule accelerators
2020. Alaska Center for Economic Development. Microreactor Use Case Analysis	Feasibility, drivers, and end-use analysis of communities of interest, value proposition, opportunities, and barriers to implementation of nuclear reactors
2021. Global Market Analysis of Microreactors. DOE/INL.	Describes economic and market opportunities for the market potential of microreactors with regulatory considerations
2022. Proposed Decision Framework for DOD Investment in Nuclear Energy Technology (NET). RAND (Haak, K.).	Location-technology pairing; monetary and non-monetary benefits (costs); identification of potential installations for microreactor use
2022. Prospects for Nuclear Microreactors. Nuclear Technology, 209: Sup1	Reviews the existing literature on the technology, potential markets, economic viability, and regulatory and institutional challenges of nuclear microreactors
2023. Pathways to Commercial Liftoff: Advanced Nuclear. DOE.	Identifies and outlines pathways for commercialization, constraints and solutions, and ongoing engagement to drive scaling and implementation of advanced nuclear power
2023. Advanced Nuclear Reactors: Technology Overview and Current Issues. Congressional Research Service.	Summary of advanced reactors and technology descriptions; criteria for evaluations; federal support and funding approaches; licensing frameworks, constraints, and alternatives

Advanced Nuclear – What, Where, Why, How

Advantages

- Systems leverage engineered safe-by-design measures and principles
- Smaller footprint and lower impacts on siting location(s)
- Potential attributes black start, power quality, reliable, resilient, and carbon-free energy
- Prefabricated units manufactured offsite, shipped to integrate w/existing or stand-alone configurations

What

Where

Why

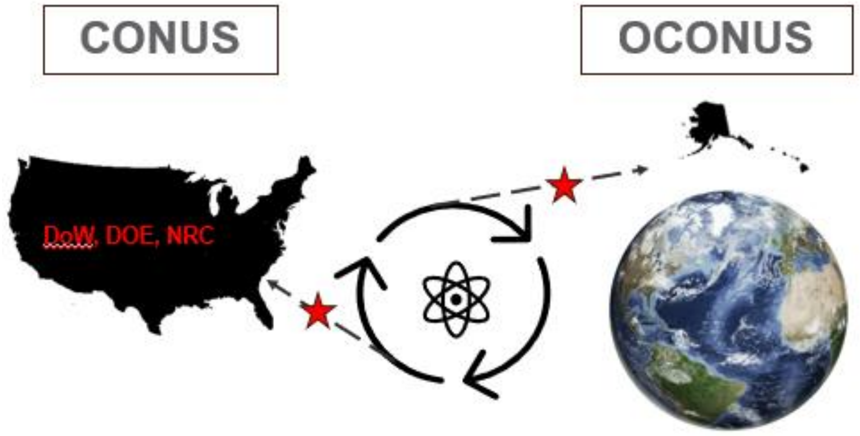
How

Challenges

- Regulatory, legal, technical, cost, schedule, and risk uncertainty
- Prototypic technologies and configurations (ex. combined heat/power)
- Execution pathways are novel including technology development, supply chains, and nuclear material lifecycle
- Transportation of microreactors is not developed with technical, legal, and regulatory complexities

Military Community/Stakeholder Survey Findings

- ~ 50%: expressed lack of awareness of microreactor technology and factors for emplacement
- ~ 90+%: indicated a deficit in information dissemination, technology, and implications
- ~10%: concerns about associated siting risks



Energy as a Whole

Reducing Complexity and Risk – Start at the Installation

Common Architectures

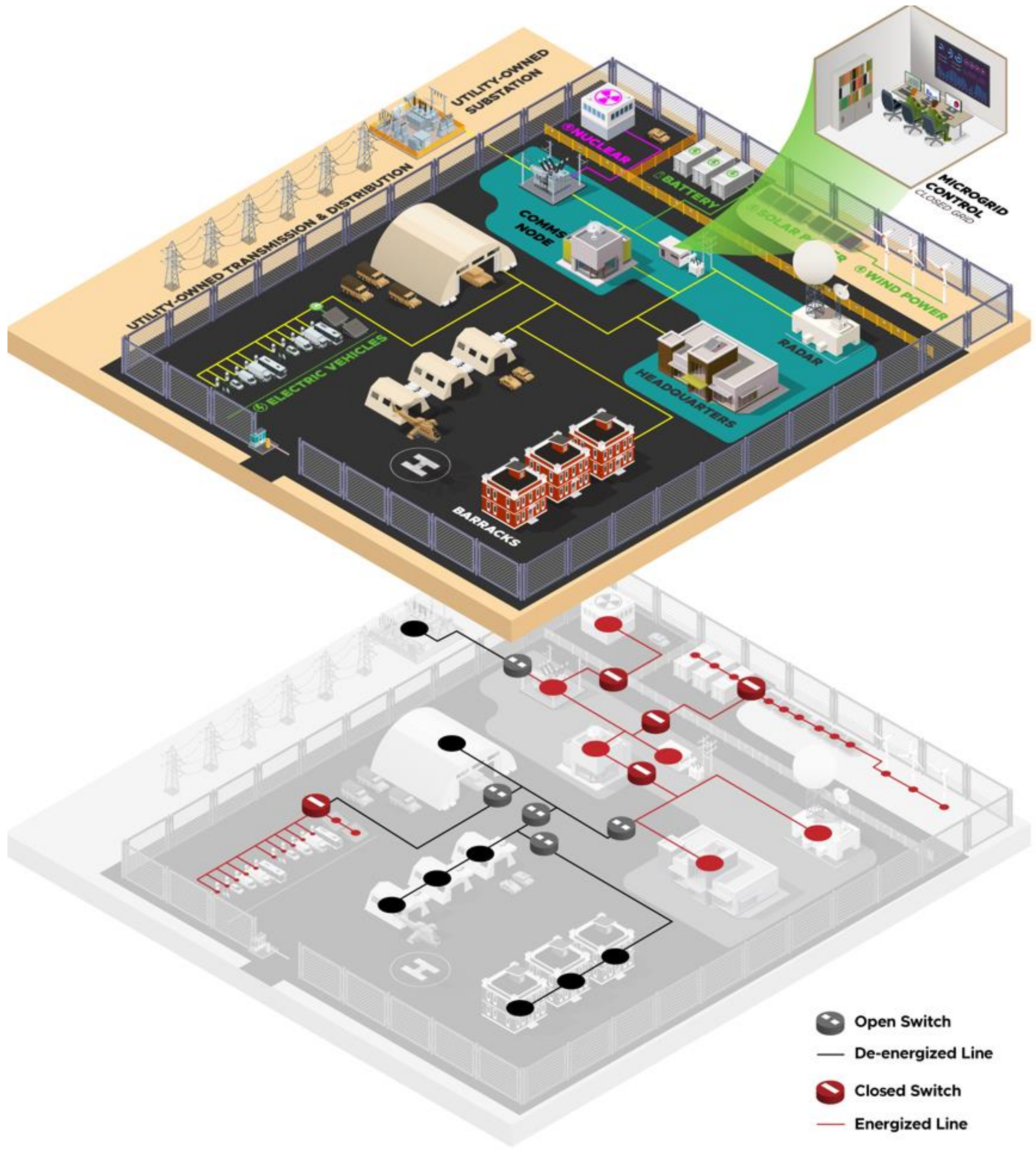
- Alignment of Installation power/energy objectives across technologies and lifecycles
- Complements not competitors in delivering safe, secure, reliable electricity and energy
- Relevant and consistent requirements

Consistency in Regulation

- Generation and Dispatch
- Transmission and Distribution
- Leveraging Distributed Resources

Ownership and Authority

- Capability Driven and Scalable
- Carbon-Free, Reliable, and Resilient
- Mission Critical Assurance



