Politics, Policy and Projects for Advanced Reactors – US Trends

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US Political Trends – Advanced Nuclear

Federal Politics

- Biden Administration is supportive of advanced nuclear with programs and policies aimed at meeting Net Zero Commitment
    - Inflation Reduction Act
    - Bi-Partisan Infrastructure Act
    - Strengthening Existing programs received funding and support – DOE Loan Processing Office
    - Research projects under ARPA and ARPA-E including the DOW Project – industrial application of an advance reactor
- Support for Nuclear is Bi-Partisan
    - There has been significant bi-partisan agreement and funding of nuclear programs since 2019; represents a generational shift in US politics
    - Currently there are 17 different pieces of legislation in House and Senate Committees on range of critical issues
        - Haleu Fuel Production
        - Regulatory Efficiency (Part 53, funding NRC, etc.)
        - Environmental Reviews
        - Global Cooperation
        - Etc.

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Production Tax Credit v. Investment Tax Credit

Production Tax Credit (PTC) for Carbon Free Generation

- At least $30/MWh for the first 10 years of operation; indexed to inflation
- Select the PTC (§45Y) or the ITC (§48E), not both
- Applies to all carbon-free generators
- Plants entering service in 2025 or later
- Lasts until CO2 emissions from electricity are 75% below 2022 levels
- Increases by 10% for energy communities; increases by 10% for domestic content

Investment Tax Credit (ITC)

- Credit for 30% of construction expenses when plant enters service
- Select the PTC (§45Y) or the ITC (§48E), not both
- Applies to all carbon-free generators
- Plants entering service in 2025 or later
- Lasts until CO2 emissions from electricity are 75% below 2022 levels
- Increases 10% for coal communities; increases 10% for domestic content

“There's a natural order of things: if there are signed contracts for real projects, the supply chain will stand itself up. They can confidently make those capital investments,” adds Julie Kozeracki senior advisor with the loans program at the U.S. Department of Energy, at the virtual conference.

“We are fiercely private-sector-led and government-enabled,” she emphasizes. “So we've got low-cost debt financing through the loan programs office — like the 30% and up to 50% investment tax credit from the Inflation Reduction Act. I mean, that's basically buy one reactor, get one free”

