Big Data Analytics for Smart Grid - Forecast, Predict for A Smarter Grid

Rui Zhang

Research Staff Member, IBM T.J. Watson Research Center

Email: zhangrui@us.ibm.com

According to U.S. Department of Energy, by 2030, the power grid will evolve into an intelligent energy delivery system that supports plug-and play integration of dispatch able and intermittent low-carbon energy sources, and provides a platform for consumer engagement (prosumer) in load management, national energy independence, innovation, entrepreneurship, and economic security.

If we envision the picture of the future smart grid, we can see a few trends, namely:

1. The gird is increasingly instrumented and intelligent. SCADA system and smart meters are collecting huge amount of data each moment. It poses huge opportunity for utilities to discover new insights from the data.
2. 2. Energy cost is becoming a function of time and place of the consumption. Incentivizing the customers to change their consumption pattern, such that the peak usage is reduced is key to sustainable growth of energy demand.
3. 3. Renewable energy although uncertain, is becoming more and more cost competitive. Wind farms and solar panels are being installed at a rapid pace. Ability to remove uncertainty in renewable forecasting will provide a new economic incentive to move to 100% renewable
4. 4. We have more and more electric vehicles running on the road. However, bear in mind, we still have a 120 years old infrastructure to manage while we evolve into the new intelligent grid – "We are trying to reinvent the air plane while it is still flying".

To enable seamless transition to this vision, IBM is launching a framework called Opus, which is our effort in collaboration with the utility industry to reinvent the future of smart grid. And we use "uncertainty" as the key word in our framework. We will leverage IBM's expertise in analytics, big data and the Internet of Things (IOT) to build a system based on a probabilistic framework for advanced optimization that incorporates all sources of uncertainty to make better decision, which will enable profitable and reliable energy systems. That is quite a mouthful, but the real key is actionable intelligence based on a mathematical decision support system.

As a running start, we already developed a series of capabilities includes: foundational capabilities like IBM's deep expertise in analytics, Deep Thunder hyper-local weather forecasting, Decision Management Under Uncertainty Toolkit, an Energy & Utility Data Curation Engine and CIM enabled data model. And set of advanced applications like Customer Intelligence, Asset Predictive Management, Transactive Energy Management, Renewable Forecasting, Demand Forecasting and Renewable Integration.