C2ES CENTER FOR CLIMATE AND ENERGY SOLUTIONS

DEPLOYING LONG DURATION ENERGY STORAGE IN VIRGINIA

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Roundtable Takeaways

Note: Takeaways represent statements made in the roundtable discussion and do not necessarily reflect the positions or opinion of the Center for Climate and Energy Solutions (C2ES), nor do they represent consensus among participants in the event.

Definitions

- **Short-duration energy storage:** Systems capable of storing energy and dispatching it for a short period of time, often 2–6 hours. Most of these storage systems use lithium-ion battery technology.
- **Long-duration energy storage:** Systems capable of storing energy and dispatching it for extended periods of time. While the exact duration is not agreed upon among all providers, the U.S. Department of Energy considers "long duration" to be 10 hours or greater.
    - **Inter-day storage** provides 10–36 hours of energy, which can shift excess power produced at one point in the day to another point in the same day or next day.
    - **Multi-day storage** provides 36–160 hours of energy, which can shift energy produced at one point in the day to later in the week and/or serve as backup power in the event of an extended outage.

Key Themes

- **Bolstering clean energy deployment:** Long-duration energy storage (LDES) will be crucial to Virginia's clean-energy transition, as energy demand grows rapidly in the coming decades and the expansion of intermittent renewable generation requires support to ensure reliability and resiliency. Deploying LDES strategically and responsibly will enable the state to utilize its renewable resources to their greatest potential.
- **Education:** Stakeholders at all levels—whether industry representatives, policymakers, regulators, community members, or private sector companies—require significantly more education on the technologies, opportunities, and potential physical and economic impacts of LDES and how it could contribute to the clean energy transition.
- **Differentiation between storage types:** Policymakers, regulators, and developers must differentiate between short- and long-duration energy storage to: (1) ensure that the value and benefits of long duration storage can be captured in incentive structures and energy markets; (2) enable local communities, policymakers, and the general public to develop an understanding of the differing environmental, physical, and economic impacts of the projects; and (3) ensure workers, especially emergency response workers, are aware of the different safety protocols for differing battery chemistries and can safely respond to potential issues.
- **Community engagement:** Developers should authentically and transparently engage with communities from the earliest possible phase of the project to ensure communities' needs are heard and addressed, and to provide answers to communities' questions about potential impacts to the environment, viewshed,[1] and local economy. This can both accelerate project development by smoothing the permitting process and ensure that communities benefit from projects in their region. Clearly designating storage technologies as long duration and educating the public on the specifics of

[1] The viewshed is the area that can be seen from a specific vantage point.

their components and operations can help developers engage more comprehensively with communities.

Clean energy in Virginia

- The Virginia Clean Economy Act (VCEA) mandates that Virginia reach 100 percent clean energy by 2045. In order to meet that target, new energy solutions must also provide firm, dispatchable power. The VCEA also requires 3,100 MW of storage capacity prior to December 31, 2035.
    - As the state updates its climate action plan in the coming years and as more renewable energy joins the larger electricity grid, LDES could play a major role in supporting the state's ability to achieve its goals. Yet as the technology develops rapidly, anticipating the extent to which it can support these goals could present a challenge.
- Virginia is facing a "generational demand challenge," wherein electricity demand is expected to reach unprecedented levels to accommodate rapidly expanding data centers. With Northern Virginia recognized as the data center capital of the world, state energy planners anticipate that data centers will soon account for one-third of the state's energy consumption.
    - Additional demand could come from growing adoption of electric vehicles, heat pumps, and other electrification solutions.
- In Virginia, there are 218 energy storage projects, almost all of which are short duration in the interconnection queue for the regional transmission organization PJM, indicating a significant interest among Virginian companies in building out energy storage solutions.

