

SPECIAL REPORT

HOW TO DE-RISK NORTH AMERICA'S ENERGY STORAGE PROJECT PIPELINE

North America needs to deploy record-breaking levels of energy storage in pursuit of a low-carbon energy system. But how can the storage industry reduce the risks surrounding what is still an emerging technology?

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Summary

The year 2021 looks set to be an inflection point for North American renewables following the approval of President Biden's Build Back Better Bill.

The bill includes \$555 billion to fight climate change, powering the US towards a net-zero economy by 2050.

Transitioning away from fossil fuels will require more than just money, however. Energy storage, mostly provided by batteries, will play a key role in giving the grid the flexibility it needs to absorb massive quantities of wind and solar power.

In a Global Energy Storage Outlook published in October 2021, the analyst firm Wood Mackenzie

estimates the US, which accounts for 95% of the North American market, could have almost 400 GWh of battery storage installed by 2030, around a twentyfold increase on current levels.

Yet investors still only have limited experience of battery storage and are rightly concerned about a range of risks associated with the technology. For the energy transition to proceed at the speed required, these risks need to be understood and mitigated as quickly as possible.

To help assess the challenges involved in energy storage risk mitigation, the global independent safety science company UL convened a Wind Investment Boardroom event in November 2021, featuring a range of clean energy experts. This paper captures the main themes and conclusions of the discussion.



Overcoming limited field experience

Even though North American energy storage capacity is set to grow 276% between 2020 and 2021, according to Wood Mackenzie, batteries are still seen as only having limited operating experience.

And that is a problem in scaling deployment, says Sara Graziano, partner and chair of the investment committee at SER Capital Partners, a private equity firm focused on sustainable, environmental and renewable investments.

complexity and cost, especially to smaller, distributed storage projects,” she says.

Annam Muthu, director of energy storage at Engie, says one of the outstanding challenges facing the sector is how to add contracted revenues to projects.

Not all developers or tax equity backers are happy funding plants based on the prospect of merchant revenues alone, he says, which can make it challenging to get projects underway. One way around this, he says, is to co-locate storage projects with assets such as solar parks or wind farms.

In regions belonging to independent system operators such as Southwest Power Pool or the Electric Reliability Council of Texas, where solar and wind power is impacting the shape of the electricity delivery curve, “storage can be really valuable not just financially but also physically,” he says.

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That lack of standardization, and the bespoke nature of every single project, really slows things down

“We are doing a lot of distribution-level projects. And going to the AHJs [Authorities Having Jurisdiction], for example, they pretend that they’ve never seen you before,” she says.

“That lack of standardization, and the bespoke nature of every single project, really slows things down and adds a significant amount of

Insurance and risk allocation

The perceived lack of experience in battery storage, coupled with recent high-profile fire incidents, creates a situation in which asset owners and insurers each tend to look for tradeoffs in risk allocation.

In markets such as wind and solar, a key factor in risk allocation is the warranty from the original equipment manufacturer (OEM). Battery warranties, for now, tend to be more limited in scope, and away from the major Asian suppliers there may be a risk of the OEM going out of business.

Nevertheless, says Nate Hudson, senior vice president at specialist insurer Lockton Power: “Insurance markets are able to provide products that focus on the warranty side, ensuring that where there is new technology risk there is a backstop there in the event of an issue with the supplier.”

A greater problem, he says, is around the variability in deployment. Insurers will remain naturally cautious until they have been able to gain a fuller assessment of the risks involved in energy storage projects. As an example, he discussed a client with three projects using the same name plate units but where components of each varied (chemistry, etc.). This caused three different responses from the insurance underwriting

community. Another challenge discussed was the variability in potential revenue streams. As he explained “Determining business interruption exposure for certain projects can be challenging and in certain instances might lead to an insurer imposing restrictions on the coverage which can create conflicts with what lenders / investors will mandate”.

