ViZn Energy: A new flow battery contender in the grid-scale storage race

DATE : 2014-09-03

For years, battery technology startups and researchers have been striving to create a rechargeable, grid-scale energy storage system using zinc, one of the world's cheapest and most plentiful metals. Zinc-based batteries tend to break down after just hundreds of charge-discharge cycles, however -- and coming up with new technology innovations to overcome this remains a challenge.

Take the example of ViZn Energy Systems, a startup with a zinc-iron flow battery it's now putting to the test in grid-scale applications. For the past four years, ViZn (pronounced "vision") has been busy turning a fundamental weakness of its alkaline-based electrolyte chemistry into a key advantage.

Founded in 2009 as Zinc Air Inc., the Columbia Falls, Mont.-based startup changed its name in September and launched its first commercial-scaleproduct, an 80-kilowatt, 160-kilowatt-hour zinc redox flow battery housed in a 20-foot shipping container. It also announced its first deployment with BlueSky Energy for an Austrian microgrid project, aimed at storing and balancing on-site solar generation.

In March, ViZn announced that Kalispell, Mont.-based utility Flathead Electric Cooperative had installed a second system, meant to test a variety of grid support services. And this week, grid energy storage software and systems startup Greensmith named ViZn as one of the battery providers it's working with at grid scale.

ViZn's Z20 systems are targeting a price point of $800 per kilowatt-hour for microgrid systems, Kirk Plautz, vice president of sales, told me in a July interview. The company's longer-term goal is to put together five of these containers in a 1-megawatt, 3 megawatt-hour system, the GS200, with a "clear path" to reducing those costs to about $450 per kilowatt-hour at scale, he said.

That's on par with the costs being targeted by other flow battery competitors, whether they're using vanadium (UniEnergy, Imergy andCellcube), iron-chromium (EnerVault) or zinc-bromine chemistries (Primus Power, ZBB, RedFlow). Flow batteries pump electrolyte through electrochemical cells, and thus can add more tanks of electrolyte to expand their energy capacity, something sealed batteries can't do. They aren't as efficient as the latest lithium-ion batteries, however, and can't compete on how much power they're able to deliver at any one time.

One of ViZn's key differentiators is its use of an alkaline, rather than acidic, electrolyte to get the job done, executive vice president Craig Wilkins told me. That alkaline chemistry, developed over the course of nearly a decade of research at Lockheed Martin, was aimed at avoiding the dendrite formation and subsequent failure common to acidic-based zinc battery chemistries, he said.

Instead of spiky dendrites, the alkaline electrolyte led to a "clumping" of byproduct materials on the battery electrodes, he said. That in turn led to its own set of problems for cycle life in closed battery systems, ultimately prompting Lockheed to put the technology on hold.

But for flow batteries, this "clumping" had the unintended side effect of increasing the power density of the system, by increasing the surface area upon which electrochemical reactions could occur. That allows ViZn's flow batteries to ramp up to higher power more quickly than many other flow batteries, while still retaining the multi-hour energy storage advantages the technology provides, he said.

"We leveraged this weakness in the chemistry," through licensing of the core patents from Lockheed, Wilkins said. (The company's board of advisors includes Roger Hollandsworth, who led much of Lockheed's research into aqueous zinc redox batteries.) "Lockheed spent eight years and $10 million on the chemistry," he said. "All we had to do is commercialize it."

ViZn's website notes that its "low-cost, non-acid" and low-temperature chemistry allows the use of inexpensive construction materials, and that it has built battery stacks with "proprietary elements to deal with the shunt issues historically afflicting flow batteries." The company also claims the potential for 10,000 cycles and a 20-year lifespan, critical factors for investments that need to run for years in order to pay for themselves.

ViZn has raised about $20 million to date, mostly from private investors, which has allowed the company to deploy its first systems working with manufacturing partners like Semitool, the Kalispell, Mont.-based semiconductor chemical processing equipment maker bought by Applied Materials in 2009. ViZn's new CEO Ron Van Dell told Bloomberg in July that the company is now seeking up to $25 million, with hopes of ramping up manufacturing capacity in late 2014 and early 2015.

To be sure, ViZn isn't the only flow battery startup promising key improvements in chemistry, engineering and manufacturing processes. Nor is it the only contender promising a zinc-based grid storage alternative --startup Eos Energy is now testing its aqueous electrolyte zinc batteries, which it hopes to bring to market at a cost of $160 per kilowatt-hour.

California's 1.3-gigawatt grid energy storage mandate is creating major new opportunities for batteries that can store energy for multiple hours at a time. Lithium-ion batteries are already providing power-centric grid services in projects around the world, and are starting to be deployed for multi-hour applications as well. But flow batteries are getting their own share of business for long-duration storage -- and adding some power density to the mix could allow them to provide both types of services, Wilkins noted. As with all grid-scale energy storage efforts, the proof will come in the real-world deployments.

SOURCE GreenTech Media