

CFTI Advanced Nuclear Workgroup Phase 3 Policy Proposals

Proposed 118th Congress Priorities

The Advanced Reactor Demonstration Program (ARDP) and Carbon Free Power Project (CFPP)

Continued, sufficient funding for the existing ARDP and CFPP.

- **Authorization:** N/A
- **Appropriations:** \$250,000,000 per year through FY2027 for ARDP, and \$1,355,000,000 total for the CFPP cost-share through FY2030 (year over year costs TBD)
- **Basis:** There needs to be additional, continued funding for the existing ARDP at the level necessary to keep the program on track to meet its goals. The companies' success and the success of these demonstrations are contingent on Congressional appropriations. Without sufficient support, the 2028 timeline is unlikely to be met, and/or insufficient supply chain activities could result in delays, both of which would undermine the program and undermine these reactors' being cost-competitive in the market.

All activities included in the ARDP program were funded at \$230,000,000 in FY20 and \$250,000,000 in both FY21 and FY22. The two major demonstration awards received \$2.4 billion of direct funding in the bipartisan Infrastructure Investment and Jobs Act (IIJA). While a significant investment, there needs to be additional, continued funding for the remainder of the two major demonstration cost-shares, which are now part of the new Office of Clean Energy Demonstrations (OCED). In addition, there needs to be continued funding for the other portions of the ARDP including the five Risk Reduction awards, the National Reactor Innovation Center (NRIC), and both the Regulatory and Safeguards support line items in the Office of Nuclear Energy. This funding is necessary to enable these additional projects to be built on time, as well as support the NRIC test beds for advanced reactor testing.

In October 2020, The Department of Energy's Office of Nuclear Energy awarded the Utah Associated Municipal Power Systems (UAMPS) \$1,355,000,000 for the CFPP to bring the NuScale project online near Idaho National Lab. Similar to the ARDP, this cost-share with UAMPS is needed to have the program succeed.

Advanced Nuclear Fuel Availability Program (HALEU Program)

Implement the Advanced Nuclear Fuel Availability Program to support the commercial development of a High-Assay Low Enriched Uranium (HALEU) supply chain, as well as provide funding for downblending High Enriched Uranium (HEU) for first movers such as the two Advanced Reactor Demonstration Program (ARDP) demonstration awards.

- **Authorization:** Enact the Fueling Our Nuclear Future Act (S.4066) and the International Nuclear Energy Act (S.4064, H.R.9098)

- **Appropriations:** \$150,000,000 per year through FY2027 to support the commercial development of a HALEU supply chain; and \$160,000,000 total for downblending HEU for first movers such as the two ARDP demonstration awards. Congressional direction for the National Nuclear Security Administration (NNSA) to release a modest amount (e.g., about 4-5 metric tons of uranium (MTU)) of its HEU inventory for downblending to produce HALEU for the two ARDP demonstration first cores.
- **Basis:** Currently the U.S. does not have a domestic HALEU supply chain. Russia is the only commercial supplier of HALEU. Originally, many advanced reactor companies planned on purchasing material for their first fuel load from Russia; however, Russia is no longer a viable supplier so the urgency to develop a domestic HALEU supply chain has increased. The Energy Act of 2020 authorized the Advanced Nuclear Fuel Availability Program to support the availability of HALEU for civilian domestic research, development, demonstration, and commercial use. The Inflation Reduction Act (IRA) included a total of \$700,000,000 for the Advanced Nuclear Fuel Availability Program through September 30, 2026. The program should continue to be funded at \$150,000,000 per year through FY2027 to support the deployment of a competitive, commercial HALEU supply chain in the U.S. that is able to grow to meet our domestic requirements and our allies.

Furthermore, an alternate short-term supply of HALEU must be found for current ARDP projects to bridge the gap before domestic production capacity is available. The fastest path to support near-term fuel requirements is to downblend existing fresh HEU. The total cost of a downblending bridge-program to produce 20 MTU of HALEU, the amount needed for the two ARDP demonstrations' first fuel loads, is expected to be about \$160, 000,000. Additionally, there should be Congressional direction to the (NNSA to release a modest amount (e.g., ~4-5 MTU) of its HEU inventory for downblending to produce the HALEU for the ARDP demonstration first cores.

Implementation of Inflation Reduction Tax Credits

Proper implementation of the Inflation Reduction Act (IRA) tax credits can support early-market, clean energy technologies (including nuclear energy).