In practice, however, the pace of buildout required in North America's energy transition means investors and developers cannot stand still while insurers become familiar with storage.

“We are running forward as fast as we can, but we are looking in the rearview mirror as we do that,” summarizes Colin Tareila, global lead for solar and storage at UL's consulting subsidiary UL Services Group. “We can't take our foot off the accelerator. It is going to be a challenge to find the time.”



Understanding supply chain risks

One potential challenge for the current generation of lithium-ion based battery technologies is supply chain shortages. North American power markets compete with the automotive and, to a lesser degree, consumer technology sectors for lithium-ion battery capacity.

Hence, “We are seeing non-lithium alternatives starting to capture market share because lithium doesn’t have the capacity to serve other markets as well,” comments Raafe Khan, director of energy storage at the project developer Pine Gate Renewables.

On one hand, products that diminish energy storage’s reliance on lithium-ion could be seen as beneficial from a risk perspective. However, most alternative battery technologies have even less operating experience than lithium-ion, which acts to drive risk up instead of down.

According to Khan, potential lithium-ion supply constraints and the lack of mature alternatives represents “a blind spot” for the industry.

“Developers are planning gigawatts upon gigawatts of projects, but do we really have the supply chain commitments from the market to enable that to happen?” he asks.

The answer, says Beth Bremer, energy storage manager at project financing and development firm Crossover Energy Partners, is to maintain an open dialogue with battery vendors. “The unfortunate thing is they are learning as we are going along,” she says.

Because of this, it is important to arrive promptly at universal performance standards. The standardization of performance requirements is starting to happen in California, she says, but it remains the case that basic metrics such as round-trip efficiency are still measured differently by different OEMs.

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Dealing with physical hazards

Another important area of risk related to lithium-ion batteries is fire.

In the brief history of lithium-ion battery deployment, several facilities in North America and elsewhere have experienced thermal runaway events, including a storage plant incident in Arizona that led to multiple hospitalizations in 2019.

Following that event at the McMicken project owned by Arizona Public Service, “we have a number of questions around what’s changed,” says Jeff Canfield, executive vice president of casualty and product innovation at Ethos Specialty Insurance Services.

“We want to know things like: are local fire departments now trained

to deal with a thermal runaway event?” he says.

Above all, says Canfield, insurers are asking if there is a consistent loss history for projects, which can inform risk evaluation. But “in many cases the answer is no,” he says. “That’s where we struggle.”

Joel Vyduna, vice president for energy storage at Strata Clean Energy, says the safety issues associated with lithium-ion are now “a lot less scary” than they used to be. “I think you can divide the energy storage fleet into pre-McMicken and post-McMicken,” he says.

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Are local fire departments now trained to deal with a thermal runaway event?



How to best reduce risks in energy storage?

It is clear many of the risks associated with battery storage arise from a lack of familiarity with a new asset class that is now being deployed at scale.

Standardization of the technology and the contract structures around it could thus act to reduce risk and improve scale and speed of deployment.

Alex Morris, executive director of the California Energy Storage Alliance (CESA), says standardization is difficult because there is still uncertainty over how much of the battery market will ultimately be made up of lithium-ion and how much will go to alternative technologies.

“Right now, it’s all over the place, with different contract terms, different warranties, different underlying technology, different risk allocation strategies,” he says. “It’s a bit of a mess in terms of the insurance folks sifting through that.”

Nevertheless, CESA is considering moves to simplify energy storage contracting, for example by adopting the Schedule C terms for energy trading from WSPP (formerly the Western Systems Power Pool) as a standard contract. “What we really needed was a standard fungible product,” says Morris.

“Storage is not there yet, but it could be, especially if we see lithium really continue to prevail in solicitations. You could see a situation where you could move to a standard contract pretty quickly.”

Despite this, there is still uncertainty over whether the energy storage market can evolve quickly enough to achieve the scale of deployment required by 2050.