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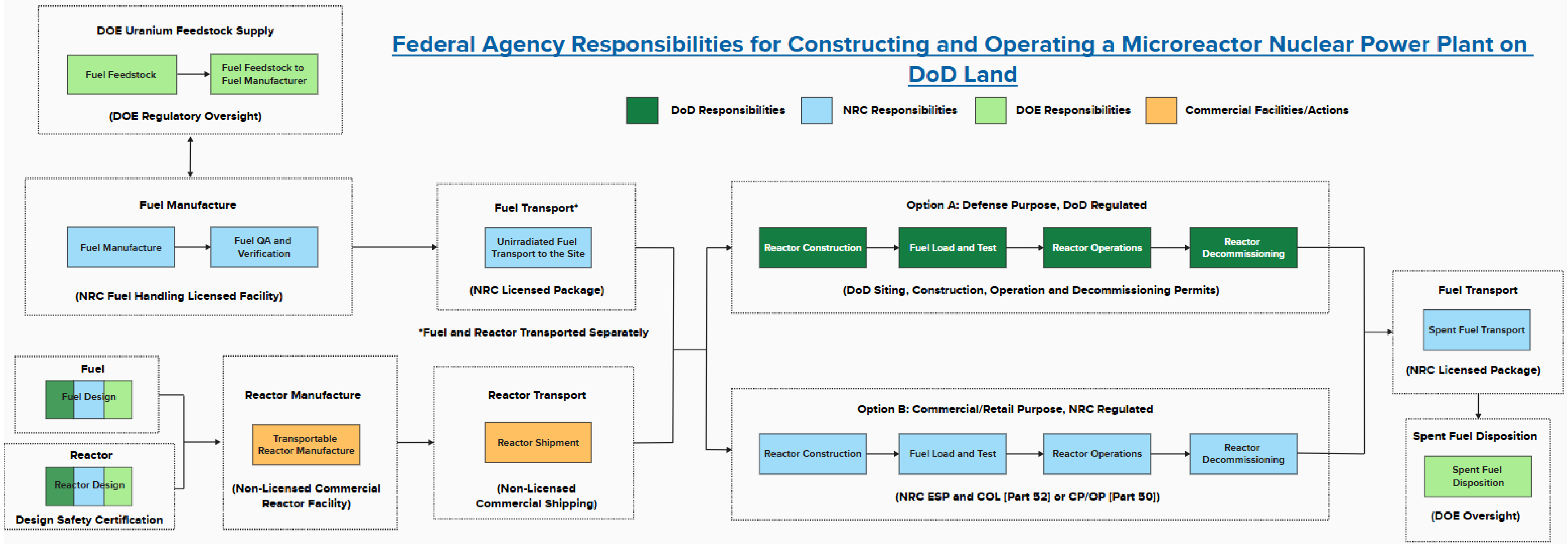
Military Microreactor Regulatory Landscape

NOTIONAL - All of Government Approach



OASW (ER&O)
- CONUS and OCONUS Siting and Feasibility
- Operational Energy
- Coordination and Working Group Leadership

OSW (Strategic Capabilities Office)
Pele Transportable Microreactor
- Technology Development
- Test and Evaluation
- Requirements V&V (Military)

US Nuclear Regulatory Commission
- Certificate of Compliance OTR
- Support/Implementing Interim Staff Guidance for Microreactors (ISG029)

Navy
- Siting Feasibility for SMRs
- Maritime Movement – Mobile and Transportable Advanced Nuclear

OASW (OECIF)
- Military Maritime Nuclear Transportation Asset Capability Assessment
- Maritime Nuclear Defense Applications - Legal and Regulatory Taxonomy

US Department of Energy
- Fuel Sourcing and Qualification
- Site and Design Parameterization
- Nuclear testing facilities

Army
- Army Regulatory and Legal
- ASA (IE&E), Installation and Operational Energy
- JANUS Nuclear Power Project

Air Force
- DAF(EI&E) Eielson Air Force Base
- Community and Stakeholder Engagement
- System Integration
- Advanced Nuclear Power for Installations Project

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DoW Nuclear Projects and Programs

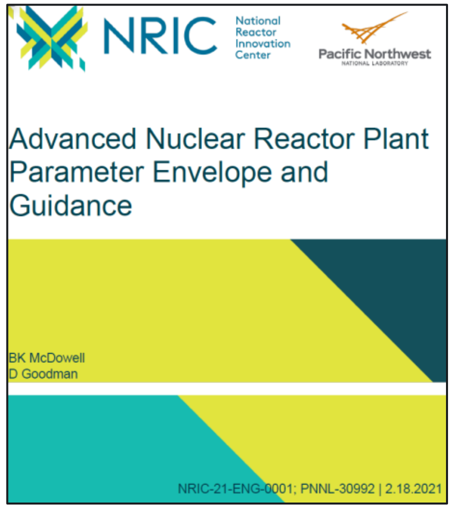
Technology Development

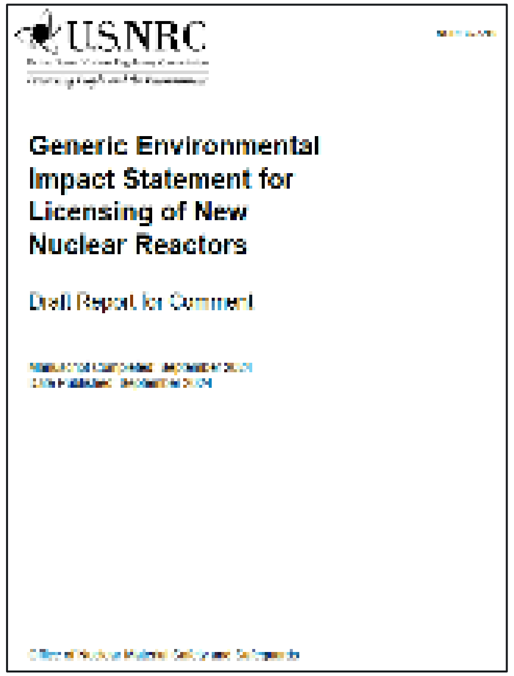
- Feasibility Analysis
- Military Functions and Requirements
- Test and Evaluation Planning
- Readiness and Sustainment
- FOAK to NOAK maturation

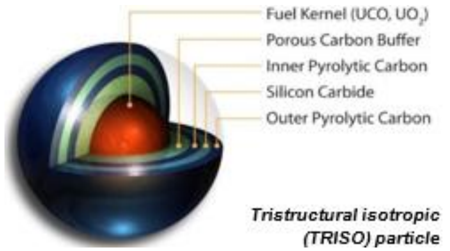
Project Implementation

- Policy and Strategy Development – CONUS and OCONUS
- Executive Order Execution
- Siting and Implementation – environmental, nuclear safety, and energy infrastructure
- Acquisition Support
- Regulatory and Legal
  - Transportation (road and maritime)
  - Interagency coordination
  - Fuel life cycle
  - Military authorization and indemnification

National Nuclear Security Administration


NRIC National Reactor Innovation Center
Pacific Northwest
Advanced Nuclear Reactor Plant Parameter Envelope and Guidance
BK McDowell
D Goodman
NRIC-21-ENG-0001; PNNL-30992 | 2.18.2021


U.S.NRC
Generic Environmental Impact Statement for Licensing of New Nuclear Reactors
Draft Report for Comment



WE’VE ALIGNED THE MISSION NEED AND THE IMPLEMENTATION REALITIES—POLICY, SITING, SAFETY, AND LEGAL.

NOW WE SHIFT TO THE TECHNOLOGY THAT COULD CHANGE THE EQUATION: SMALL & MICRO NUCLEAR—WHERE IT IS, WHERE IT’S GOING, AND WHAT HURDLES WE HAVE TO CLEAR, ESPECIALLY OCONUS

Types of Advanced Reactors

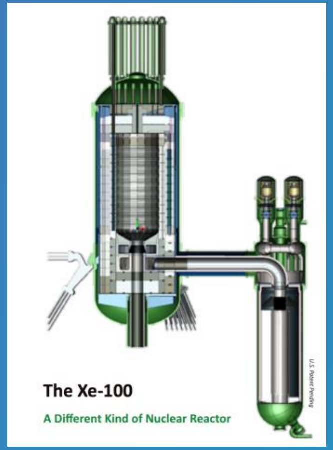
Range of sizes and features to meet diverse market needs*

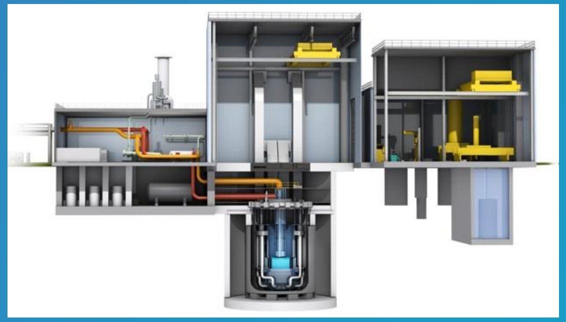
Learn more about innovative technologies with the Nuclear Innovation Alliance.

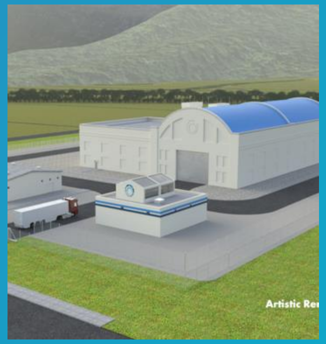
Water Cooled

Non-Water Cooled: High Temp Gas Reactors | Liquid Metal Reactors | Molten Salt Reactors

Either







Large	Small Modular Reactors				Micro
Water Cooled	Water Cooled	High Temp Gas Reactors	Liquid Metal Reactors	Molten Salt Reactors	Either
Westinghouse AP1000® (shown) GE ABWR GE ESBWR	GEH BWRX-300 (shown) NuScale Holtec SMR-300 Westinghouse AP300	X-energy (shown) General Atomics	TerraPower Natrium™ (shown) ARC Clean Energy	Kairos Hermes (shown) Terrestrial Natura Resources	Aalo (shown) Oklo Radiant (many others)

*Does not represent all designs, but only a short list of examples.