- **Authorization:** N/A
- **Appropriations:** N/A
- **Treasury Guidance:** Provide feedback to the Treasury to ensure recently enacted IRA tax credits are impactful and effective and can support a variety of technologies including nuclear. This would include feedback on specific tax credits and other aspects of the tax credit bill (e.g., direct pay, energy communities, etc).
- **Basis:** The IRA enacted a suite of tax credits to support clean energy technologies (including nuclear energy). Ensuring that these tax credits are implemented in accordance with Congressional intent can maximize their impact (<https://home.treasury.gov/news/press-releases/jy0993>).

Low Enriched Uranium Supply Chain

Develop a Low Enriched Uranium supply for the existing fleet to minimize reliance on Russian and Chinese uranium.

- **Authorization:** Enact the International Nuclear Energy Act (S.4064/H.R.9098)
- **Appropriations:** Per S.4064, the International Nuclear Energy Act:
 - (I) Authorization Of Appropriations.—In addition to amounts otherwise available, there are authorized to be appropriated to the Secretary—
 - (1) for the Nuclear Fuel Security Program, \$3,500,000,000 for fiscal year 2023, to remain available until September 30, 2031; and

(2) for the National Strategic Uranium Reserve Program and the American Assured Fuel Supply Program, such sums as are necessary for the period of fiscal years 2023 through 2030, to remain available until September 30, 2031.

- **Basis:** The U.S. reactor fleet currently obtains about 20% of its enriched uranium from Russia and is committed to ceasing reliance on Russian-enriched uranium. Section 16 of the International Nuclear Energy Act, U.S. Nuclear Fuels Security Initiative to Reduce Reliance on Nuclear Fuels from Russia and China, authorizes multiple programs to cease this reliance.

Long-term Power Purchase Agreements (PPAs)

Authorize the federal government to enter into long-term power purchase agreements with advanced nuclear reactors.

- **Authorization:** Enact the Nuclear Power Purchase Agreements Act (H.R.4834)
- **Appropriations:** N/A
- **Basis:** Power purchase agreements (PPAs) by the federal government are usually restricted to a maximum of ten years, but nuclear power facilities have much longer timescales. PPAs can serve as an early market driver for U.S. nuclear energy technologies; off-taker certainty increases access to financing for budding advanced reactor companies with limited equity and credit lines. These agreements are positive for federal government projects as well as they can provide reliable and resilient power in remote off-grid and emergency scenarios. For example, the University of Wisconsin considered nuclear energy use at federal facilities to enhance energy resilience: <https://ines.engr.wisc.edu/2021/05/08/https-www-engr-wisc-edu-news-tapping-innovative-balance-of-power-microreactors-could-enhance-energy-resilience/>

Off-fee Nuclear Regulatory Commission (NRC) Funding for Advanced Reactor Regulation

Provide additional and consistent funding, at least \$150,000,000 per year for at least 5 years, to the Nuclear Regulatory Commission (NRC) for activities related to the development of the regulatory infrastructure for advanced nuclear reactor technologies.

- **Authorization:** N/A - this is already authorized under NEIMA
- **Appropriations:** \$150,000,000 per year for at least 5 years
- **Basis:** The NRC anticipates 13+ current and potential applications by 2027, as well as 6+ potential operating licenses by 2027. If the first-of-a-kind demonstrations are successful, the industry anticipates a significant increase in yearly license applications. For example, a June 2022 Nuclear Energy Institute survey of its 19 utility members anticipates more than 90 GW of new nuclear generation by the 2050s, which equates to 100s of reactor applications over the next few decades. Accelerating the NRC's efforts to license advanced reactor technologies, including an increase in the volume of applications, will ensure the NRC can meet its safety and security mission while efficiently and effectively licensing new technologies.

DOE Cost-Share for Advanced Reactor Licensing

Provide DOE funding (at least \$10,000,000 per year for 10 years) for the Advanced Nuclear Energy Licensing Cost-Share Grant Program as authorized in the Nuclear Energy Innovation Capabilities Act (NEICA).