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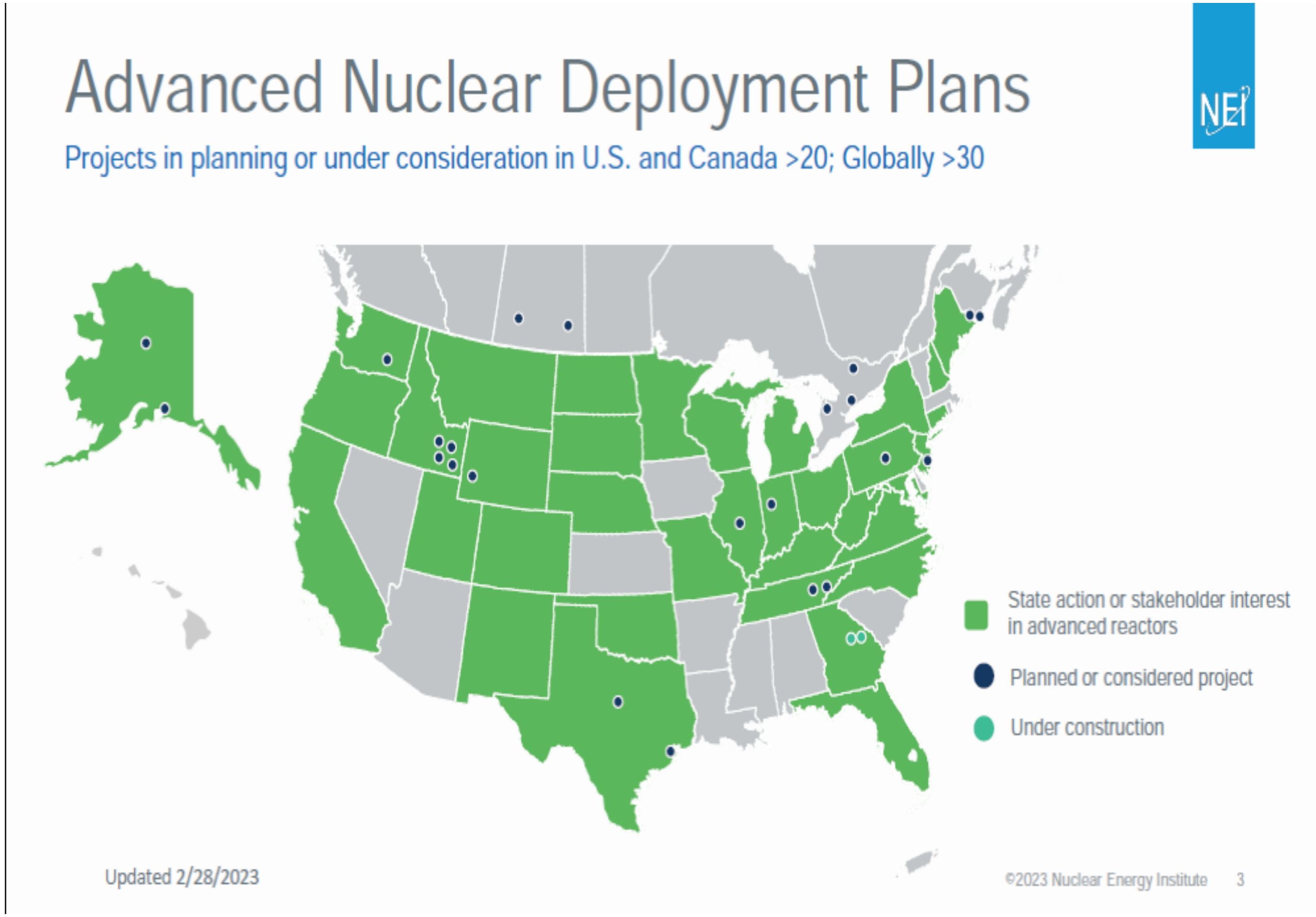
US Political Trends – State Actions



State Politics

Spurred by the IRA and Net Zero goals there has been a significant uptick in interest at the state level across the US

Legislative Actions

- 2022 – 30 pieces of legislation
  - 19 States introduced bills
  - 11 States passed legislation
- 2023 – 100+ bills introduced
  - Lifting moratoriums on nuclear development
  - Clean Energy Standards review
  - SMR Studies
  - Establishing a nuclear task force
- Other Events
  - Support for reviving Diablo Canyon and Palisades

DOE Liftoff for Advanced Nuclear

Pathways to Commercial Liftoff: Advanced Nuclear

- US domestic nuclear capacity has the potential to scale from ~100 GW in 2023 to ~300 GW by 2050 driven by deployment of advanced nuclear technologies
- Advanced nuclear includes a range of proven and innovative technologies
- Advanced nuclear provides a differentiated value proposition for a decarbonized grid
- To unlock deployment at scale, Nth-of-a-kind (NOAK) advanced nuclear overnight capital costs may need approach $3600 per KW

"However, the nuclear industry today is at a commercial stalemate between potential customers and investments in the nuclear industrial base needed for deployment—putting decarbonization goals at risk. Utilities and other potential customers recognize the need for nuclear power, but perceived risks of uncontrolled cost overrun and project abandonment have limited committed orders for new reactors."
US DOE Pathways to Commercial Liftoff: Advanced Nuclear