NUCLEAR ENERGY INSTITUTE

POWERING CLEAN AND RELIABLE ENERGY

Powering National and Economic Security

Expedite Fullest Use of Nuclear Energy

- Unleash the industrial base
- Increase domestic fuel production
- Accelerate deployment of new nuclear
- Enable private investment, innovation and use
- Achieve licensing efficiency
- Expand export of US nuclear technologies
- Prepare a robust workforce

Enhance U.S. Technology Portfolio

Micro **Small** **Large**

Advanced Technologies

Power Critical Industries

- Data Centers
- Space
- Military Bases
- Agriculture
- Petrochemical
- Mining
- Maritime
- Steel

Protect National and Economic Security

- Achieve energy independence and dominance
- Produce abundant, reliable and resilient energy
- Prioritize diversified sources of dispatchable energy
- Ensure energy is affordable, safe and clean
- Secure global industrial and digital leadership
- Create 10,000s high-paying jobs

Public Support and Value Recognition | Federal Legislation and Executive Actions | State Legislation and Market Policies | Industry Actions and Nuclear Benefits

Key Enablers from the Executive Orders on Nuclear Energy

National Security (14299), NRC Reform (14300), DOE Testing (14301), and Industrial Base (14302)

Add 300 Gigawatts of U.S. Nuclear Capacity by 2050

- Restarts and power uprates
- 10 large reactors in construction by 2030

1 Speed up Nuclear Reactor Licensing

- NRC licensing less than 18 months
- Faster for DOE/DoD tested designs

2 Lay the Ground-Work for Faster Reactor Testing

- Pilot 3 reactors outside of labs
- Expand DOE testing pathways

3 Deploy U.S. Reactors for AI and Military Bases

- Operate at DoD facilities in 3 years
- AI as critical defense facilities

4 Amp Up Domestic Nuclear Fuel Production

- Maximize domestic fuel production
- Mine, enrich, convert, de-convert

5 Assess Spent Fuel and Recycling

- Recommend a National policy
- Safe, Secure Long Term Fuel Cycle

6 Expand U.S. Nuclear Energy Exports

- Compete for civil nuclear globally
- Pursue new 123 Agreements

7 Bolster the American Nuclear Workforce

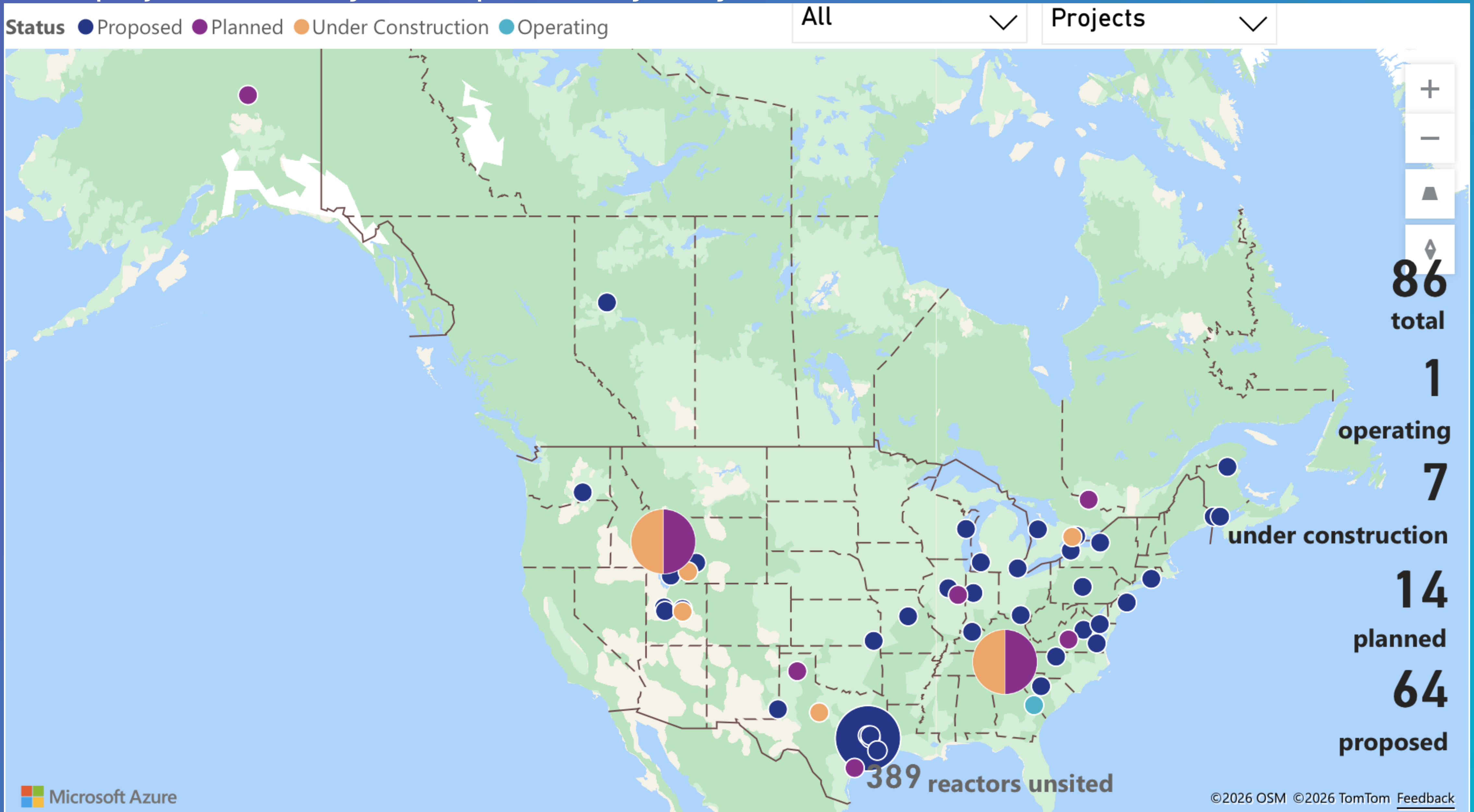
- Increase nuclear apprenticeships
- Prioritize nuclear energy careers

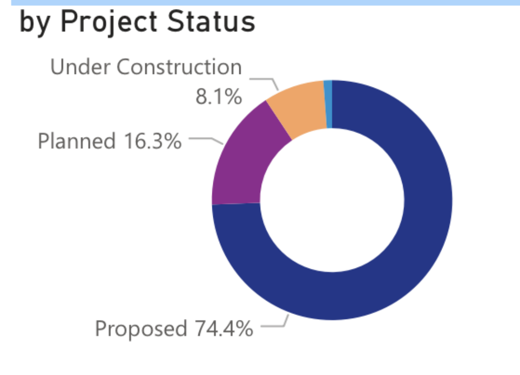
Reference: https://www.energy.gov/ne/articles/9-key-takeaways-president-trumps-executive-orders-nuclear-energy