- **Authorization:** Licensing cost shares are already authorized under Section 3 of the NEICA. Enact the Nuclear Assistance for America's Small Businesses Act (H.R.9045).
- **Appropriations:** \$10,000,000 per year for 10 years
- **Basis:** The NRC anticipates 13+ current and potential applications by 2027, as well as 6+ potential operating licenses by 2027. First of a kind (FOAK) designs have to overcome licensing processes that are based on prior experience with the current fleet of large light-water nuclear reactors while addressing unique policy and technology licensing issues. As NRC hourly fees

are nearly \$300 per staff-hour, this creates an undue burden for FOAK applicants. Implementing the Licensing Cost-share Grant Program as authorized by NEICA can help de-risk FOAK applications by decreasing the financial burden to overcome these first-mover licensing challenges. Recent bills, like the Nuclear Assistance for America's Small Businesses Act (H.R.9045) would support U.S. small businesses engaged or seeking to engage in the research, development, and deployment of advanced nuclear reactors.

Advanced Nuclear Energy Earthshot

Launch an Energy Earthshot Initiative for nuclear energy — Advanced Nuclear Energy Earthshot — that aims to accelerate breakthroughs of more abundant, affordable, and reliable clean nuclear energy solutions within the decade. The Advanced Nuclear Energy Earthshot should broadly seek to reduce the cost of new nuclear energy technologies to below \$2,000/kW capital costs and \$35/MWh Levelized Cost Of Energy (LCOE) by 2030.

- **Authorization:** N/A - similar to other Energy Earthshots, DOE can implement this under existing authority
- **Appropriations:** This would be evaluated by DOE and stakeholders after standing up the program
- **Basis:** Similar to other DOE Energy Earthshots for hydrogen and long duration energy storage, a nuclear energy earthshot would provide a clear, actionable goal for the Department and Office of Nuclear Energy to orient around. This would complement the existing activities of the Department, but go further to help enable a clean grid by focusing on cost reduction which makes nuclear energy available to smaller utilities as well as new markets beyond the electricity sector.

Nuclear Supply Chain Development

Establish a program at DOE focused on developing the Nuclear Supply Chain.

- **Authorization:** This could be established through a bill or appropriations
- **Appropriations:** \$5,000,000 in the initial fiscal year; future years would be evaluated by DOE and stakeholders after standing up the program
- **Basis:** There needs to be a robust supply chain to support the rapid deployment of new nuclear reactors. DOE should establish a program focused on developing the key points of the nuclear supply chain domestically as well as collaborating with our allies in a manner that protects energy security. This new program could be established in the Office of Nuclear Energy or within the Office of Manufacturing and Energy Supply Chains and would align with the proposed Advanced Nuclear Energy Earthshot initiative. DOE has additional information in its February 2022 report, "America's Strategy to Secure the Supply Chain for a Robust Clean Energy Transition," <https://www.energy.gov/policy/securing-americas-clean-energy-supply-chain>.

Loan Programs Office (LPO) Used Fuel Project Support

Provide direction to LPO to support back-end of the fuel cycle projects

- **Authorization:** Similar language to pages 845-846 of the Energy Act of 2020 that modifies Section 953 of the Energy Policy Act of 2005 regarding Fuel Cycle R+D to authorize LPO to support the back end of the fuel cycle:
Section 1703 of the Energy Policy Act of 2005 (42 U.S.C. 16513) is amended—
(1) in subsection (b) by adding at the end the following:
“(13) Technologies or processes for used nuclear fuel storage, use, and disposal, including advanced nuclear reactor and non-reactor concepts.”
- **Appropriations:** N/A

- **Basis:** Today, LPO is unable to support innovative technologies that relate to the back-end of the nuclear fuel cycle. While the Office of Nuclear Energy (NE) was authorized to support Used Nuclear Fuel Research, Development, Demonstration, and Commercial Applications in Section 2003 of the Energy Act of 2020, LPO was not provided with such authority. Providing this authority to LPO will complement the work within NE by providing resources for near-commercial, innovative solutions to back-end nuclear material. These projects can leverage unique attributes of advanced nuclear concepts and would include recycling used fuel for use by new nuclear technologies.

Coal to Nuclear Studies

Direct the Department of Energy (DOE) to implement the Fission for the Future Act (S.3428), which was included in the CHIPS and Science Act, to provide grants to communities, universities, municipal utilities, public service commissions, and other small entities to conduct studies for the replacement and/or repowering of coal-fired power plants with advanced nuclear reactors.