Impact of Waiting to Start Deployment

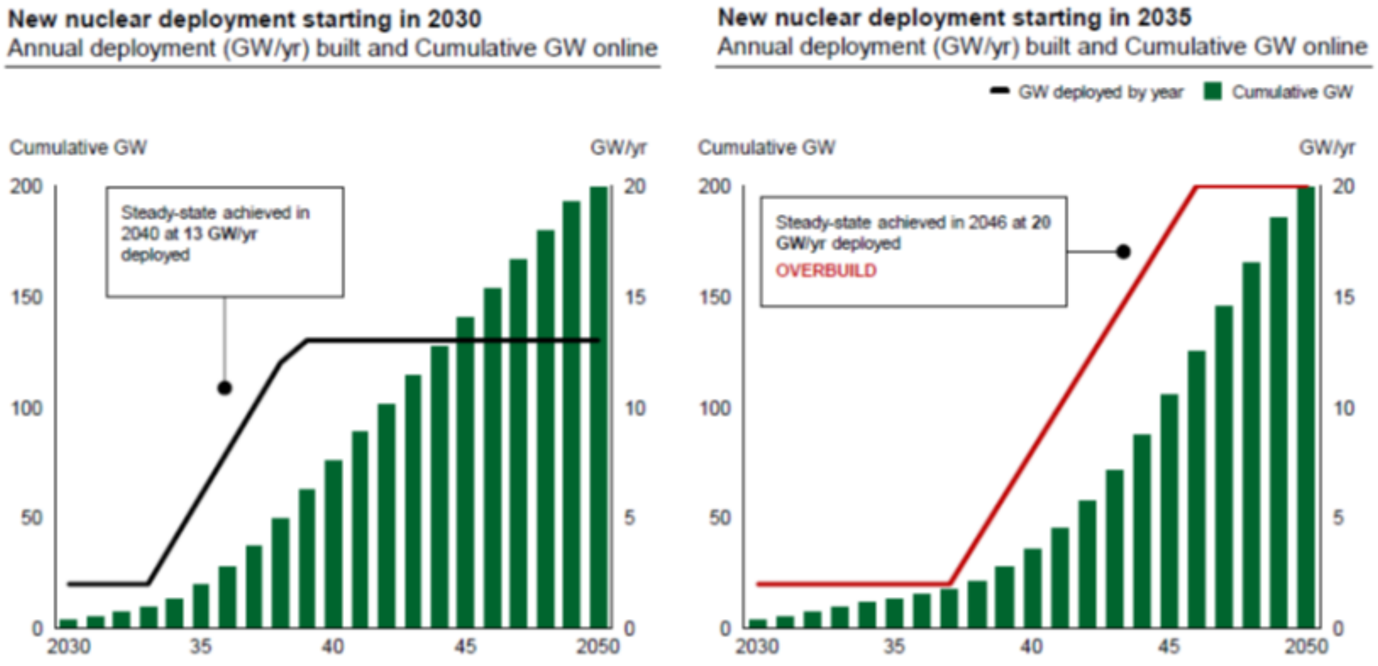


Figure 1: New nuclear build-out scenarios and implications for industrial base capacity requirements

Imperatives Driving DOE

1. Committed Order Book – 5-10 deployments of each reactor design by 2025
2. Project Delivery – first projects must be “reasonably on time and on budget” - +/- 20%
3. Industrialization – scale up to match maturity of the industry

“Advanced nuclear can play a critical role in strengthening energy security, reliability, and affordability while generating high-quality, high-paying jobs and facilitating an equitable energy transition. Industry, investors, government, and the broader stakeholder ecosystem each has a role to play in ensuring advanced nuclear achieves commercial liftoff and rises to meet the challenge in time.”

