Small Modular Nuclear Reactors
Beyond Talking Points

CHAMBERS FOR INNOVATION & CLEAN ENERGY

What Are Small Module Reactors (SMRs)?

SMRs are nuclear reactors with capacities under 300 megawatts. Unlike larger, conventional nuclear plants, SMRs are produced with modular technology where components are manufactured in a factory, transported, and then constructed on site. In theory, compared to large reactors, SMRs have a number of benefits. SMRs:

- can be installed more quickly and efficiently
- have smaller up-front capital costs
- offer more flexible siting options
- are fueled less often than conventional nuclear and are easier to decommission

What Are Challenges with new nuclear and SMRs?

As clean energy policies take shape, many utilities and policymakers are placing heavy bets on SMRs as an important piece of a carbon free energy system, which they likely will be, but at this moment, there are no actual SMRs in operation and many short-term challenges exist that SMRs will have to overcome before being predictably written into state and federal long-term energy plans. Current challenges and hurdles SMRs and future nuclear generation include:

- **New nuclear projects, on the whole, have proven risky:** In recent years conventional nuclear projects have seen significant construction delays and increased costs.
  - The Plant Vogtle power station in Georgia, the only commercial nuclear plant currently under construction, out of more than 30 initially proposed around the same time, has taken double the time to construct, has run more than twice the anticipated budget, and is still not complete.
  - In some cases, such as the V.C. Summer project in South Carolina, nuclear projects are initiated but never come to fruition. After years of delays and $9 billion in sunk costs, the anticipated remaining cost was deemed too high and the project was abandoned, leaving ratepayers on the hook for some of these costs.

- **Completed SMR technology does not yet exist:** Though the concept has existed for years, there are currently no SMRs deployed anywhere in the world. It is unlikely that a United States project will be operating any sooner than 2029. The likely first SMR project expected to come online is NuScale's SMR for the Utah Associated Municipal Power Systems (UAMPS). Other SMR projects will fair differently but a look at NuScale's SMR project provides a cautionary tale for policy makers and utilities:
  - In 2014, NuScale, submitted a proposal for a demonstration SMR, with the first reactor slated for 2016 deployment.
    - The project was not approved until 2020.
  - When first proposed, NuScale's first reactor was slated for 2016 deployment. Rising costs and other delays have thwarted engineering, procurement, and construction benchmarks. The project has now seen multiple iterations of design and downsizing.
  - The number of participating entities (mostly small municipalities) in the UAMPS project has already declined significantly due, primarily, to rising costs. Should it continue to hit barriers and cost overruns, remaining participants will have the ability to walk away from their commitment to the project. If the project continues, there is no guarantee that participants won't bear inordinate costs through completion and beyond

- **SMRs, relative to existing scaleable clean energy technologies, are expensive:**
  - NuScale projected that its demonstration SMR would produce power at $58 per megawatt-hour (MWh). New modeling recently discussed with investor municipalities, however, predicts that costs will be around $100/MWh, thanks to supply chain issues and higher interest rates.
  - The U.S. Department of Energy (DOE) has spent more than $1.2 billion on SMR test projects and could spend another $5.5 billion over the next decade to develop and demonstrate this new technology.

- **Existing, proven clean technologies are cheaper and available right now:** While SMRs are unproven, not yet operational or scalable, and costly, existing clean energy sources already out-compete the predicted SMR price-point. Solar and wind paired with storage have proven to be reliable and viable generation assets.
  - The cost of solar modules declined 89 percent between 2009 and 2019, and continues to plummet. In fact, solar now provides the cheapest electricity in history.
  - Utility-scale solar alone currently costs $32/MWh and will be sub-$20/Mwh by 2030.
  - Combined solar and storage costs currently sit around $45/MWh and are projected to fall to around $25/MWh by 2030 with a continued steady decline thereafter.
  - Onshore wind energy currently costs approximately $30/MWh after a 70 percent decline in price between 2009 and 2019. Like solar, wind energy is predicted to continue its decline in price as well.

Many see new nuclear energy as instrumental to the transition away from fossil fuels and a long-term, baseload energy source necessary to fill “gaps” from variable resources. However renewables like solar and wind paired with battery storage (which is rapidly evolving and improving) can already reliably provide power around 95 percent of the time and, in times of need, emerging load-shifting technologies provide options to store and deploy multi-source clean energy to meet demand.

The utility industry, itself, is not yet sold on SMRs which is another reason to take pause and let the technology come to market when it is ready and at a cost-effective price point. For example, the CEO of NextEra, the largest electric utility in the country said…

"They (SMRs) are going to be very expensive and then you're going to be taking a bet on the technology," John W. Ketchum said. "Right now, I look at SMRs as an opportunity to lose money in smaller batches."

The reality is that solar and wind plus storage outcompete even the best cost projections for SMRs which are still years down the road. As a country, the smart bet is to prioritize existing renewables as a key emissions- and cost-reduction strategy in short-term and long-term energy planning.