Will Energy Storage Help or Hurt Utilities?

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December, 2014

Meet the Author:

An IEEE Fellow, electricity industry visionary, and leader, Dr. Mani Vadari delivers strategic services to a global set of utilities, vendors, and service providers seeking deep subject matter expertise in setting the business and technical direction to develop the next-generation electric/energy system. As a Business Architect, Dr. Vadari has been delivering solutions focusing on Transmission/ Distribution/ generation operations, Energy markets, and Smart Grid for over 35 years. In addition, he is an Adjunct Professor at Washington State University and an Affiliate Professor at the University of Washington. He has published two popular books, "Smart Grid Redefined: Transformation of the Electric Utility" and "Electric System Operations – Evolving to the Modern Grid, 2nd Edition", in addition to over a hundred industry papers, articles, and blogs. His books are serving as textbooks at several universities in the US and around the world

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Energy storage is that disruptive technology that many of us power system engineers have been waiting for our entire professional lives. It is disruptive in the same nature as PCs, the Internet and so on.

Why would I state something like this?

Energy storage can come in many different forms with electro-chemical being one of the most common forms. The one key characteristic that causes it to become the ultimate disruptor is in its ability to be both a consumer and a generator.

It is a consumer when it takes on electricity to load up on the charge
It is a generator when it discharges electricity back into the grid.

There is no other device with a capability such as this in the power system arena. Every other device in the grid is a consumer, a generator or a conductor. The ability to disrupt comes from being able to consume when there is either excess energy in the grid and deliver energy back to the grid when there is a need.

Why is this important?

Consumption of electricity follows a profile during the day with a couple of peaks and valleys. This type of consumption pattern forces utilities across the world to commit their generating units based on a cost/location profile. As a result, there are always some generators that deliver power for only a few hours a day (also known as peaking plants), week or month leading to a very inefficient use of their capacity. As a result, the overall cost of power supply goes up to cover the fixed and operating costs of these peaking plants which are also some of the more inefficient plants in the system.

Over the last few years, Demand Response was considered as the ultimate response to this issue – however, for Demand Response to deliver results, consumers need to curtail their load either voluntarily or remotely under external control. This has not yet proven to be very successful mainly because customers have not yet agreed to change their consumption behavior especially during utility peak periods or congestion times.

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Where is the value of Energy Storage?

Energy storage can deliver value in several different ways:

- *Consume energy (charge up) when prices are low and deliver energy (discharge) when prices are high or there is congestion in the grid.*
- *Capable of being placed in locations close to consumption to avoid congestion and also capable of supporting needs either at transmission and/or distribution level.*

From a location perspective and from a permitting perspective, it is generally considered far easier to install storage at any location on the grid based on need instead of based on specific locations only where it was possible to get permitting to install generators.

The value, as a result, comes from the ability of the storage device to smooth out the load profile, thereby allowing (1) better use of the full capacity from all forms of generators and (2) being able to make fuller use of supply from renewable sources of energy by allowing them to deliver generation when they are capable.

What is holding us back?

The main aspect holding us back from going all out with energy storage is cost. As costs come down, it is reasonable to expect that storage will play a major role in utility grid design and also allow the utility grid to accept more supply from renewable sources.