

WELCOME

Historians will mark 2015 as the dawn of utility-scale energy storage.

The huge surge in energy storage R&D, as well as in companies chasing an emerging market, is a natural outgrowth of the solar boom that started a few years back. That is, of course, because energy storage helps solve solar's intermittency issues.

"Storage has hit the big leagues," AES Energy Storage VP Praveen Kathpal told us in an exclusive interview. "Prior to this point, everything's been done on the 10-, 20-, or 30-MW scale and now we're on the 100-MW scale."

In this exclusive report, assembled over the last six months, *Smart Grid Today* chronicles how 20 leaders are feverishly working to get utility-scale energy storage solutions on the market around the globe.

Our report includes discussion of "heatcrete," molten-salt thermal energy storage, power conversion systems, lithium-ion battery-based "demand-reduction systems," flywheel systems, storage-as-service and "that black box called storage."

The experts we interviewed addressed a seemingly endless number of applications, including frequency regulation, DR, demand management, spinning reserve needs, peak-shaving, renewable energy integration, community energy storage, microgrids, distribution grid reliability and "primary control reserve" (PCR).

The experts address a plethora of evolving issues, including modular energy storage architecture (MESA) standards, "modular charging" for EVs and recognizing energy storage as its own asset class in energy-related regulations.

Our coverage of energy storage will, of course, continue. But we believe the time is ripe for this report, which will help stakeholders begin to understand how energy storage is shaping up as a crucial element of the smart grid and smart cities.

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[PART 8]

Ecacion shows off smaller, stronger grid batteries

CEO compares storage investment to peakers, HV lines



Carmine Pizzurro

JUNE 26, 2015 | Toronto energy storage firm Ecacion shrank energy storage to 1/3 the conventional size, the firm's CEO Carmine Pizzurro told us this week in an exclusive interview. The firm was inspired by the Chevy Volt and the need for utilities to store as much energy as possible in small spaces for urban communities, Pizzurro said.

"The mandate is to build a unit that is very small and compact, yet very powerful," he added. "We want to demystify energy storage."

These units sell for less than US\$200,000, but once mass production begins, the firm should be able to lower the price to US\$100,000, Pizzurro said.

Most energy storage systems are the size of industrial shipping containers and secured behind fences, he added. "Imagine a 40-foot container, the ones you see in trucks going up and down I-95," Pizzurro said. "That is typical of storage devices in other areas."

Pizzurro worked briefly on the Volt during a 20-year career at GM and knew big storage could come in smaller packages, he added. The goal: energy that becomes part of the community served, sized and safely engineered to fit on what Canadians call "the boulevard" – the strip of grass between the sidewalk and the street.

"My background is in high-production manufacturing. That's how I got to know batteries," Pizzurro said. He left GM rather than relocate to the US during that firm's reorganization. "You can pack a lot of energy and power into a small amount of space."

After GM, he continued working with batteries, looked at market studies and spoke with entrepreneurs. One firm had developed a small battery, but it produced only 25 KWs and stored only 25 KWHs.

Pizzurro sought more power without compromising on size and founded Ecacion in 2009. His firm now offers a battery system three times bigger than the small one from the other firm mentioned above, but with 10 times the storage and that can release 20 times the power, he added.

Ecacion's standard system is three meters by 2.4 meters by 1.68 meters and can support 100-150 homes.

QUOTABLE: I went to the drawing board, in conjunction with Toronto Hydro, and started calculating how much energy and storage I could get into the size I wanted. It turned out to be 250-500 KWs. This turned out to be a size large enough to make a significant impact for utilities. – *Ecacion CEO Carmine Pizzurro in an exclusive interview*

One key difference with the Ecacion system, (the name was reportedly taken from "Energy,"

“Canada,” “America” and “ion”) is that this storage system is out in the open. “It is able to be embedded into the community – like mailboxes or telephone booths,” Pizzurro said. “It does not need to be behind fences.