In response to being asked if we will solve the world’s climate problem, a participant who leads technical due diligence for a large bank said he thinks we can, but noted, “We’re building the pyramids here”, meaning we may not see the solution in our lifetimes. He then noted his organization is undertaking various measures to reduce risk, such as:

- Asking for emergency action plans that can be shared with first responders to mitigate liability.
- Seeking continuity of operation plans from OEMs, including provisions for plant augmentation.

- Installing third-party plant controllers that can handle assets from a range of battery vendors.
- Requiring sponsors to provide reasonable downside scenarios on issues such as degradation.
- Getting performance and accelerated lifetime test reports from independent laboratories.
- Looking for operational data going back at least a year, from pilots if not operating plants.
- Requesting factory inspections.
- Doing power flow estimations.

Conclusion

The moves being made by private bodies and associations demonstrate that the industry is alive to the risks of energy storage and is working to resolve them.

Overall, the sentiment emerging from the UL event was that this effort will ultimately allow energy storage deployment to speed up, but whether it will be able to reach the pace needed to achieve net zero electricity in North America by 2035 remains to be seen.

Participants warned of short-term growing pains, particularly in advanced markets such as California, because of supply chain challenges. One of them reports having received an OEM's force majeure notice already on one out of three projects currently under development.

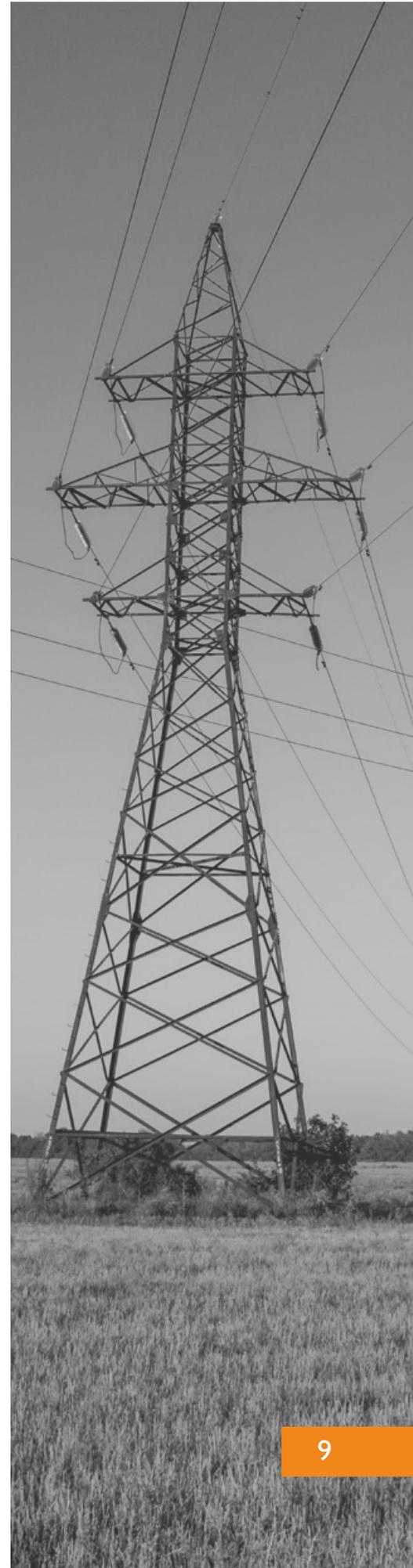
Longer term, one of the problems the industry faces is that energy storage risk is something of a moving target: today's supply chain issues and safety standards, for example, could change in future as lithium-ion gives way to alternative technologies.

Hence, "the need to be flexible is key," says David Mintzer, director of energy storage advisory services at UL.

"To the extent we can create and then support consistent practices, from commissioning to operation, then tending to the world of the unknowns—of which there are still many because of the limited operational data we have—will be more manageable," he says.

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The need to be flexible is key





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