The benefits of long duration energy storage

- Electricity generated by renewables like wind and solar is intermittent and may produce significant peaks and valleys throughout the day. However, electricity generated by fossil-fuels, hydropower, nuclear power, or advanced geothermal power is dispatchable, meaning it can be supplied on-demand. LDES can help smooth these peaks and valleys and supply a stable level of power throughout the day that is more consistent with electricity demand.
- Energy storage , particularly LDES, enables renewable resources to be more completely utilized because the storage solution enables the operator to capture and monetize energy that would otherwise have been curtailed (i.e., unused). It can help to maximize the usable energy from renewable generation and reduce the need to "overbuild" facilities to meet demand. This can help to reduce land use impacts of large-scale renewable facilities.
- As the Coastal Virginia Offshore Wind project and other offshore wind projects come online, Virginia will need to consider energy storage to maximize use of the project's renewable electricity generation and to compensate for wind power's intermittency. LDES deployment could support the integration of this resource into the grid as a more dispatchable form of energy.
- In the global race to expand and utilize energy storage, countries like China with access to the complete battery supply chain are leading deployment. For lithium-ion batteries, this supply chain does not currently exist in the United States. However, for LDES technologies, many of the components can be sourced domestically and do not rely on foreign supply chains. Developing this technology and the relevant supply chains can help alternative storage technologies become more competitive with lithium-ion.

Barriers to the deployment of long duration energy storage

- LDES is a relatively new technology in comparison to other energy resources, whether fossil or renewable, and technology is continuously developing as projects are deployed across the country. Market and regulatory structures are not able to evolve as quickly to respond to the unique needs of energy storage. Additionally, because of the rapid entrance of emerging storage technologies on the market, it is difficult for a singular regulatory structure to accommodate the nuances of each. As LDES technologies become more common and standardized, it may be easier for policymakers to design incentive structures. Dialogue is necessary between utilities, solution providers, public utility commissions (PUCs), regional transmission organizations (RTOs), and other stakeholders to develop a flexible framework that can address the market need for LDES and the value it offers to the power system, while fostering innovation in a nascent and rapidly evolving industry.
- Lithium-ion battery technology has been in development for multiple decades and benefits from economies of scale after years of technology improvement. Project costs are high on a per MW basis for LDES projects relative to short-duration lithium-ion battery storage, making the latter appear significantly more attractive and competitive if only the total capacity of the project is considered, rather than the many additional benefits longer duration storage offers.
- Under present regulatory and market structures, the reliability and resource adequacy benefits of long duration energy storage are not captured or valued, meaning long-duration energy storage is not able to compete on price and cost with short duration energy storage.
- Present policy approaches, such as Virginia's storage procurement mandate under the VCEA, do not distinguish between short- and long-duration energy storage, which disadvantages long-duration storage projects whose value is not adequately captured in economic considerations and therefore are not seen as competitive with short duration storage projects.
- Energy storage projects face headwinds in part because of long timelines for interconnection, study, and review. These challenges are exacerbated for LDES by the evolving nature and nuances of the technology, as well as the unique workforce needs to build out projects. As Virginia works to meet its energy storage requirement, more efforts to engage and educate local governments and communities are crucial to making sure solutions can be deployed at the necessary pace and scale.

Community engagement considerations

- The development of the solar industry in Virginia has faced public resistance and political polarization, which participants suggested could provide lessons to the LDES industry. It is never too early to begin educating the public on the benefits of LDES technologies, potential environmental impacts, and safety mechanisms, while preventing misconceptions from taking root. Better informed communities will likely have more positive perceptions, compared to the entrenched and polarized opposition to solar energy prevalent in rural Virginia. The more informed voters are—across the political spectrum—the more they are generally supportive of new energy technologies.
- Multiple participants agreed that engaging communities early in the project development process leads to wider public acceptance of LDES and more meaningful project development. However, this conflicts with the business models of many developers that may limit their ability to engage communities before some elements like site purchasing agreements are finalized. Additionally, communities may be less receptive to developers if approached too early in a project's timeline before there is a tangible project to discuss.

- Tax revenues and other municipal income from associated community benefits agreements should be used in productive ways at the local level, such as supporting workforce training. LDES project benefits must be effectively communicated to communities alongside potential costs in an honest, specific, and transparent manner.
- Building trust improves community support and will contribute to more successful LDES project outcomes. From working with trusted community voices to providing contacts of communities that have successfully installed batteries, developers can take measures to form meaningful relationships with communities that will ease the permitting process.
- Participants stressed that involving the local workforce and local businesses is key to gaining public support for LDES development. Communities often oppose projects that involve many out-of-state workers and prefer to see projects that will engage local workers and businesses. Developing relationships with local governments, including counties' boards of supervisors and planning commissions, helps improve the validity and outcomes of community engagement efforts.

Policy questions for further research and discussion

- What defines LDES to state and federal policymakers, and how can it be differentiated from short duration energy storage through regulatory and policy structures?
- What options are available to municipalities, utilities, and developers to support the deployment of LDES?