

Doris Cellarius

Concerns about new Modular Nuclear Reactors

There are major concerns that more nuclear power plants are not a climate solution and, because there is no safe place anywhere for their nuclear wastes to be stored, they pose serious financial costs and risks for communities that invest in them.

Serious technical problems related to new modular reactors are described in this study published by the National Academy of Sciences (NAS): <https://www.pnas.org/doi/10.1073/pnas.2111833119>

"Conclusions: This analysis of three distinct SMR designs shows that, relative to a gigawatt-scale PWR, these reactors will increase the energy-equivalent volumes of SNF, long-lived LILW, and short-lived LILW by factors of up to 5.5, 30, and 35, respectively. These findings stand in contrast to the waste reduction benefits that advocates have claimed for advanced nuclear technologies. More importantly, SMR waste streams will bear significant (radio-)chemical differences from those of existing reactors. Molten salt- and sodium-cooled SMRs will use highly corrosive and pyrophoric fuels and coolants that, following irradiation, will become highly radioactive. Relatively high concentrations of ²³⁹Pu and ²³⁵U in low-burnup SMR SNF will render recriticality a significant risk for these chemically unstable waste streams.

Although we have analyzed only three of the dozens of proposed SMR designs, these findings are driven by the basic physical reality that, relative to a larger reactor with a similar design and fuel cycle, neutron leakage will be enhanced in the SMR core. Therefore, most SMR designs entail a significant net disadvantage for nuclear waste disposal activities. Given that SMRs are incompatible with existing nuclear waste disposal technologies and concepts, future studies should address whether safe interim storage of reactive SMR waste streams is credible in the context of a continued delay in the development of a geologic repository in the United States."

The good news is that economic arguments have stopped some projects:

<https://www.science.org/content/article/several-us-utilities-back-out-deal-build-novel-nuclear-power-plant>

"Plans to build an innovative new nuclear power plant—and thus revitalize the struggling U.S. nuclear industry—have taken a hit as in recent weeks: Eight of the 36 public utilities that had signed on to help build the plant have backed out of the deal. The withdrawals come just months after the Utah Associated Municipal Power Systems (UAMPS), which intends to buy the plant containing 12 small modular reactors from NuScale Power, announced that completion of the project would be delayed by 3 years to 2030. It also estimates the cost would climb from \$4.2 billion to \$6.1 billion."

Other studies reinforce the argument that costs and flaws in new modular reactors are definitely not a climate solution:

<https://www.power-eng.com/nuclear/report-claims-serious-problems-with-proposed-nuscale-smr/#gref>

"Too late, too expensive, too risky and too uncertain" is how a new report by the Institute for Energy Economics and Financial Analysis (IEEFA) described NuScale's proposed small modular reactor (SMR) project. The analysis, released by the Institute February 17, primarily focuses on the SMR project the Oregon-based company is building for Utah Associated Municipal Power Systems (UAMPS) at a U.S. Department of Energy (DOE) site in Idaho. However, the institute noted it was outlining cost risks, construction timelines, and competitive alternatives for all buyers in the SMR market.

The report also cited the new wind, solar and energy storage that have been added to the grid in the last decade, along with significant additional renewable capacity and storage expected to come online by 2030. IEEFA added new techniques for operating these renewable and storage resources, along with energy

efficiency, load management and broad efforts to better integrate the western grid would undermine NuScale's affordability and reliability claims."