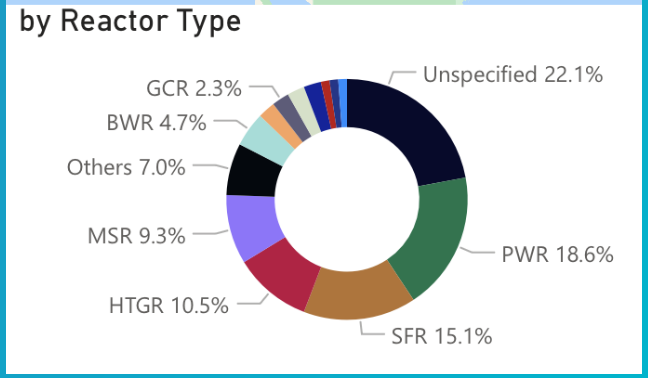
Micro-Reactor Markets

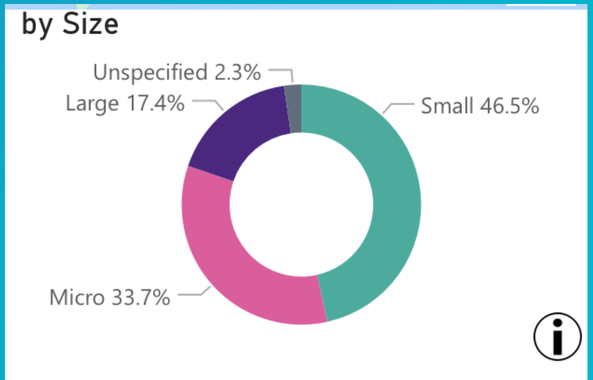
U.S. New Nuclear Deployment Plans

Over 80 projects that may be in operation by early 2030s





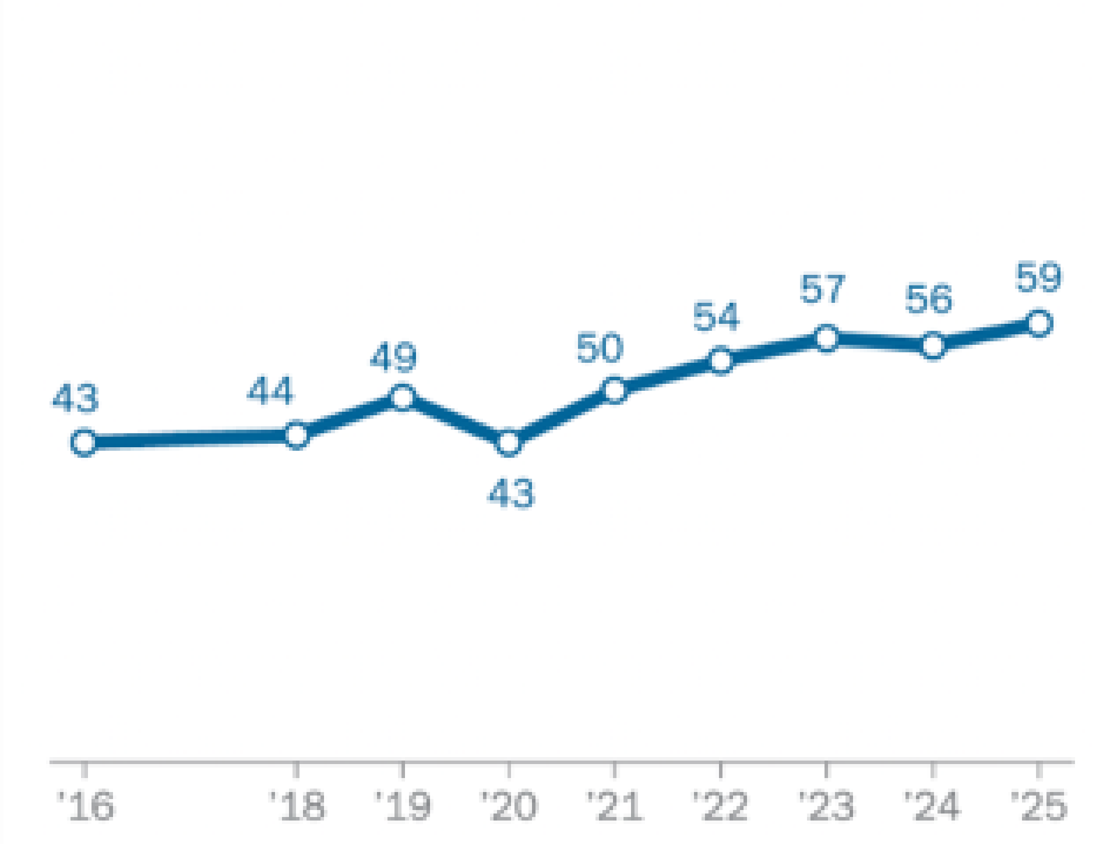




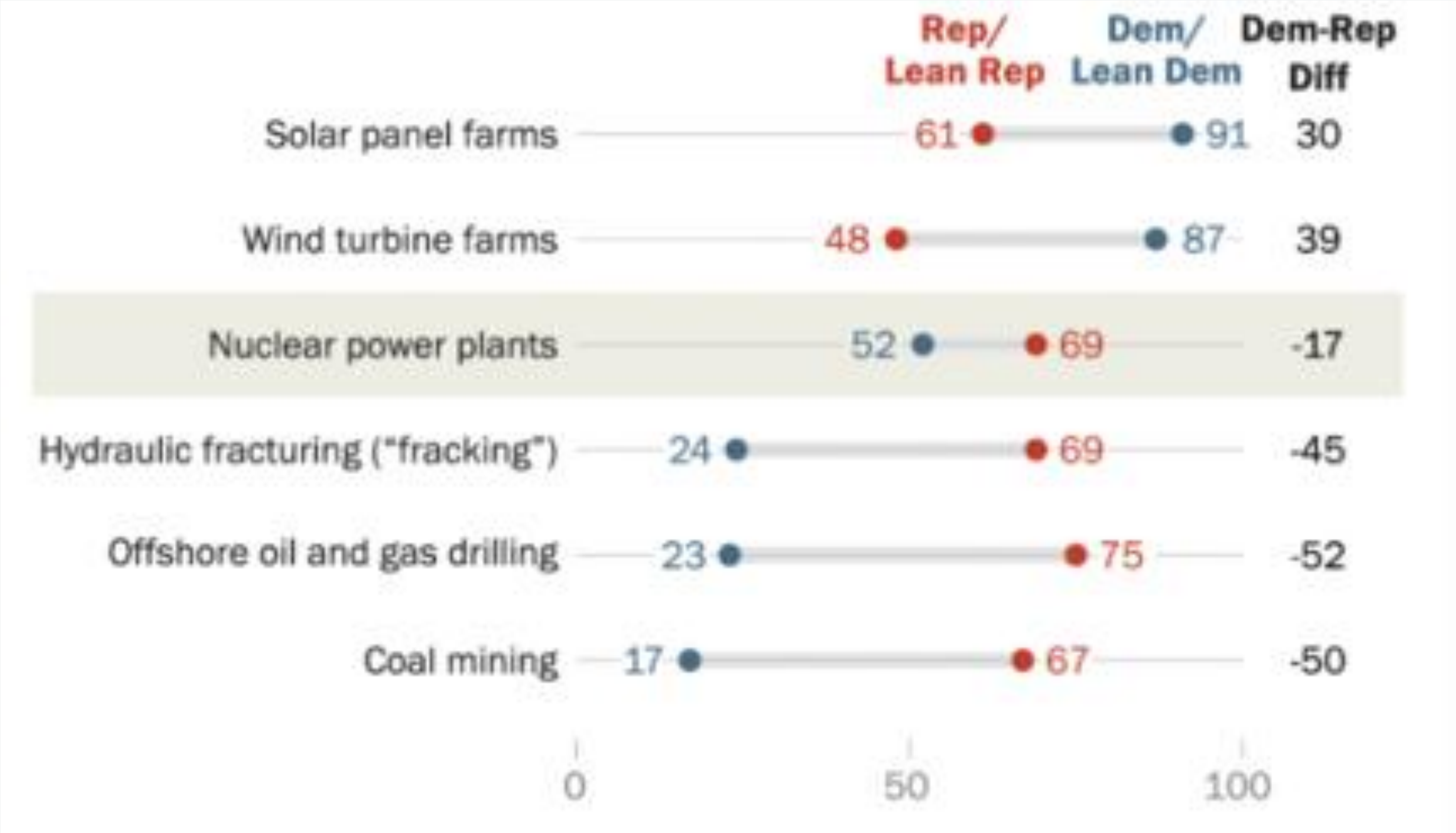
Updated 03/19/2026

https://www.nei.org/advanced-nuclear-energy/advanced-nuclear-project-map

Favorability to More Nuclear Energy



Public Opinion



Bi-Partisan Support

Pew Research Center, October 2025
https://www.pewresearch.org/short-reads/2025/10/16/support-for-expanding-nuclear-power-is-up-in-both-parties-since-2020/

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%

Both scenarios are successful in reducing electricity grid GHG emissions by over 95% by 2050 and reducing the economy-wide GHG emissions by over 60%

