

The Declining Significance Of Rates; A Guide To Technology Development

Charles Koontz (Integrus Energy Services, Worthington, Ohio, USA). cakoontz@integrysenergy.com

For over 100 years electricity transmission and distribution systems have been treated as natural monopolies. The resulting regulatory oversight and “ratemaking” has resulted in a system of non-market economics that at times has encouraged technologies beyond their true utility or dissuaded the implementation of technologies despite their advantages.

Successful entrepreneurs and technology developers are primarily focused not on solving important problems, but on creating solutions for which customers are willing to pay. With good technical solutions being constantly developed, the challenge to the financial success of the utility energy storage market is that the solutions being proffered need to have paying customers.

In the 1990s, deregulation challenged the inclusion of electricity generation in the natural monopoly and has opened parts of the market up to competition. Energy storage technologies are in the regulatory no man’s land between electricity generation, and electricity distribution. Distribution is usually regulated by the states, and remains so, even in markets that are deregulated. Generation is regulated at the Federal level, but is also under the jurisdiction of the states where deregulation has not yet progressed. In competitive markets, rules to promote competition prohibit information sharing and cooperation between the generation, transmission and distribution functions. This move away from central planning poses a unique set of challenges to storage technologies

Energy storage is neither generation nor distribution. It relies on and interacts with generation but affects distribution. It can be used to solve generator transient limitations, to improve operating performance of the whole system, or to delay investment in transmission and distribution. Prior research identified two approaches to earning returns by installing energy storage devices; Energy Arbitrage and T&D Upgrade Deferral. (Innovative Applications of Energy Storage in a Restructured Energy Marketplace, Ianucci et al, Sandia, March 2005)

Yet it can be illustrative to look at other breakdowns such as; Market vs. Non-market returns, capacity vs. energy sales, providing supply vs. reliability, and retail vs. wholesale.

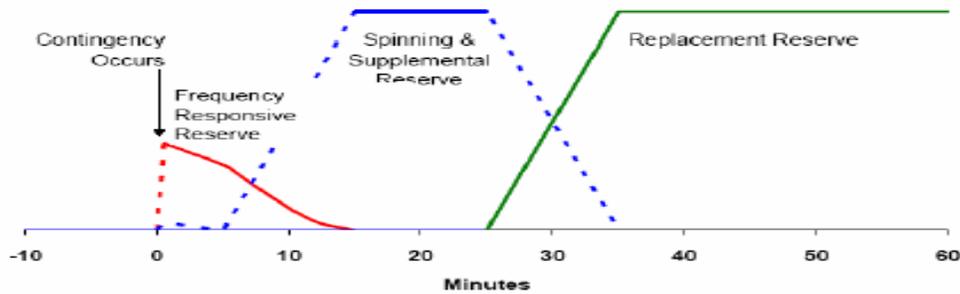
Accessing market returns is possible in functioning ISO and RTO markets where buyers and sellers of energy commodities conduct business at a market price. Non-market opportunities are characterized by specific projects where there is only one potential buyer, as in the case of a monopoly utility. These monopoly buyers may or may not have a transparent process for assessing the technical and commercial merits of the utility storage device, and in fact may make decisions based on non-economic factors along evaluation criteria that may favor traditional or outdated business practices.

The other dichotomies to consider have more to do with value proposition than they do to market approach, and will often depend on the specific characteristics of the technology. In a market environment selling energy may make more sense when onpeak and offpeak prices are widely divergent, and the technology enjoys low marginal cost for additional cycles. Where additional cycles are expensive and reliability is high it may be more beneficial to market the availability of power in the form of capacity, or to sell reliability, with the expectation of being needed for relatively few events per year.

Fortunately, the Federal Energy Regulatory Commissions put in place rules culminating in late 1999 with FERC Order 2000 that promote the development of functioning and accessible markets. These markets create price signals that can show technology developers what the value of energy storage technologies are based on their capabilities.

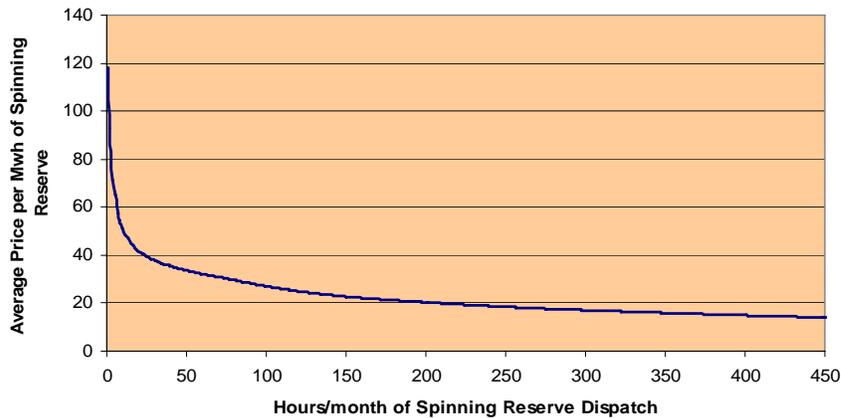
The PJM marketplace has clear hourly price signals for energy which are achieved by determining the “least cost security constrained dispatch” for the system on a day ahead and on an hourly basis. This means the system operator dispatches generating units and interruptible loads to create the lowest aggregate cost for the system without overloading any lines or transformers. This creates an equilibrium price for each node on the system, against which they repeat the process hourly as the energy is delivered. The difference between

nighttime load and daytime load, compounded by the marginal affect of congestion, creates daytime/nighttime energy cost differences that is one potential use of energy storage. The other approach is to use the flexibility of energy storage to reply to higher value needs for “ancillary services.”



The value of ancillary services is a function of response time, with faster response times realizing considerably more value. However, the number of events per year is also correlated with the speed of response (i.e. the market needs more short response events than it does long response events). This poses some challenges for energy storage technologies for which device life or operating cost are more impacted by cycles than calendar years.

PJM November 2005 Price distribution



Optimizing the value of the device is thus a market challenge and an operational challenge, but it also becomes a critical part of the successful business plan. At least as important as maximizing the value during device operation is being able to hedge that value in the future. The deregulated energy market is a meritocracy that will allow premium returns to early adopters, returns that most regulated utilities will not pay.

Technology companies, utilities, consumers and politicians are all expecting new technologies to affect the energy market. Understanding how the emerging and constantly changing energy market measures the value of energy based on location, time and flexibility is critical to the success of new technology ventures. Real opportunities will continue to exist to sell solutions to monopoly utilities, but the efficiency and speed of the unbiased marketplace is better matched to the needs of new technologies.