

## GE Moves Into Battery Business Long After Edison Sketched Plant

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By Peter Coy

July 12 (Bloomberg) -- What does it take to build a better battery? Makers of electric vehicles, smartphones and renewable energy gear want to know.

For a 45-person internal startup at General Electric Co., it took the financial backing and technical support of an AAA-rated company with more than \$140 billion in annual revenue, not to mention the care and attention of Chairman and Chief Executive Officer Jeffrey Immelt.

It also helped that the team chose a proven battery design that had been under development for 30 years before GE got involved. The result is the Durathon, a molten salt battery that went on sale in September, providing backup power for mobile-phone towers, among other uses.

There are plenty of ideas for new batteries. The problem is commercializing them, Bloomberg Businessweek reports in its July 16 issue. Today's cars still rely on lead-acid batteries that date back to experiments done in 1859, while consumer electronics are powered by alkaline batteries that trace their roots to 1899.

Innovators come along regularly, though in the past year a slew of battery startups have hit rough patches. Ener1 Inc., which was pledged \$118 million of federal aid to develop

lithium-ion batteries for electric vehicles, filed for bankruptcy in January. Battery maker A123 Systems Inc. of Waltham, Massachusetts, lost \$125 million in the first quarter.

At a U.S. Energy Department conference in February that showcased new battery concepts, Microsoft Corp. Chairman Bill Gates warned that “the failure rates here are going to be well over 90 percent.”

### Startup Challenges

Even with its built-in advantages, GE’s nascent Energy Storage Technologies unit wrestled with the same challenges that afflict less pampered startups: a constantly changing business model, performance constraints imposed by the chemistry itself, finicky manufacturing processes and heated arguments between different parts of the development team.

GE’s Six Sigma manufacturing experts repeatedly clashed with team members who wanted to rush out prototypes for beta-testing in the market. The Six Sigma types seemed to be vindicated when the first battery sent to a customer in late 2010 broke during shipment.

“At one point in 2010, I was feeling a little lost,” said Prescott Logan, the unit’s general manager and a 10-year GE veteran with an MBA and an undergraduate degree in economics.

“We went through some fights, some serious fights.”

### Quality, Cost

One clear lesson from GE's experience is that choosing the right elements off the periodic table is only the start. The hard part is producing the battery in large quantities with high quality and at low cost.

"In theory, anybody else could make this battery. To which I say, 'Good luck,'" said Sandor Hollo, a manufacturing expert who moved from GE's lighting business to work on the project.

Even though Thomas Edison sketched plans for a battery plant more than a century ago, GE has never been a player in batteries, aside from its brief ownership of a manufacturer of nickel-cadmium batteries. Executives decided to go into the battery business in 2009 after concluding that none of the options on the market did what GE needed for its own products, like helping to power locomotives and monster mining trucks. Manufacturing for only its own needs, though, would have been inefficient.

"There were very tough discussions" about market opportunities and pricing models, said Beth Comstock, GE's chief marketing officer, who participated in the meetings. "Jeff was constantly probing" Logan: 'What have you tried?' Jeff hates it when people come in and they've only tried one thing."

### Big Suitcase

The battery that the team created will never power your mobile phone. A typical Durathon battery pack is the size of a

big suitcase and weighs about 300 pounds. It operates internally at over 500 degrees Fahrenheit (260 degrees Celsius), though the exterior is barely warm to the touch, and produces current by turning liquid sodium metal into ordinary table salt. Its strong points are the amount of energy it can pack into a small space, quickness to recharge, ruggedness and long life.

GE claims that the battery stores as much energy as lead-acid batteries twice its size and that it lasts 10 times as long. It performs well in outdoor temperatures from -40 degrees to 150 degrees. It's weaker in power density -- the ability to provide a big surge of current rapidly.

#### Phone Towers

Logan and his unit, now numbering about 300, wrestled with what kinds of customers would value a battery with the Durathon's particular strengths and weaknesses. After first targeting backup power for data centers, Logan and others concluded that GE's best initial opportunity was in mobile-phone systems in developing countries with unreliable electrical grids.

Sales in Asia and Africa began last year, and on July 10 Immelt announced an order for 6,000 batteries that will be installed next year on mobile phone towers in Nigeria. GE also has landed orders for the Durathon by U.S. wind farms (to store energy when the wind is blowing) and for the electrical distribution grid.

The company is exploring uses in locomotives, mining trucks, work boats and buses. The battery doesn't provide the quick bursts of power that electric cars need. One solution: Couple it with a different battery or supercapacitor to obtain the benefits of each type of storage.

### Proven Design

GE decided early on to apply its manufacturing and marketing prowess to a battery design that already had been shown to work. The Durathon's chemistry was developed in the 1970s in South Africa. Daimler-Benz used the technology to power its pint-size A-Class electric vehicles. One of the Durathon's key components, a ceramic tube separating the positive and negative terminals, grew out of work at Ford Motor Co. in the 1960s and was improved by Beta Research & Development in the U.K. GE acquired Beta R&D in 2007.

Brian Warshay, a battery market expert for Lux Research in Boston, says Immelt's stated goal of making batteries into a billion-dollar-a-year business within a few years "certainly seems plausible to me."

It's too soon to declare victory, yet GE seems to show that launching a battery business isn't impossible. Just very, very hard.

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