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

VCE VIBRANT CLEAN ENERGY

Source: Vibrant Clean Energy: https://www.vibrantcleanenergy.com/media/reports/

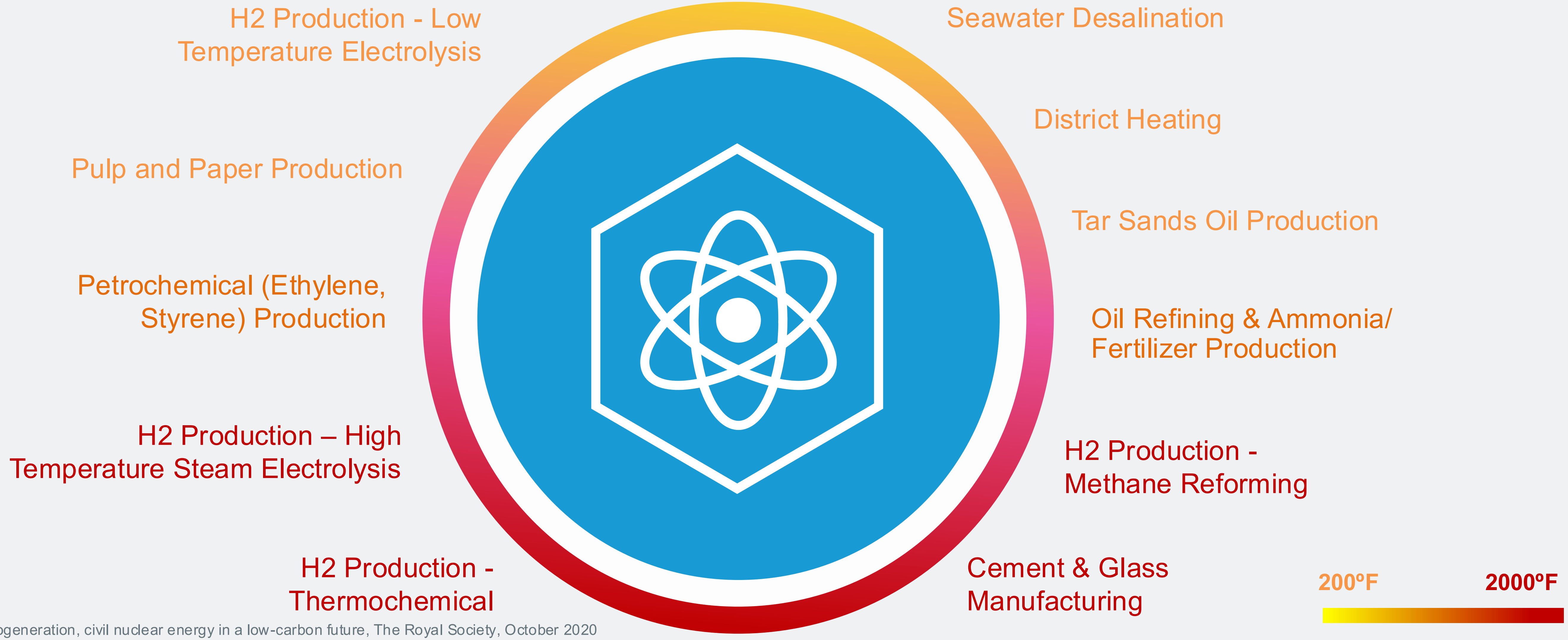
System Benefits of Advanced Nuclear Energy

Long term price stability	• Low fuel and operating costs
Reliable dispatchable generation	• 24/7, 365 days per year, years between refueling (Capacity factors >92%)
Efficient use of transmission	• Land utilization <0.1 acre/TWh (Wind =1,125 acre/TWh; Solar 144 acre/TWh)
Environmentally friendly	• Zero-carbon emissions, one of lowest total carbon footprints • Many SMRs are being designed with ability for dry air cooling
Integration with renewables and storage	• Paired with heat storage and able to quickly change power
Black-start and operate independent from the grid	• Resilience for mission critical activities • Protect against natural phenomena, cyber threats and EMP

Source: SMR Start, *SMRs in Integrated Resource Planning*

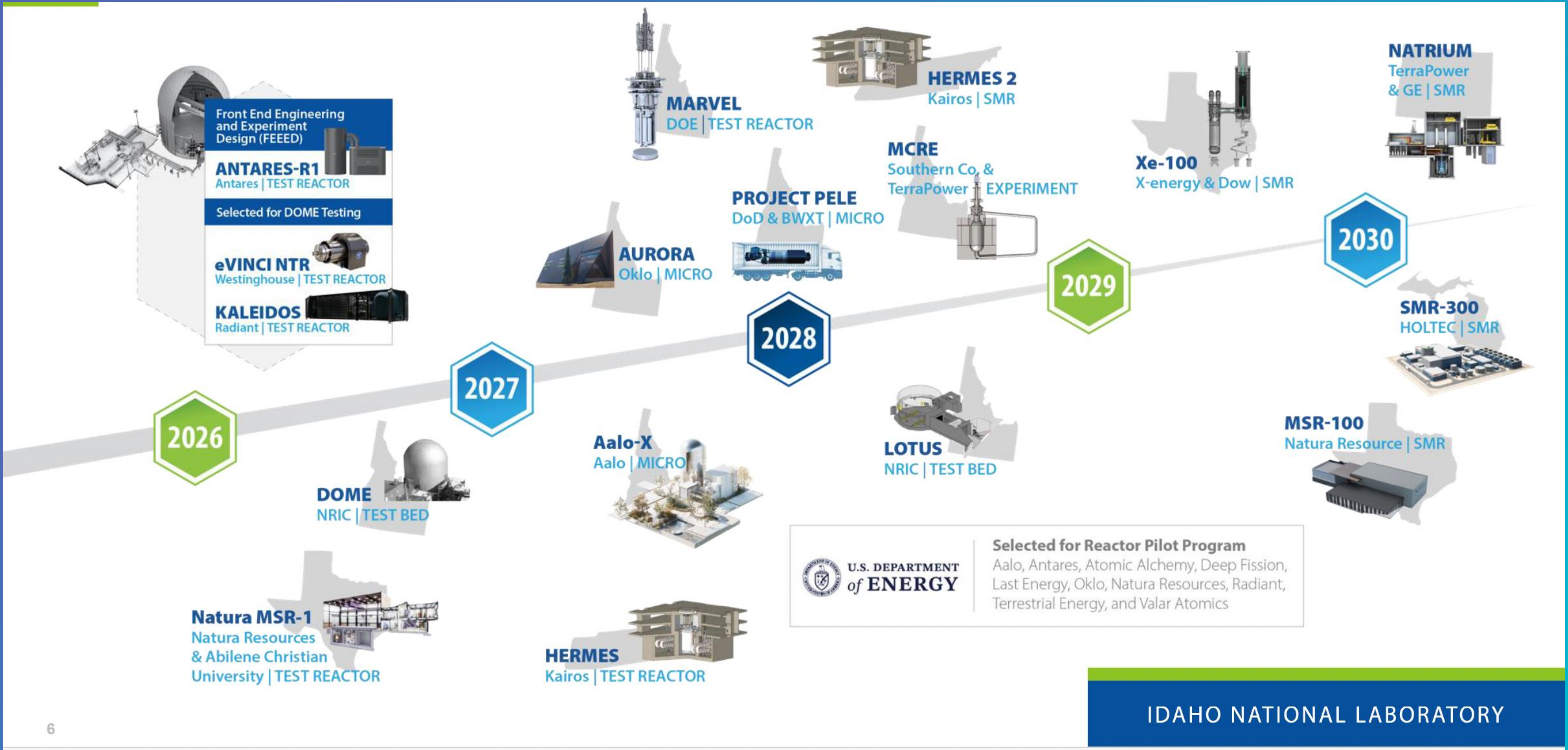
Gateway to Heat Markets

Process Heat Temperature Needs



Source: Nuclear Cogeneration, civil nuclear energy in a low-carbon future, The Royal Society, October 2020

DOE Accelerating Advanced Nuclear Demonstrations



Community Benefits of Nuclear Energy

Sustainable Jobs

Pays 36% more than average salaries in local area

- Safe and secure employment during 60+ years of operation

Good Neighbor

Tax base supports community services

- e.g., schools, parks, transportation, emergency preparedness

Dependable

Resilience for essential services and recovery

- Protect against natural phenomena, cyber threats and EMP

Low Land Use

Small plant footprint and efficient use of transmission

- <0.1 acre/TWh (Wind – 1,125 acre/TWh; Solar = 144 acre/TWh

Clean Air & Water

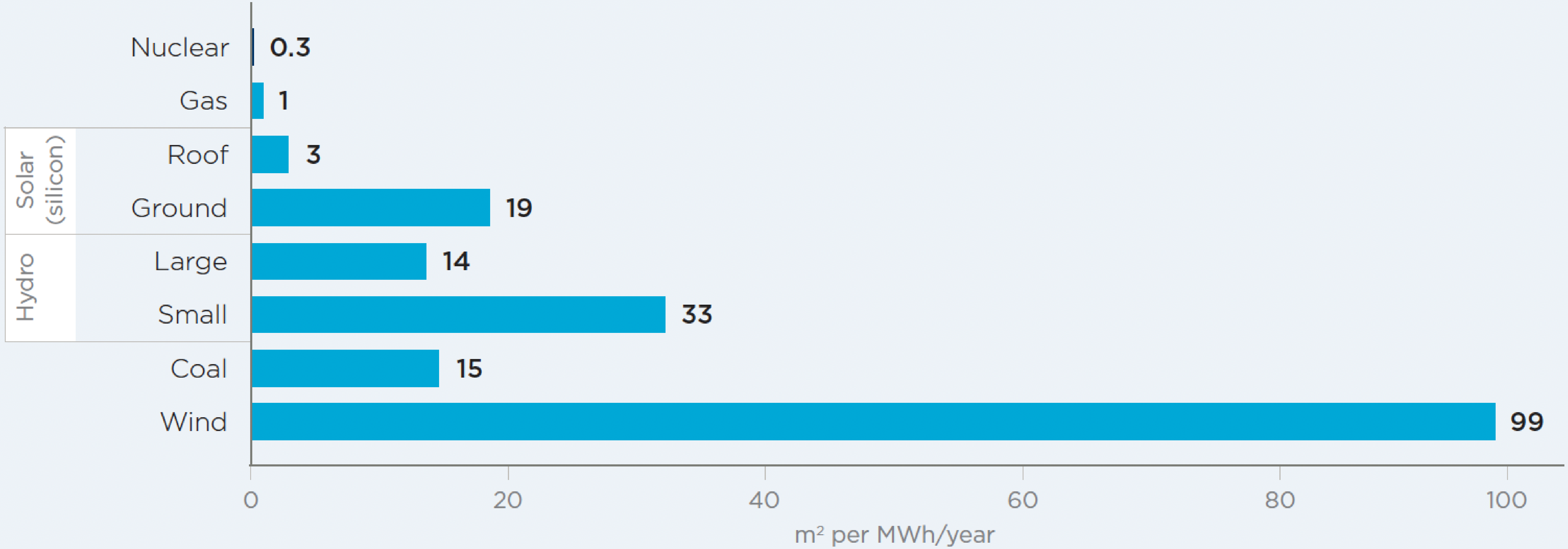
Zero-carbon emissions; among lowest total carbon footprints

