

Small Modular Reactors



Infographic by Sarah Gerrity,
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For the purpose of this American Nuclear Society (ANS) position statement, small modular reactors (SMRs) are defined as advanced light water reactors (LWRs) with power outputs of 300 MWe or less per module. ANS Position Statement #35, “Advanced Reactors,” is focused on non-LWRs. As with all nuclear power reactors, SMRs are non-carbon-emitting sources of electricity.

The smaller size of SMRs means that a greater fraction of functional systems can be factory fabricated and assembled than with traditional LWRs, for which a larger fraction of work must take place at the construction site. Factory fabrication offers an opportunity for more automation to achieve high quality with repeatability, which leads to improved standardization and lower costs.

SMRs are operationally similar to currently operating reactors and would rely on fuel designs that are in use today. Also, many SMR components can be manufactured by existing supply chain companies. In addition, the analytical tools used for SMR design and safety demonstration are well characterized. These factors lead to confidence that first-of-a-kind demonstrations of SMRs will be feasible in the late 2020s.

The small size and modular nature of SMRs means that deployment can be tailored to electricity demand changes. The modular approach allows generation to come on-line gradually and permits investment requirements to be more gradual and levelized. SMR siting flexibility means that a utility can supply the electricity near the demand, minimizing investment in transmission. Last, inherent safety features permit smaller emergency planning zones so SMRs can be located closer to population centers. This means SMRs can replace a retiring coal plant and reuse transmission and other existing infrastructure, even if the coal facility is in a densely populated area.

Both the U.S. Congress and the U.S. Department of Energy have recognized the need for public-private partnerships to share in the costs and risks of the demonstration of first-of-a-kind SMR deployments. High capital costs and long timelines for regulatory approval are unique barriers for new nuclear technologies. Federal support will reduce the economic, technical, and other barriers to enable efficient and timely deployment of economically viable SMRs. These investments are justified by the critical need for zero-emitting, flexible, reliable electrical generation sources if clean energy goals are to be met. SMRs are designed for high operational flexibility in addition to reliability, and therefore are able to load-follow intermittent renewable generation and support even more clean energy on the grid. Further, establishing a robust U.S. SMR capability will offer the export market a reactor sized to suit the needs of developing countries, enhance global competitiveness, and support national security objectives.

The American Nuclear Society recognizes the near-term opportunity presented by SMRs to provide safe, reliable, clean, and affordable electricity to meet the demands of society. ANS supports advancing the R&D, testing, regulations, manufacturing capabilities, and policies necessary to enable deployment of first-of-a-kind SMRs, leading to broad use of standardized reactors in the United States and to possible future export of these technologies.

References

1. U.S. Department of Energy, Advanced Reactor Demonstration Program Funding Opportunity Announcement (May 2020); <https://www.id.energy.gov/NEWS/ARDFO/ARDFOopportunities/APPX/Appendixes.html> (current as of Oct. 5, 2020)
2. SMR Start, “Policy Statement on U.S. Public-Private Partnerships for Small Modular Reactors” (Oct. 2019); <http://smrstart.org/wp-content/uploads/2020/02/SMR-Start-Public-Policy-on-Federal-Public-Private-Partnership-Approved-2019-10-10.pdf> (current as of Oct. 5, 2020).
3. U.S. Department of Energy, Technology Readiness Assessment Guide, DOE G 413.3-4; <https://www.directives.doe.gov/directives-documents/400-series/0413.3-EGuide-04/@images/file> (current as of Oct. 5, 2020).



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