Management Of Big Data To Drive Utility Transformation, Pt. I

✏️ Dr. Mani Vadari

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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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The utility industry has been in a slow evolutionary mode since the middle of the 20th century. However, over the last 10-15 years, the pace of change has dramatically changed and much of this happening through the implementation of technology. New technologies are flowing into utilities at unprecedented rates in a variety of different ways.

The first set is the increasing presence of electric vehicles, distributed generation like wind and solar PV, and electric storage. These technologies, in addition to creating new system requirements, continue to increase the stress on already loaded feeders and low-voltage transformers. Some of these stresses are also hitting the transmission infrastructure as large wind farms with reduced capacity factors are setting new expectations in terms of transmission availability.

To combat these new stresses, a new set of technological changes is coming in the form of utility automation levels that have been rising steadily over the last few years. There are several examples of these including substation automation and distribution automation; measurement units, smart meters, Volt/ VAR control, demand response, and others.

Many of the changes covered in the two sets of technologies above go under the mysterious moniker of Smart Grid. This term Smart Grid means so many different things to everyone – if you ask 3 people, it is possible to get 4 or more definitions. Regardless of what the definitions are, it represents the biggest change that is being faced by the utility industry and has the potential to change everything that we have faced in our industry. These changes are causing utility CIOs to have nightmares about the impacts on the stability and resiliency of the grid and the potential for these problems to show up on the evening news.

Utility CIOs do have tools available for them

This brings to us the third set – operational and semi-operational systems. Over the last 30 years, System Operations have evolved from the EMS to new systems like OMS, DMS, MDMS, and the more recent movement towards Distributed Energy Management Systems (DEMS). These new technologies are also invading non-operational areas like field force automation, customer services, and online asset management – the latter in the form of condition-based inspection and maintenance..

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A new set of problems are now being created?

While utilities always have had to deal with data, nothing could prepare them for the new onslaught of data from PMU s in transmission and the new sensors, controls and smart meters in distribution. As an example, just Smart Meters alone have moved the amount of data per residence from 12 data points per year (one per month) to multiple data points per premise every 15-minute. These incredibly large quantities of data are all sitting in their individual silos. The problem is that there is a lot of intelligence in the data and utilities are not yet taking advantage of it. Utilities are just beginning to start taking advantage of this data and drive insight to improve their own operations, provide better service to customers and deliver improved returns to shareholders – leading to the 4th set – Big data and analytics.

In my next post I'll discuss what technological changes need to be made and where to make them.