- Little or no water use with ability for dry air cooling

Source: SMR Start, *The Economics of Small Modular Reactors* and *SMRs in Integrated Resource Planning*

Land Use Comparison of Energy Technologies

Fig. 16. Land use requirements of power generation technologies[31]



Source: Ritchie (2022)

Source: https://www.oxfordeconomics.com/resource/the-economic-contribution-of-the-us-nuclear-power-industry/

Federal Funding Opportunities for New Nuclear

Tax Credits

- PTC: At least $30/MWh for 10 years
- ITC: 30% of investment
- Bonuses for energy communities and domestic supply

Demonstrations (Awarded)

- DOE funding 12 different designs, >$5B over 7 years
- ARDP Demos, Risk Reduction, Early development

Loan Guarantees

- >$250B in authority
- $63B in Nuclear Applications (6/2024)

Deployments

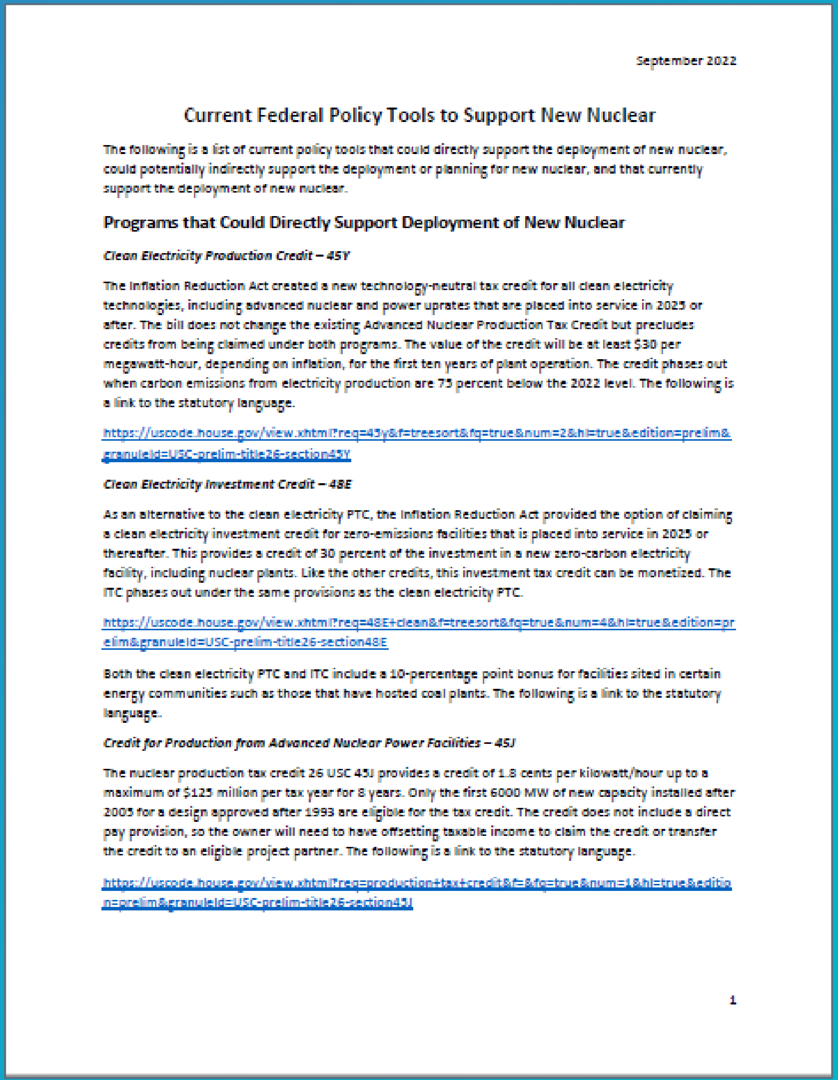
- $900M for light-water SMRs
- +$3.1B for ARDP/LWR SMR

Fuel and Supply Chain

- HALEU Fuel - $700M
- $2.7 Billion for fuel (conditional on Russian import ban)

Other Support

- Japan/US Investment ($40B to-date)
- GAIN Vouchers
- DOE Launch Pad



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 2025 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=45y&f=treesort&fq=true&num=2&hl=true&edition=prelim&granuleId=USC-prelim-title26-section45Y

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=48E+clean&f=treesort&fq=true&num=4&hl=true&edition=prelim&granuleId=USC-prelim-title26-section48E

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 – 45J

The nuclear production tax credit 26 USC 45J 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 1993 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=production+tax+credit&f=&fq=true&num=1&hl=true&edition=prelim&granuleId=USC-prelim-title26-section45J

1

Current Federal Policies: https://www.nei.org/CorporateSite/media/filefolder/advantages/Current-Policy-Tools-to-Support-New-Nuclear.pdf

States Taking Action for Nuclear

New in 2025 **Highlighted**

Exploring Nuclear Technology	**Arkansas**, Connecticut, **Delaware**, Florida, **Hawaii**, Idaho, Indiana, Kentucky, **Louisiana**, Maine, Maryland, Michigan, Montana, Nebraska, New Hampshire, **New York, North Dakota**, Ohio, **Oklahoma**, Pennsylvania, Tennessee, and Texas, **Utah**, Virginia, and **Wisconsin**
Recognizing Nuclear as a Clean Energy	**Colorado**, Idaho, **Indiana**, **Kentucky**, Maine, Michigan, Minnesota, New Mexico, North Carolina, Ohio Tennessee, Utah, Virginia and Washington
Removing Barriers and Signaling Support	Repealing Nuclear Moratoriums: **Connecticut**, Illinois, Kentucky, Montana, West Virginia, and Wisconsin Signaling Regulatory Support: Indiana, Mississippi, North Carolina, and South Dakota
Incentivizing Nuclear Technology and Supply Chain	**Indiana**, Kentucky, **Maryland**, Michigan, **New York**, **Tennessee**, **Texas**, Virginia, Washington, and Wyoming

OPPORTUNITY IS ONLY IMPACT IF WE CAN EXECUTE

From promise to pathway—how we navigate licensing speed, regulatory steps, and fielding at DoD installations.

U.S. ARMY

POWERING THE MISSION: NUCLEAR ENERGY AND REGULATORY PATHWAY

OASA (IE&E)