“We chose all the components based on safety, reliability and durability,” he added. “We have one next door to a community center. It takes a lot of confidence on our part to be able to do that.

“This one has been triple checked. It has 20 or 30 locks on it. We are not allowed to open our own unit. It has to be opened by a Toronto Hydro employee with the proper training.

“If a car runs into it, everything gets automatically disconnected and shuts down.”

Ecation secured its first patent in 2009, a method of cooling to boost the lifespan of the system and for safety and quality while reducing costs of modular lithium-ion battery packs, Pizzurro said. Later patents included the design and configuration of community energy storage systems – and the interface with the utility grid – in conjunction with Reza Iravani of the University of Toronto's Centre of Applied Power Electronics, he added.

Ecation last year won C\$4.75 million (US\$3.86 million) in funding for four energy storage demonstration projects to promote peak-energy management, grid reliability and added renewable energy penetration (SGT, [Dec-3](#)). On these projects, Ecation is working with Greater Sudbury Hydro, Hydro One, Hydro Ottawa, Toronto Hydro and Toronto Hydro-Electric System, Pizzurro said.

The first of those demo projects provides three advanced “smart” energy-storage systems for a museum called Science North. The project will showcase the integration of building energy management systems, EV applications, energy storage and solar energy.

The project will demonstrate opportunities for customer control, enable conservation and allow for high penetration of renewables.

One of the components provides energy storage for a butterfly habitat where the humidity and temperature have to stay within strict parameters. That means the energy storage has to work flawlessly and seamlessly with the solar power, he added.

“We’re saving all the foliage for the butterflies by keeping the humidity and temperature within certain boundaries. If we don’t keep the food going, the butterflies don’t have anything to eat.”

That project is likely to be installed in October and then integrated into the system by January, Ecation told the press.

Other projects involve microgrids and power matching using renewables and energy storage – and using storage to maximize the use of solar PVs. The benefits are the same as for other energy storage:

- Energy efficiency via power-factor correction and reduced losses;

- TOU peak shaving and valley filling;
- Demand management to shave peak demand;
- Frequency regulation and power quality stability with volt/VAR optimization;
- Fast charging of EVs without requiring facility or utility upgrades;
- Easier integration of renewables, and
- Supporting load growth without requiring facility upgrades.

Future applications include DR, backup power and microgrids, Pizzurro said.

Payback time could vary from one to three years, depending on the area of the country and the issue the storage system is addressing, he added.

QUOTABLE: If you would have had to build a peak-shaving plant, then ... [energy storage as an alternative is] a no-brainer. The payback is days. You spend millions of dollars on peak-shaving plants. Plus, there are intangibles like environmental issues. In Canada, when you talk about building a new plant, everyone goes crazy. – *Pizzurro*

Another savings is in avoiding the cost of adding and maintaining underground power lines large enough to meet peak demand and the cost and maintenance of other equipment such as transformers, he added. "Construction and maintenance of these large lines is expensive. They're sized for the five days/year when the temperatures are 100° in the summer months. The other 360 days, you don't need lines that size.

"You can also reduce the capital costs of replacing equipment, such as transformers," he added.

For those wanting less storage, the units can be scaled down to 75 KWHs or 5.3 KWHs for individual home use. The cost of that small home unit is about \$4,500 now but once the firm begins full production the price will drop to about \$2,500, Pizzurro said.

Storage offers security

In addition to meeting peak demand, Ecamion's energy storage system could help get other backup power turned on. Most hospitals have diesel generators, "but a lot of them don't maintain their generators. After Hurricane Sandy in New York State, a lot of hospitals couldn't start up their generators," he added.

Ecamion will ramp up production as soon as demand warrants it.

"We're ready for it," Pizzurro said. "The technology has been proven. We've done half a dozen demonstrations. We've demonstrated that it does work.

QUOTABLE: But utilities are conservative by nature. They don't want to do anything

until they've tested it out themselves. We're building one [storage system deployment] every couple of months. We'd like to get to the point where we can produce one every week. – *Pizzurro*

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