Contributors to FOAK/NOAK Cost

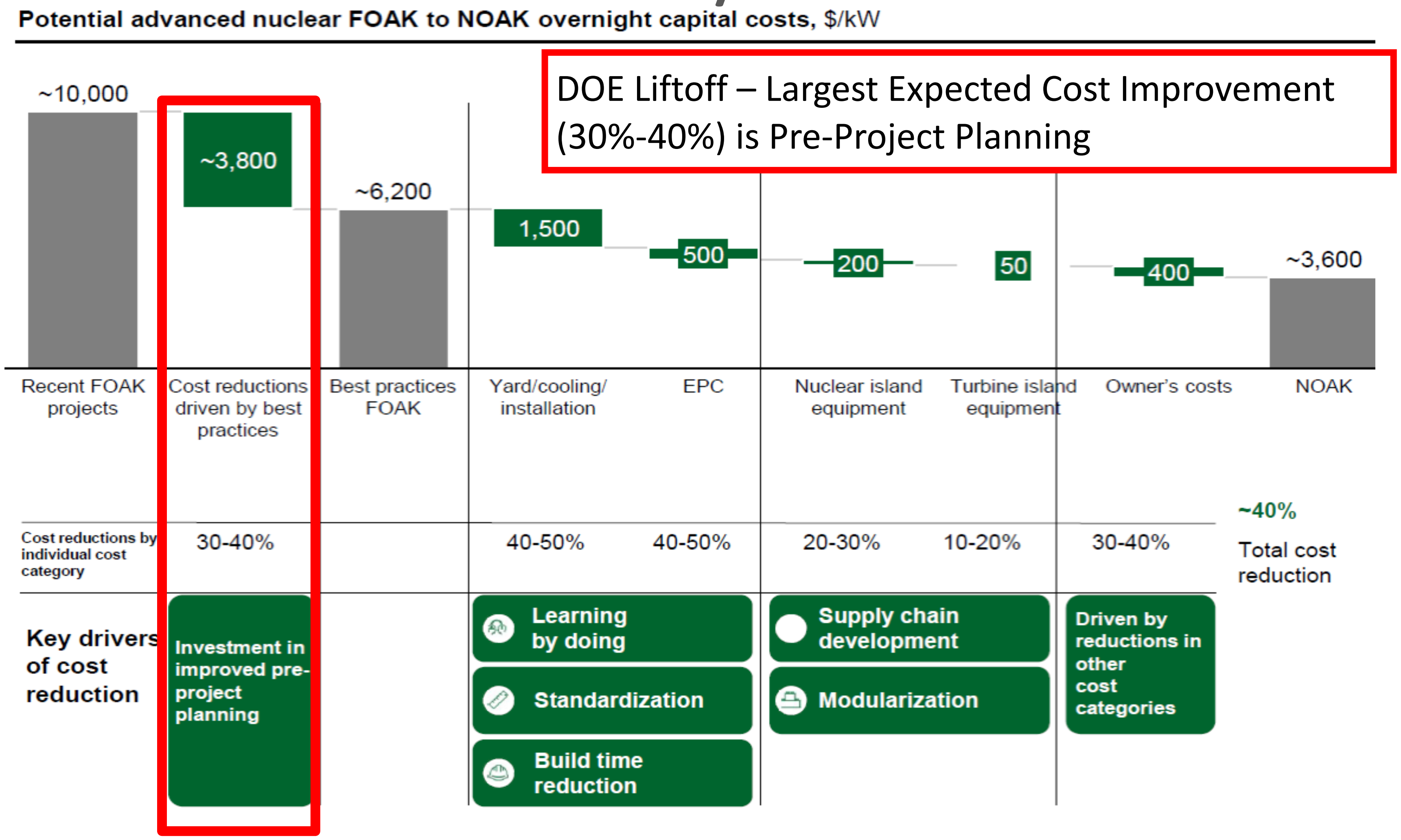


Figure 15: Categorizations for how advanced nuclear costs could decrease from FOAK to NOAK deployments[xxvi]

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Monetizing NOAK Benefits for Close Followers