Briefer Name: LTC Mark Williams, PhD
Manager, Army Reactor Program

APR 2026

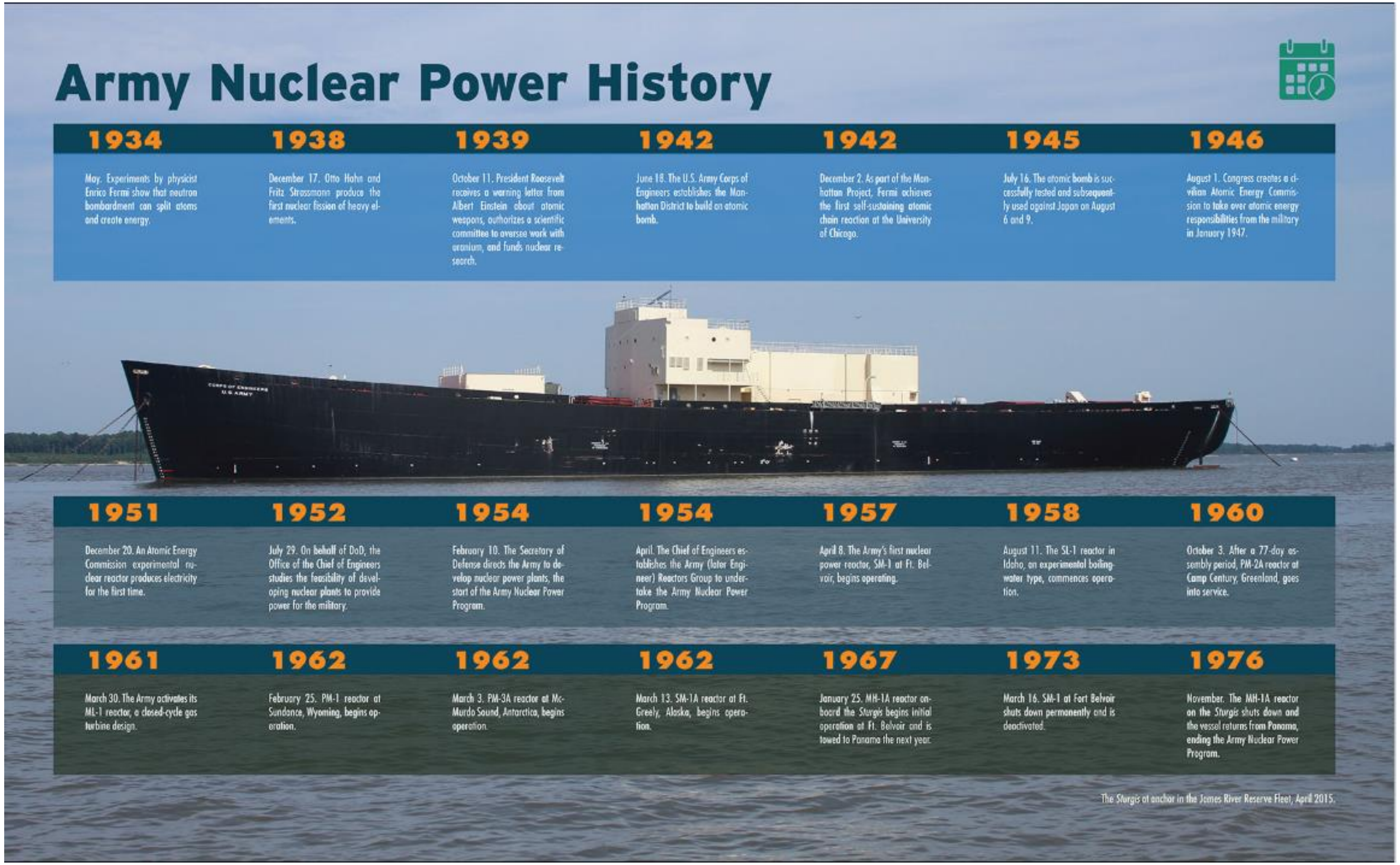
Controlled by: HQDA, ODASA (E&S)
CUI Category: None as of 2/25/2026
Control: N/A
POC: LTC Mark Williams, mark.t.williams20.mil@army.mil

AGENDA

- Our History: Army Reactor Regulatory Office
- Federal Partnerships
- Army Regulatory Network and Our Approach
- Army Regulatory Activities in Support of Janus Program

OUR HISTORY

- We will use the Atomic Energy Act of 1954, Section 91b and Public Law 85-804 for indemnification
- Under these authorities we managed Government Owned and Operated Reactors (1954-1977)
  - Currently we are decommissioning the last 2 power plants
- (1977-Now), Permitting of a test reactor and providing regulatory oversight, and decommissioning permits
- Now- into the future; Permitting Installation microreactors, Contractor Owned and Contractor Operated (COCO), behind the meter power plants



JANUS PROGRAM: INSTALLATION NUCLEAR ENERGY

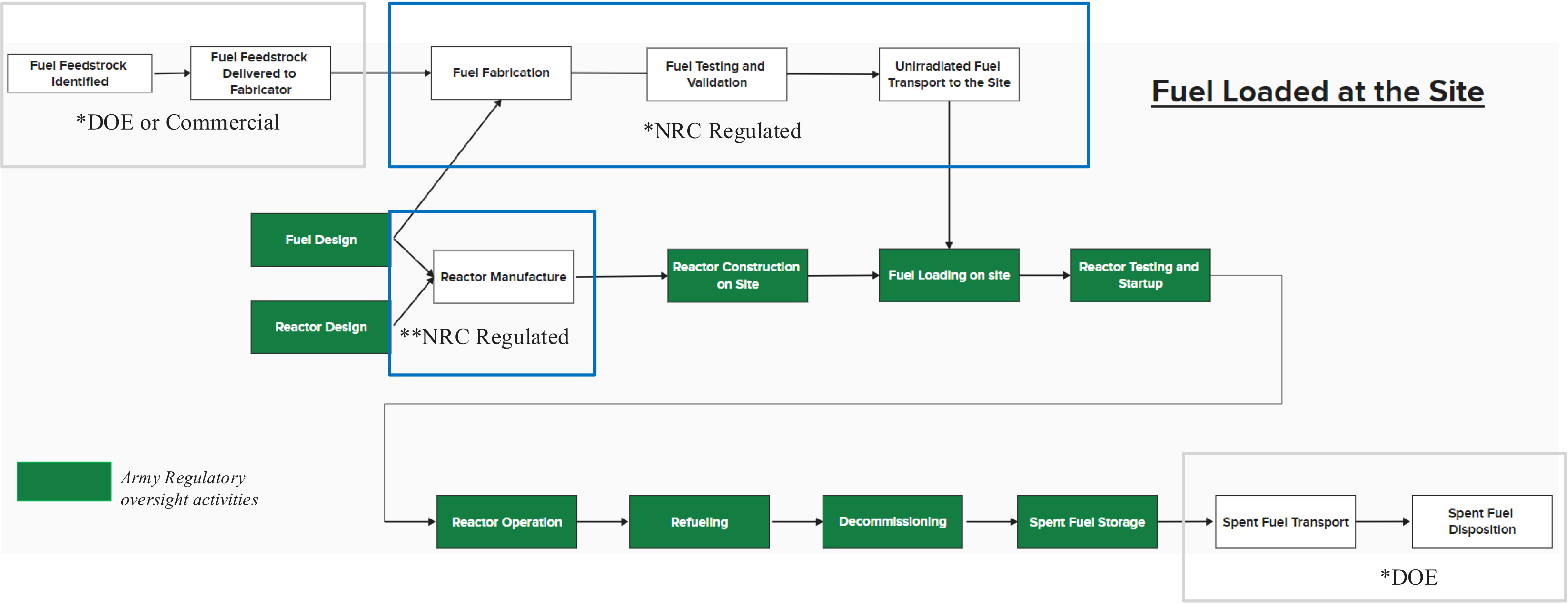
- Executive Order 14299 *Deploying Advanced Nuclear Reactor Technologies for National Security,* states that it is the policy of the United States to:
  - Ensure the rapid development, deployment, and use of advanced nuclear technologies to support national security objectives
  - Enable private sector investment, innovation, development, and use of advanced nuclear technologies in the United States
  - Coordinate regulatory efforts across the Department of Defense and the Department of Energy
- The Janus Program was created to meet the goals in EO 14299 by:
  - Building microreactor power plants (MPP), up to 20 MWe each, to operate critical installation missions, off the commercial gird, throughout their useful lives
  - Accelerating technology commercialization by sending clear demand signals to the nuclear industry and supply chain
- Army is targeting groundbreakings in FY28, and full operations in FY31.

FEDERAL PARTNERSHIPS

- DOE and National Labs
- NEO is a new office within the DASA(E&S) and is organized to implement the Janus Program and perform the duties of the Executive Agent to implement EO 14299.
- Army Reactor Regulatory Office (ARRO) is an existing office, now within the DASA (ESOH)
- ASA(IE&E) is closely coordinating with DOE to address nuclear fuel supply chain
- Coordinating with DOE and NRC on opportunities for regulatory harmonization

