Why lithium-ion isn't the answer for long-term stationary energy storage

By Contributing Author

Lithium-ion has served as the trailblazing battery technology for modern energy storage applications — and the bright, guiding light for the cleantech industry as it first emerged. But with increasing fire safety issues and other limitations, those now depending on lithium-ion should be concerned that any bright, trailblazing lights from their batteries might just be their expensive infrastructure going up in smoke.

Despite occasional news leads about li-ion-powered electric vehicles that start on fire and are nearly impossible to put out, li-ion continues to thrive as a technology for EV use cases. Those fire incidents are undoubtedly scary, but also relatively isolated to the standalone vehicles where they begin and the initial fire risk of li-ion is arguably much less than that of gasoline.

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However, project leaders charged with developing and scaling stationary energy storage use cases are increasingly wary of li-ion technology — or if they still aren't, they ought to be. Given li-ion's known risks, the thought of a fast-moving fire roaring through an installation should have leaders and stakeholders looking for alternative technologies that can still get the job done, but that don't have the same risk of a catastrophic thermal event. And fire is actually just one of several major concerns that li-ion raises for stationary deployments.

Here are the critical risks and limitations of stationary li-ion battery systems that project owners need to understand.

Thermal runaway, fires and explosions

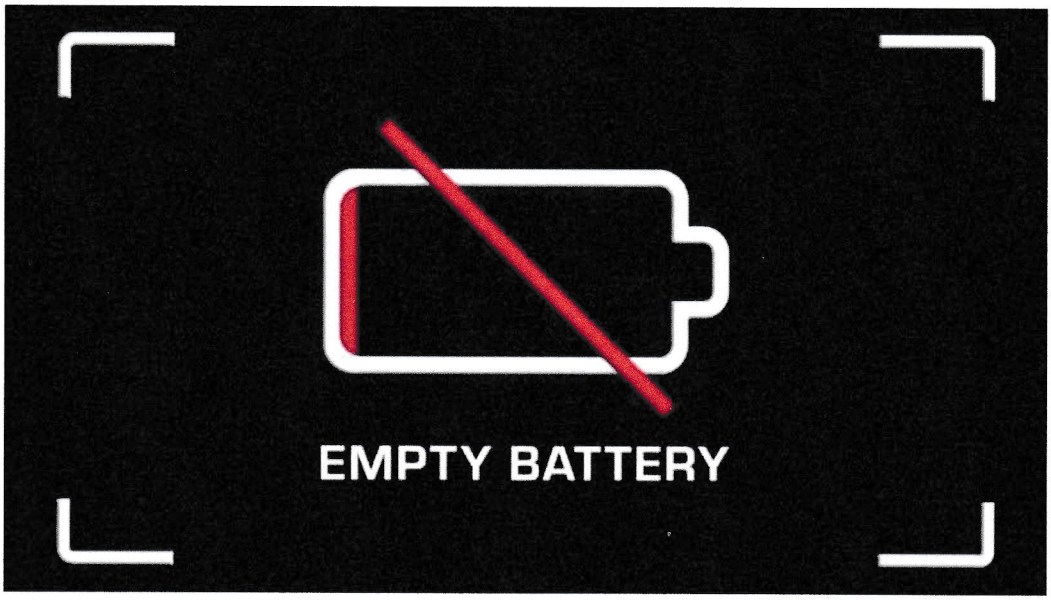
Here's an easy mnemonic for stationary energy storage project leaders who don't want their projects destroyed: If a battery technology has a high risk of thermal runaway, *run away*. It's not worth the risk, and li-ion batteries carry well-documented risks of fire and explosion.

Worse, li-ion fires are particularly nasty. Tom Purcell, a Massachusetts fire chief who's faced off against li-ion fires, says, "If [li-ion] battery packs go into thermal runaway, which is just a chemical reaction, then they get super-heated and they run away. You can't put them out. They don't go out. They reignite. And they release tremendously toxic gases."

Li-ion fires can stem from defects in manufacturing, flawed system design, charging issues, low-quality components and other causes. The end result of a li-ion thermal runaway incident at a stationary energy facility is service and revenue interruption, costly downtime and repair or replacement expenses.

The potential financial impact of a significant fire is staggering. Beyond remediation, the damage to your brand and customer base may not be recoverable. For leaders and stakeholders investing in long-duration energy storage in pursuit of sustainability and profitability goals, li-ion therefore carries a considerable risk of taking projects in the wrong direction.

Longevity limitations



Li-ion battery chemistry simply isn't a strong fit for stationary long-duration use cases. Severe battery degradation often occurs as early as 2,000 cycles into the lifespan of a li-ion battery. For comparison, nickel-hydrogen battery chemistry has a 30-year 30,000-cycle lifespan and can deliver at 86% capacity after 30,000 cycles. That's a stark difference.

Unfortunately for project owners with aspirations of achieving consistent long-term revenue, li-ion's brief lifespans are plagued by cycling limitations. Whereas alternative technologies support discharging to 100%, deep discharges will cause permanent damage to li-ion batteries, requiring careful management and limiting revenue streams.

Because li-ion battery degradation is unpredictable, li-ion-based systems often require frequent servicing and service interruptions that further impact and reduce revenue expectations.

Maintenance-hungry operations

Given the degradation issues li-ion batteries experience, frequent maintenance is a necessity, and that need can arise without warning. Unlike the "set-it-and-forget-it" solutions project stakeholders dream of, li-ion offers more of a "set-it-and-constantly-monitor-and-perform-costly-augmentation-about-every-five-years" solution. Any downtime or unexpected augmentation needs will mean downgrading expected revenue.

Circling back to li-ion's fire risks, any stationary li-ion deployment must be equipped with appropriate HVAC and fire suppression systems ready to kick into action to limit fire damage. Those complex systems require their own costly monitoring and maintenance, adding to the burdensome overhead of li-ion and further reducing its operational and cost efficiency.

Limited flexibility

Given li-ion's volatile battery chemistry, installations must maintain careful conditions. As mentioned above, operators must avoid over-charging or over-discharging li-ion — with deep discharges opening the door to extreme battery damage. Li-ion also couples battery power and energy capacity, eliminating the economic viability of long-duration energy storage services.

Understand that li-ion has become a high-risk investment

From fire risk to operational burdens and other inherent issues, project decision-makers should have a clear picture of li-ion's limitations.

For stationary use cases, expensive augmentations and continuing maintenance are the reality with short-life li-ion. At the same time, the lithium supply chain risk is significant. With EVs dominating demand, stationary storage is left to play second fiddle for supply. This complicates long-term planning and jeopardizes the viability of aging projects.

For leaders and project owners, opting for alternative battery technologies with lifespans that match that of their projects is an increasingly attractive strategy.

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