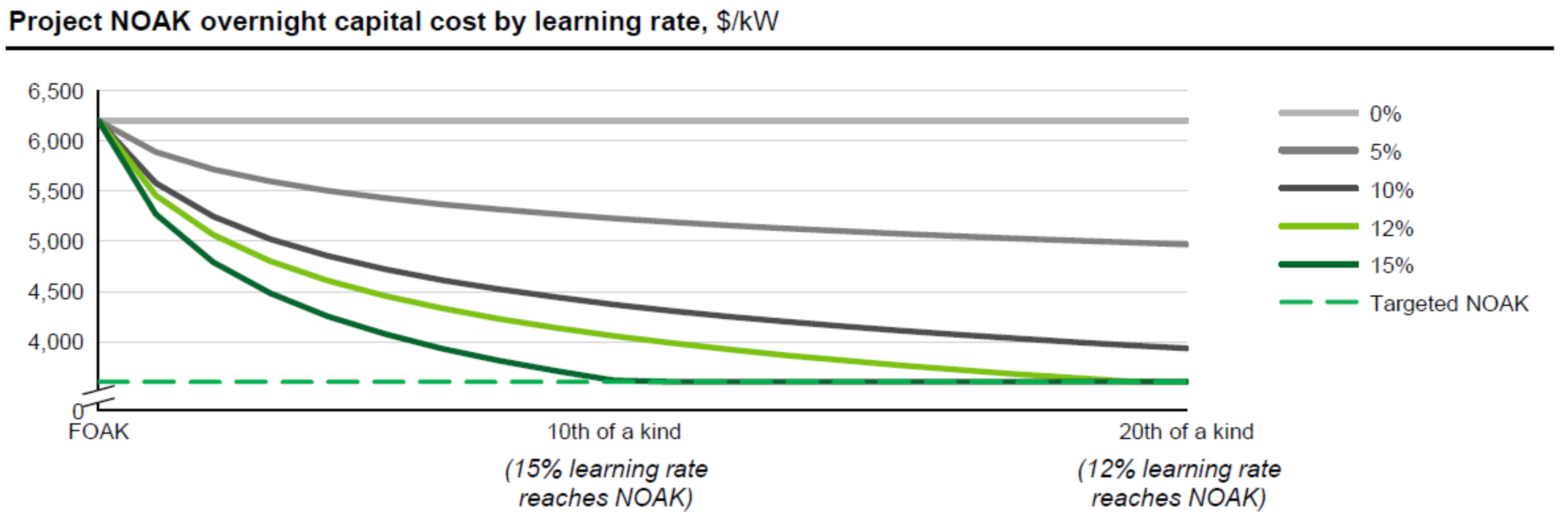

Figure 16: The number of reactors it would take to reach NOAK overnight capital costs depends on the learning rate achieved by the nuclear program

US DOE Pathways to Commercial Liftoff provides a forecast of NOAK benefits for SMR/advanced reactors

- Expected learning rate is likely to reduce cost between 12%-15% per unit for the first 10-20 units
- Benefits will come from: (1) learning by doing; (2) standardization; (3) build-time reductions
- Projects "executed in rapid succession using the same workforce will achieve better learning rates than those with significant time between builds (which) use a new workforce"

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Observations

- Acceptance of nuclear is bi-partisan and growing on a state-by-state basis
  - Political acceptance of nuclear (as well as renewables and hydrogen) is growing across the US – in some US states, motivation is Net Zero, in others it is economics
  - Public acceptance – nuclear is now viewed as both “green” and “clean” though concerns about waste and safety are hard to shake
  - SMRs are a game changer – based on experience of large plants, SMRs are viewed as faster, less risky, less costly and more flexible (Illinois example)
- Policy priorities are based on Speed and Scale
  - Policy measures are designed to help utilities offset FOAK risks with direct funding, financing, ITC/PTC and other measures
  - First of a Kind is a risk to be monetized and managed, not a barrier to doing “big things”
  - Meeting the cost curve requires developers use sound project management and be completely honest and transparent with the risks of early deployment
  - There will be winners and losers as the market shakes out – we need to redefine what “success” looks like – “reasonably within cost and schedule”
- US and Canada <u>must</u> work together
  - Darlington and Bruce Refurbishments have had a real impact in the US
  - Advanced reactor developers need orders to ramp up - US and Canada together form a formidable market
  - OPG and TVA projects provide a template to be replicated

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THANK YOU

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