U.S. ARMY

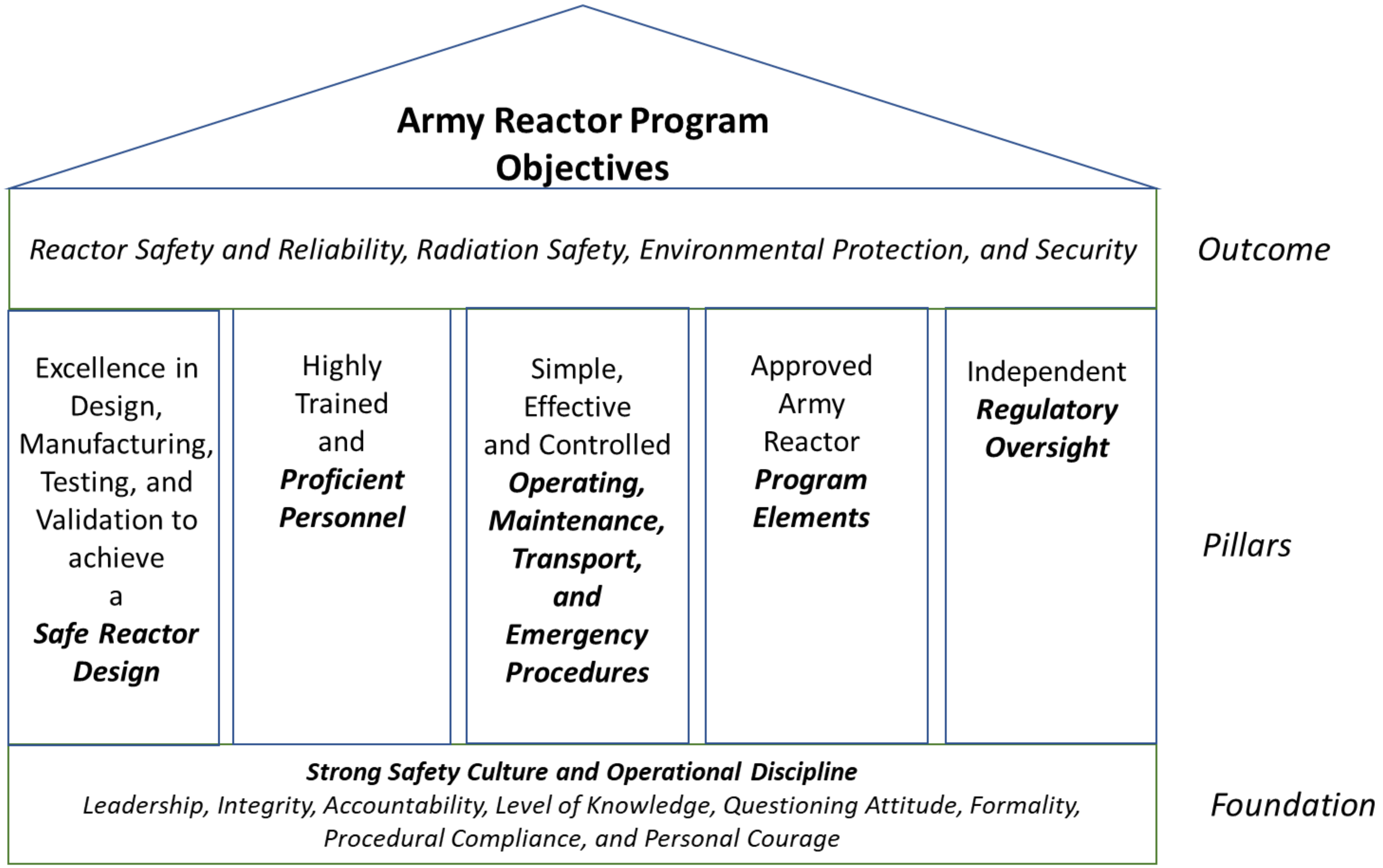
ARMY REGULATORY NETWORK – ALL-OF-GOVT



*Notional Responsibilities. Formal Roles and Responsibilities will be the subject of one or more MOUs between Federal Agencies.

**Army regulatory framework includes a Manufacturing Permit, but an Army Manufacturing Permit is not required if fuel is loaded at the base. The vendor may choose to obtain an NRC license for the Manufacturing Facility.

ARMY REGULATORY FRAMEWORK

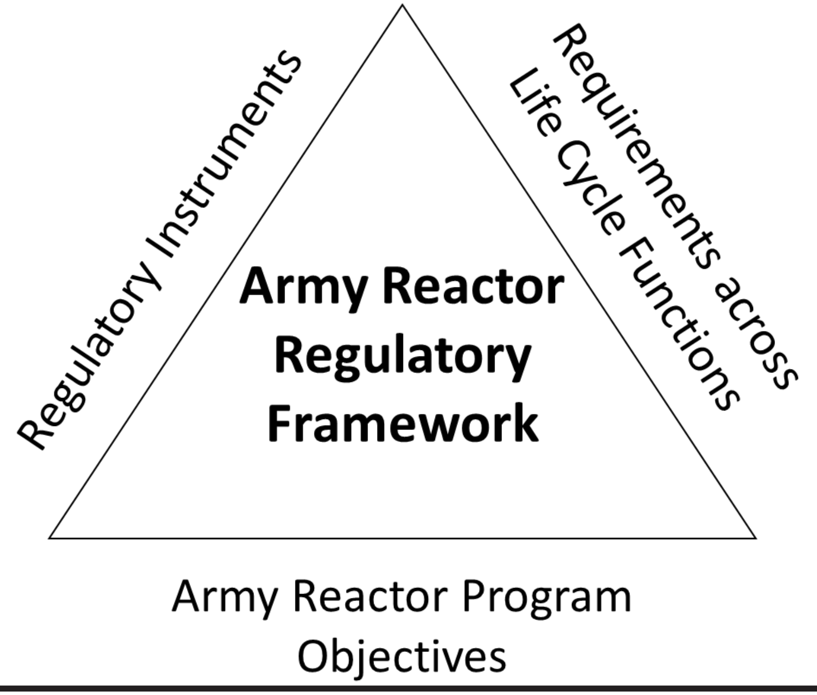


Authorities

Section 91b of the Atomic Energy Act (42 U.S.C. § 2121(b)), as implemented pursuant to the Presidential Directive of 23 September 1961.

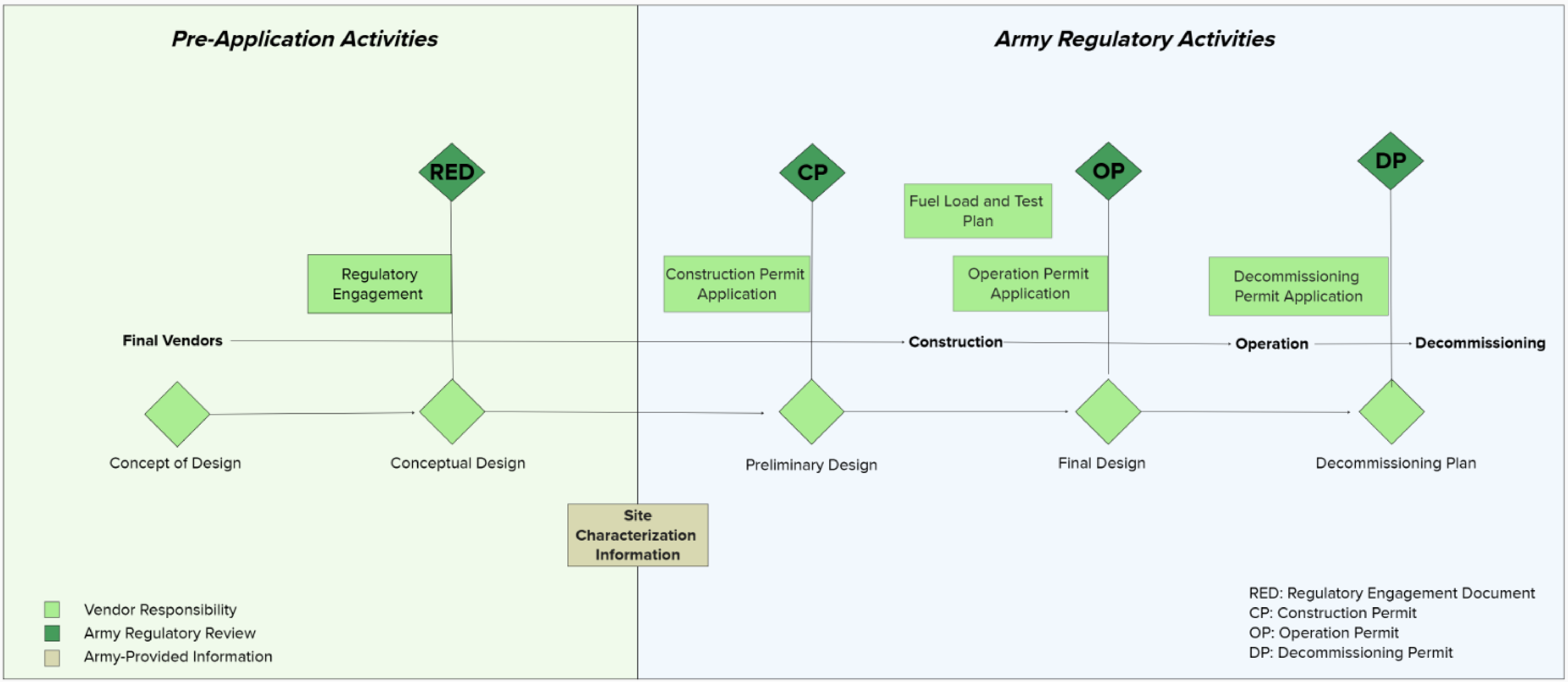
Policy

It is Army policy, when appropriate, to be consistent with federal guidelines, international safety and security standards, the National Council on Radiation Protection and Measurements guidance and recommendations, and consensus codes and standards.



U.S. ARMY

Army Regulatory Activities in support of Janus Program



QUESTIONS