- **Authorization:** N/A
- **Appropriations:** Provide funding to implement this program as authorized in the CHIPS and Science Act:
 - AUTHORIZATION OF APPROPRIATIONS.—In addition to amounts otherwise available, there are authorized to be appropriated to the Secretary to carry out the program—
 - \$75,000,000 for fiscal year 2023;
 - \$100,000,000 for fiscal year 2024;
 - \$150,000,000 for fiscal year 2025;
 - \$225,000,000 for fiscal year 2026; and
 - \$250,000,000 for fiscal year 2027.
- **Basis:** Coal facilities have provided decades of secure jobs and a reliable tax base to communities and advanced nuclear power plants can support communities that have announced retiring coal facilities. There is a significant overlap between coal plant and nuclear plant jobs, and a nuclear plant can leverage the trained workforce. In addition, existing infrastructure, such as transmission and rights-of-ways, can be leveraged (<https://www.goodenergycollective.org/policy/coal-repowering>; <https://www.energy.gov/ne/articles/doe-report-finds-hundreds-retiring-coal-plant-sites-could-convert-nuclear>). Table 3 [<https://www.nuscalepower.com/environment/coal-plants>] compares the types of jobs between a NuScale plant and a coal plant; this comparison could be generally applied to any advanced reactor technology. However, nuclear industry jobs typically pay better than other types of power plants. The following report [<https://www.usenergyjobs.org/wages>] shows that the nuclear industry has median hourly wages of \$39.19, which is more than twice as high as the national median of \$19.14. Funding grants for local entities for the replacement and/or repowering of coal-fired power plants with advanced nuclear reactors would enable them to explore this community-saving, clean technology option.

Create a microreactor demonstration program

A targeted demonstration program through the Department of Energy's (DOE) Office of Clean Energy Demonstrations (OCED) for microreactors can spur rapid deployments of new nuclear technologies as these projects are smaller than other reactor designs.

- **Authorization:** NA
- **Appropriations:** \$30,000,000 initially; the total program cost would be \$150,000,000.
- **Basis:** Microreactors can play a unique role in powering remote communities, providing resiliency (microgrids), or producing energy for specific end uses including the non-electric sector. A targeted microreactor demonstration program can continue to jump start the U.S. nuclear industry and supply chain, including fuel, components, and human capital. Bringing

commercial microreactors online can complement the timelines of the existing Advanced Reactor Demonstration Program (ARDP) and Carbon Free Power Project (CFPP), by preparing the industry and supply chain for subsequent deployments. This program would also complement efforts at the Department of Defense such as Project Pele and the microreactor demonstration project at Eielson Air Force Base in Alaska.

Begin to socialize another round of larger demonstration reactor funding (ARDP 2.0)

Another round of demonstration reactor funding that builds upon the current Advanced Reactor Demonstration Program (ARDP), specifically to support the existing Risk Reduction awardees, or other first of a kind reactors that can come online in a clear timeframe. This program should be competitively awarded, have no less than two awardees, be based on specific milestones and timelines for completion of the program, and utilize payments for milestones in the same manner as the NASA COTS program. This program would be through the Department of Energy's (DOE) Office of Clean Energy Demonstrations (OCED).

- **Authorization:** TBD
- **Appropriations:** TBD
- **Basis:** While it is likely this would need to be implemented in 2024 or later, after the Risk Reduction awards are closer to completion, EEI can begin to scope interest in another round of demonstration funding as well as collaborate with stakeholders to shape the program itself.

Include Nuclear as part of Federal Clean Energy Commitments

Direct the federal government to utilize nuclear energy as part of its 24/7 clean energy commitments.

- **Action:** EEI should ensure that at least one nuclear energy project (existing or new) is considered as part of the Federal Government's commitments to 24/7 clean energy.
- **Basis:** Nuclear energy provides clean, reliable, and affordable energy. As nuclear energy already operates around the clock, it can be used to help the federal government meet its 24/7 clean energy commitments. This should also include encouraging the Department of Defense and military branches to meaningfully include nuclear energy in their climate action strategies. For example, the March 24, 2022 letter to the Army Secretary titled, "Using Nuclear Energy to Achieve the Army's Climate Action Strategy," was signed by 27 signatories coming from industry associations and former defense officials and would be similarly applicable for civilian government facilities.

