New Metric for Smart Grid – DWAP

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Of all the utility bills that a commercial enterprise receives each month, none, perhaps, is more confusing than the electricity bill. In theory, there should be no simpler thing to measure than our consumption of electricity: all the utility company has to do is measure our consumption, multiply it by an agreed-upon scheduled rate, and produce a final number that is clear and simple to understand.

Instead, however, we are stuck with a system so convoluted that it often requires a separate ledger just to understand what it is we're being asked to pay for. Currently, the electric company has two distinct measures according to which we are charged: power (measured in kwh) and demand (measured in kw). Put simply, if we imagine electricity consumption in terms of driving, the power (kwh) is the gas we use to travel from one point to another, while the demand (kw) is the rate at which we consume the gas; drive fast, and you use up more gas per mile than you do if you simply cruise down the highway. The same logic applies to our utilities: use up a lot of power in a short amount of time, and you'll tax your grid. To measure our energy consumption, then, the utility company monitors both power and demand.

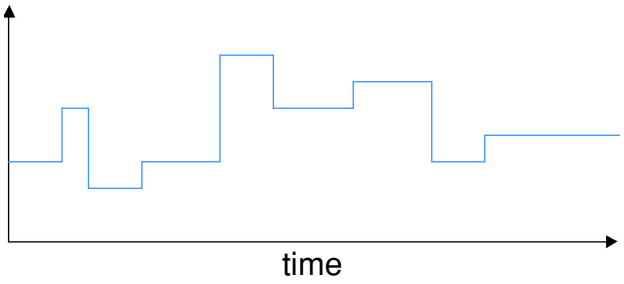
If that sounds complicated, it is. With two variables to consider, most commercial businesses, even the ones who depend heavily on electricity, aren't able to feed their energy consumption data into their operational model. And with no single, streamlined number to work with, most enterprises rely on operational systems that help them optimize every facet of their business except electricity, the cost of which is calculated as a separate, flat, monthly fee. If businesses could generate an hourly cost metric that they could feed into their operational model, they could optimize energy consumption as well; for that, they would need a smart grid.

But what is a smart grid? The term has been overused, with a myriad of companies each touting their own contributions to smart grid technology. For a grid to be truly smart, however, we must first be able to measure and understand consumption habits accurately, and to do that we must change the system's most basic building bloc, which is metering. Instead of the utility company visiting your business each month to measure your consumption, the new smart meter will measure consumption at every hour or n-minute interval. It will also be linked directly to the utility company's mainframe, and eliminate the need for inefficient monthly visits. More importantly, instead of two numbers, the smart meter could produce one, providing businesses with analytics that would fit neatly into their existing operational models and helping industries turn electricity consumption from a constant into a variable and fundamentally changing the way commercial enterprises consume energy.

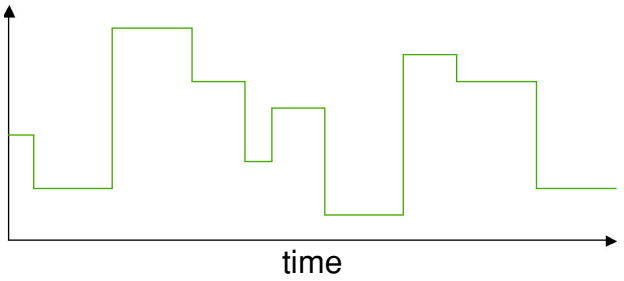
By revolutionizing metering, we would open the market to other, stand-alone devices and applications consumers could apply toward their own needs, and force the rest of the grid to truly smarten up. By launching smart metering, utility companies could finally charge customers based on real-time pricing, at which point the devices we all use to run our businesses could get truly smart and measure when they could take advantage of optimal electricity rates, directing our energy consumption accordingly. Imagine, for example, having a computer that's connected to the electricity company's mainframe; as the price of electricity fluctuates throughout the day, the computer could search for the best cost periods, turning your network on and off accordingly, optimizing production and minimizing cost. All that, however, is only possible if we can arrive at one agreed-upon metric we could all use.

DWAP - Demand Weighted Average Power

That one magical metric is Demand Weighted Average Power, or DWAP. The following graph demonstrates the system's advantage



DWAP = sum(Dj.Pj)/sum(Dj)



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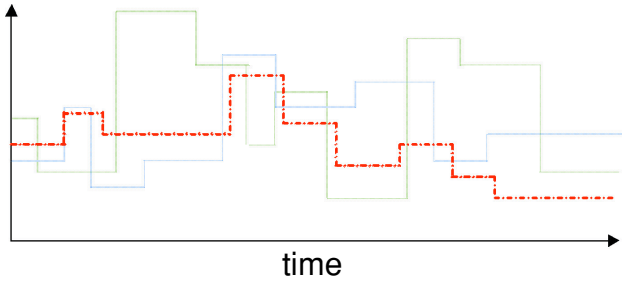

Dj = Demand in kw at j interval

Pj = Power in kwh at j interval

j = each individual n-minute interval of measurement

Previously, measuring consumption required observing and analyzing the two top graphs, a computational disadvantage that allowed little by way of modification, customization, and optimization. With DWAP, clients would be able to radically improve their performance: with our metering system now measuring consumption on an hourly basis and able to identify the inputs and outputs of each part of the production plant, customers would be able to create detailed reports of energy consumption, and optimize accordingly.

Imagine, for example, a hospital. An X-Ray department, say, could consume as much power as the entire floor its on, but each is charged differently: one draws power in short, intense bursts, and the other does so steadily over the course of the day. DWAP would enable the hospital administrator to see the difference represented as a single number, and enable him or her to allocate resources accordingly and act to optimize consumption all around. Or imagine a college campus: the building that houses the chiller, for example, may draw the same amount of power as another building, but the charge for each building is different, given the intensity (demand). To unveil the hidden cost, and control the grid to maximize efficiency, DWAP is necessary.

Finally, it should be noted that DWAP can also play an important role in promoting truly green energy consumption. With better metering comes a deeper understanding and a more accurate analysis of consumers' needs, which leads not only to financial benefits for consumers and providers alike but also to the significant reduction in energy wastage.

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