



## Position Statement #35

# Advanced Reactors

The American Nuclear Society (ANS) promotes the development and deployment of advanced reactors because of their importance to the sustainability, reliability, and security of the world's long-term energy supply. Government and environmental groups recognize that nuclear energy has an essential role in providing clean, reliable electricity. Advanced reactor designs offer the benefits of current reactors as well as the potential to deploy in high-temperature industrial applications beyond electricity generation, inherent features that reduce complexity and enhance safety, and more efficient fuel use for long-term fuel supply sustainability. Advanced reactor development is proceeding worldwide with strong government backing. It is important that the United States be a global leader in the development of advanced reactors in order to achieve objectives in nuclear safety, security, and nonproliferation. Meaningful public policy actions are needed to ensure continued U.S. leadership in this vital sector.

Advanced reactors often use fuel types different from conventional uranium oxide and generally incorporate coolants such as liquid metal, gas, or molten salt. Attributes of advanced reactor designs will enable fission technology to extend beyond clean electricity production. The higher operating temperatures of many advanced non-light water reactor designs enable clean, carbon-free, and economical process heat applications, providing an alternative to the fossil fuels that are currently used for these applications. Most proposed advanced reactor designs either produce a lower volume of nuclear waste than current reactors or have the potential to consume nuclear waste as a source of fuel. Advanced reactors often combine existing features of conventional nuclear power, such as resilience, reliability, and high capacity factors, with other features, such as enhanced load-following, microgrid generation, online refueling, and extended periods of uninterrupted operation. These features will enable advanced reactors to play a central role in creating a low-emission energy grid, improving the economic performance of nuclear energy and increasing its market attractiveness.

Advanced reactors offer the promise of improved safety and economics as well as more flexible operations, maintenance, and surveillance through inherent system characteristics. A risk-informed and performance-based framework for design and regulation<sup>1</sup> will enable advanced reactors to realize reduced capital and operating costs through simpler designs that have fewer unnecessary requirements associated with fabrication, installation, maintenance, and testing of safety-related systems and components.

The American Nuclear Society recommends the following policy actions to foster the development of advanced reactors:

1. Use the capabilities of the U.S. Department of Energy infrastructure and international partners to perform vital fundamental research related to advanced reactors. While some designs are ready for deployment based on current technology, long-term advancements in applied science and engineering will enable advanced reactors to fully realize their potential. In particular, fast reactor designs would benefit significantly from a versatile fast neutron source for materials and fuels testing.
2. Establish private-public partnerships to build demonstration units for multiple advanced reactor designs. Demonstration reactors will provide operational experience and focus research and development on advancements needed to optimize designs for commercial deployment. Nuclear energy systems have high development costs and longer time frames than other energy sources, but their attributes justify the public funding needed to bring promising designs to fruition.
3. Support the ongoing development of a technology-neutral, risk-informed, and performance-based licensing framework that will provide effective and efficient regulation of advanced reactor designs.

## References

1. Risk-Informed and Performance-Based Regulations for Nuclear Power Plants (ANS-46-2017). <http://cdn.ans.org/pi/ps/docs/ps46.pdf>



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