Update the Environmental Protection Agency (EPA) and Nuclear Regulatory Commission (NRC) Spent Nuclear Fuel (SNF) Disposal Regulations and Standards in the US

- **Authorization:** TBD
- **Appropriations:** \$10,000,000 per year for five years to EPA to promulgate a new technology-inclusive, risk-informed, and performance-based generic repository standard that incorporates international best practices.
- **Basis:** The EPA's current generic geologic repository standard, 40 CFR Part 191, is out of date and inconsistent with modern international repository standards and regulations. A new standard should be promulgated to incorporate advances in research, ensuring that the rule has a clear nexus to public health and safety, and is technology-inclusive, risk-informed, and performance-based in order to be applicable to other types of deep geologic repository designs and other innovative disposal technologies. Since the Waste Isolation Pilot Plant (WIPP) is currently licensed to 40 CFR Part 191, a new standard should be promulgated and 40 CFR Part 191 should be revised to only be applicable to the Waste Isolation Pilot Plant (WIPP). The NRC can begin updating 10 CFR Part 60 in future appropriations cycles after EPA has started the

rulemaking but before EPA has completed the rulemaking to limit the overall time and maximize the use of resources.

Continue to emphasize the importance of finding a durable solution to the back end of the fuel cycle

- **Authorization:** TBD
- **Appropriations:** TBD
- **Basis:** Addressing long-term spent fuel storage is an important topic. Near-term examples could include restarting federal progress on a long-term geologic repository using consent-based processes; the pursuit of interim-storage facilities in the near term; and opening up spent fuel storage to private sector innovation including more efficient fuel utilization, deep borehole storage, and recycling.

Potential, Future Priorities

Authorize the federal government to support advanced reactor projects in competitive, organized wholesale markets where the off-taker is not a federal entity through a contract for difference (CfD) or virtual power purchase agreement (VPPA) mechanism.

- Authorization: TBD
- Appropriations TBD
- Basis: TBD

Establish a new version of the standby support mechanism (Standby Support 2.0) for license reviews (e.g., construction permits (CPs) and operating licenses (OLs) under 10 CFR Part 50; early site permits (ESPs), design certifications (DCs), combined construction and operating licenses (COLs), and manufacturing licenses (MLs) under 10 CFR Part 52, and licensing processes that will eventually be a part of the new 10 CFR Part 53) related to advanced reactors.

- Authorization: TBD
- Appropriations TBD
- Basis: TBD

NRC direction to improve licensing (safety and environmental review) process of new nuclear at retiring or retired coal sites (including brownfield sites).

- Authorization: TBD - leverage existing siting (e.g. environmental and meteorological) data from facilities; streamline purpose and need + alternatives analysis for new projects
- Appropriations: N/A
- Basis: Easing the construction of new nuclear facilities at retiring coal sites can provide additional clean energy, as well as support communities

EPA direction to improve permitting/construction process of new nuclear at retiring or retired coal sites (including brownfield sites).

- Authorization: TBD - provide "credit" for converting sites to clean energy generation
- Appropriations: N/A
- Basis: Easing the construction of new nuclear facilities at retiring coal sites can provide additional clean energy, as well as support communities

FERC direction to improve permitting/construction process of new nuclear at retiring or retired coal sites (including brownfield sites).

- Authorization: TBD - Provide direction to FERC to leverage water/transmission right of ways to ease the construction of new facilities
- Appropriations: N/A
- Basis: Easing the construction of new nuclear facilities at retiring coal sites can provide additional clean energy, as well as support communities

Additional NRC direction to support the licensing of new reactor technologies.

- Authorization: TBD, but could include fee reform, Part 53, NEPA and environmental reviews, hiring authority, research, etc
- Appropriations: TBD
- Basis: TBD

Provide continued and expanded funding, up to \$900,000,000 per fiscal year for the next 5 years, to ensure that the Versatile Test Reactor (VTR) will come online by 2026.

- Basis: No political viability, but could revise the request based on the timeline of deployment

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Provide continuing rounds of risk reduction awards to the projects granted awards under the first phase of the ARDP.

- Basis: No political viability today

Double appropriations to at least \$340,000,000 per fiscal year for five years for the R&D of nuclear fission technologies that include the Light Water Sustainability Reactor program, Advanced Reactor Technology program, and Used Nuclear Fuel Disposition program.

- Basis: No political viability today and not a targeted request

Ensure adequate funding and implementation of the applied fusion program at \$1,200,000,000 per fiscal year for the next five years within Fusion Energy Science in the Office of Science at DOE, as included in the Energy Act of 2020.

- Basis: No political viability today and not a targeted request