Movers & Milestones in Nuclear Energy: 2017 – 2019

Nuclear Energy Innovation Capabilities Act of 2017 (P.L.115-248)

Summary: Aspects of this landmark legislation were implemented in 2019. The National Reactor Innovation Center (NRIC) was launched in September at Idaho National Lab (INL) to coordinate testing and demonstrating advanced reactors. The Versatile Test Reactor (VTR) was approved and is working towards its next major milestone to select its conceptual design, cost estimate and schedule. The FY2020 appropriations give $20 million to NRIC and $65 million for the VTR.

Broader Impact: NEICA has lay the groundwork for the INL to serve as a global leader in advanced reactor testing and demonstration.

Nuclear Energy Innovation and Modernization Act (P.L.115-439)

Summary: This law, enacted in December 2018, required the NRC to develop new processes for licensing advanced reactors. In 2019 the NRC made major inroads to efficiently and effectively license advanced reactors. For example, the Commission issued an Early Site Permit (ESP) at the Tennessee Valley Authority's Clinch River site which allowed the use of a smaller emergency planning zone that credits the inherent safety features of small modular reactors and advanced reactors. The NRC is also continuing an effort to develop a Generic Environmental Impact Statement (GEIS), which will streamline environmental reviews for new reactors.

Broader Impact: The continuation of the Emergency Planning Zone rulemaking for future project applications and the development of a GEIS are two examples of the NRC modernizing its regulatory infrastructure for the review of new and advanced reactors.

Nuclear Energy Leadership Act (S.903/H.R.3306)

Summary: The Nuclear Energy Leadership Act (NELA) passed the Senate Energy Committee by voice vote and was introduced in the House in 2019. Concurrently, portions of NELA were still supported through the FY2020 appropriations. For example, $8 million for processing EBR-II fuel into High Assy Low Enriched Uranium (HALEU), $40 million for civil nuclear fuel enrichment, and $2 million for transportation. Most importantly, the advanced reactor demonstration moonshots were allocated more than $200 million.

Broader Impact: Providing a short term supply of HALEU is a critical step in supporting early movers.

Advanced nuclear getting an advanced timeline:

Company	Government Collaboration	Expected Reactor Operation	FY2020 Funding (millions)
Oklo Aurora	Gateway for Accelerated Innovation in Nuclear (GAIN), ARPA-E, INL Site Use Permit	Early 2020s	N/A
Westinghouse eVinci microreactor	Department of Energy (DOE) Office of Nuclear Energy (NE) eVinci Micro Reactor Nuclear Demonstration Unit Readiness Project	Prototype by 2022	$20
Three TBA microreactors	Department of Defense (DOD) Strategic Capabilities Office (SCO) Micro Nuclear Reactor Program	One by 2023	$70
NuScale, light water small modular reactor	DOE NE - Advanced Nuclear Technology Development	2026 EOY	$10
General Electric Hitachi (GEH) PRISM, sodium fast reactor	DOE NE - Versatile Test Reactor	2025 - NEICA, 2026 to 2030 - estimate	$65
X-Energy	DOE NE - TRISO fuel manufacturing and furthering the development of the Xe-100 reactor design and licensing	2023 and mid-2020s	$13
Two TBA advanced reactor demos	DOE NE - Advanced Reactor Demonstration Program	Mid-2020s	$160
Two to five TBA advanced reactors	DOE NE - "Risk Reduction for Future Demonstrations" public-private partnerships	Mid-2030s	$30

NuScale

Summary: NuScale recently finished Phase 4 of its Design Certification Application and is on track to complete this process with the NRC. This aligns with NuScale's goal of operating by 2026.
Broader Impact: NuScale is the first SMR to go through the NRC licensing process and may be the first SMR to market.

Oklo

Summary: Oklo recently unveiled its Aurora design and received a Site Use Permit from DOE to build at INL. Additionally, Oklo successfully demonstrated prototypes of its metallic fuels.
Broader Impact: Oklo is anticipated to submit the first advanced fission plant combined license application for the Aurora to the NRC in the very near term.

X-Energy

Summary: X-Energy announced a partnership with GE (Global Nuclear Fuels) on TRISO fuel and gas reactors. X-Energy has also been selected to perform design studies on a gas reactor and TRISO fuel concepts for space applications.
Broader Impact: DOE has invested significant resources in developing TRISO fuel and many reactors plan on using TRISO fuel for their designs.

Westinghouse

Summary: The Westinghouse eVinci microreactor received a DOE award in 2019 to manufacture, site and test by 2022.
Broader Impact: The Westinghouse eVinci design may also be one of the earliest advanced reactor designs to be demonstrated at Idaho National Lab.

Kairos

Summary: Kairos Power recently announced acquisition of a site in Albuquerque for a new testing and component qualification facility, and has also received several GAIN vouchers and awarded multiple DOE FOAs to move molten salt technology and regulatory needs forward.
Broader Impact: Kairos has been engaged in significant pre-application activities with the NRC. Kairos also intends on using TRISO fuel for its molten salt reactor design.

DOD Micro Nuclear Reactor Program

Summary: The DOD Strategic Capabilities Office has plans to demonstrate a microreactor by 2023 and will soon announce the three reactor designs that will compete to construct a prototype.
Broader Impact: The aggressive schedule of the DOD program will advance the broader nuclear industry, especially in the areas of fuel, construction, and licensing.

NRC/CNSC Collaboration

Summary: The NRC and the Canadian Nuclear Safety Commission (CNSC) signed a Memorandum of Cooperation for the review of advanced reactors. They have selected NuScale's SMR and Terrestrial Energy's molten salt reactor as the first two designs for this process.
Broader Impact: This partnership has incredible potential to leverage expertise and resources. The success may allow the NRC and CNSC to expand to reviewing other designs (15+). Long term this may open up the potential for international licensing harmonization and/or include other countries' regulators.