Episode 3 - Overview of Power System Economics

It's been a while. But SmartWatt Weekly's blog is here to stay, and this week we bring to you the third installment in our Electricity Markets series. This week, we delve into a brief overview of electricity sector economics, specifically why perfect competition in the sector is not sustainable and arguably dangerous. After reading this segment, you will understand:

1. Why is electricity unlike other commodities?

2. How competition in the electricity sector doesn't make sense

3. The regulatory compact

In the early days of the electric utility business, intense competition was a pervasive theme. When AC power was established as the dominant technology for generating and distributing electricity, many electric light companies sprung up in major cities across the United States. This intense competition was characterized by companies duplicating infrastructure. A myriad of power lines sprung up across cities, each owned and operated by a different company vying for market share.

Economics teaches us that competition is inherently good. However, electricity markets went against the grain of traditional economic principles since duplicate infrastructure represented a massive waste of resources. Furthermore, power lines including high voltage transmission wires and lower voltage distribution wires exhibit economies of scale - the average cost goes down as more demand is served through a single wire.

Installing power lines feature exorbitant fixed costs yet virtually zero marginal cost. Once a power line is established, the marginal cost of serving an additional household with that same line is essentially zero. Thus, the more households that are serviced with a single wire, the lower the costs will be since the capital cost are shared by more consumers. Moreover, it is also cheaper to build higher-capacity power lines that meet more demand rather than many lower-capacity power lines that meet less demand.

Regulators understand the virtues of competitive markets, thus regulating the price of the monopolist to mirror the competitive outcome, where price equals marginal cost. This is known as the market clearing point. Consequently, regulators efforts would result in a consumer surplus increase, whilst the deadweight loss disappears. For the regulator to set the monopolist's price equal to its marginal cost society would be better off.

However, a problem arises since the reason for such strong economies of scale in electric power is that so much of a utility's costs are fixed in the form of capital. The marginal cost of a power plant represents approximately one-third of its overall total costs. The marginal cost of a power line is practically zero. Thus, for an electric utility, if the regulator sets its price equal to marginal cost, then the utility will be unable to pay off its capital costs and will fall into bankruptcy. Marginal cost pricing in the electricity sector is great in the short run, but problems arise in the long run, when firms cannot recover their capital investments. This is not only bad for firms but very dangerous for consumers.

Consequently, a compromise was reached through the regulatory compact which was essentially to set prices at the point where average cost and marginal cost are identical. Prices are set to equal the average cost of providing electricity service, and the amount of electricity service desired is given by the point where the average and marginal costs intersect. These profits are, in the context of average cost, enough to cover both fixed and variable costs.