



The barbarians, I mean the customers and their agents, are coming.

This is really unfair and disgraceful. Ratepayers should be grateful, they have power (well, most of the time). Utilities only make prudent investments (on their behalf) and sell power at the lowest cost (that they want to).

Indeed, utilities feel under siege from barbarians who want to change the industry. On one hand, you have ratepayers who become barbarians by consuming, generating and storing power as they see fit, without caring on the impact all this has on the grid. On the other hand, you have new entrants, like Google and new energy service companies, who enlist those customers to create new markets, squeezing utilities out and creating new revenue streams. Big, bad barbarians.

Utilities are right to be worried. Barbarians are breaching the walls of the castle bit by bit.

What is causing this upheaval and what should utilities do about it?

Illustration credit: Mabie, Hamilton Wright, 1846-1916; Wright, George, ill, WikiMedia Commons.



The cost of electricity produced from utility-scale solar PV systems is dropping about 20% a year – that's what feeds the barbarians.

Looking at auction data for systems to be delivered in 2020, we can see that prices will soon be well below 3¢ per kWh for the best utility-scale projects. That does not even pay for the coal to operate an existing coal plant.

But this is not the end.

- Solar is the renewable technology with the most patents, promising further improvements.
- The Chinese are driving it, with the most manufacturing, the best quality, and the largest installed base, and it is enshrined in their 5-year plan.
- Furthermore, the cost reductions are broad-based: solar panels, inverters, balance-of-system, installation, and operations have all seen cost reductions. At the same time, panel efficiency is getting better.
- And battery storage is following more or less the same trend.



That was for utility-scale systems. A hundred MWs or so.

Commercial systems of hundreds of kWs are just 2 years behind utility systems in terms of costs per watt. That is: the cost per watt of commercial systems today is the same as the cost of utility systems about 2 years ago.

Residential systems are just another 2 years behind.

Obviously, Canada does not get as much sun over the course of a year as, say, Arizona. Toronto, Halifax and Vancouver get 40% less than Arizona – but this is only 2 years worth of cost decline. If you are in Southern Alberta, you're in luck, as you're just a year behind Arizona.

In just a few years, your customers, starting with the commercial ones, will be able to produce energy for much, much less than they can buy now.

Obviously, <mark>barbarians</mark>, having learned from other industries like IT and Telecom, <mark>take advantage of</mark> <mark>exponential</mark> cost decline like this.



So, this should be your <mark>nightmare if you're a utility, or your ambition for business customers if</mark> <mark>you're a barbarian.</mark>

Generally speaking, Canadian electricity rates are aligned neither with utility costs nor with cost of distributed generation and storage. This creates a massive arbitrage opportunity for customers and energy service providers to squeeze out utilities with distributed generation and demand response. Many businesses feel cheated by high demand charges and more than willing to throw their gate open to barbarians.

Given how low-cost renewables and storage are advancing, before 2030, the traditional, centralized grid will have been transformed into a transactional grid of microgrids, with customer-owned distributed energy resources controlled by an array of energy service vendors. For business customers:

- Customer relationships will never be the same.
- Customer expectations will be different.
- Customers will want choice, get together with their community, and share energy assets.
- They will redefine quality, as even short interruptions that throw distributed generation off-line will be unacceptable.

Photo credit: ILIOTEC Solar GmbH, from WikiCommons, edited by B. Marcoux.



The residential market is also transforming. Smart home devices and solar panels are the sword that barbarians are swinging.

Sudden load changes caused by programmable thermostats, that aren't really smart, have already caused Canadian utilities to spend hundreds of millions of dollars to stabilize the grid.

We now have consumers buying smart, communicating devices that they love because of convenience and comfort, but that pose an event greater threat to the grid. Customer control those devices through cloud services on the Internet – think about what could happen if Vladimir Putin gained control of them. And networking of smart home devices will continue to grow – just wait for 5G cellular network to come to life around 2020. Large international players like Google and Amazon are sinking billions of dollars to get a foothold in the smart home market, not even to make money by brokering energy but to get further insights in people' mind and buying habits. This is far from a stable environment.

However, smart home devices could also help utilities in balancing power for ever increasing penetration of renewable sources. Utilities just cannot sit and wait, there's too much at stake.



I once was a barbarian, but in telecoms, helping to trounce Bell Canada. Some business customers just wanted to ditch Bell, even if that meant getting worse services from companies like mine.

Still, twenty years ago, an Angus-Reid survey put Bell Canada #2 among most admired corporations in Canada. Last year, Bell Canada ranked #291 in a University of Victoria brand trust survey.

 People love their Apple or Samsung phones, are addicted to Facebook to stay in touch with friends, and turn to Microsoft Skype to see remote family members, but they now mostly hate their phone company.

How did that happened?

20 or 30 years ago, phone utilities were highly regarded companies. Service was considered inflexible, but everyone could afford a local line, which was cross-subsidized by expensive longdistance calls and business lines.

- Like electric utilities, phone utilities had a duty for public service and provided lifelong employment to employees.
- Does it look like something you know?

But, then, commercial customers revolted. Competition emerged, first for private networks sold to businesses. The local telephone service was unbundled from long-distance service in order to have retail competition and accelerate innovation.

Could customers turn against electric utilities too? Perhaps. We heard yesterday about a few business customers who did. When listening to renewable energy developers or commercial businesses, you already hear an undercurrent of dissatisfaction.

There are two ways to react. Put up barriers to try to control the land, or orchestrating the change to a new order.



The little girl above defending her fort is my grand-daughter Clémentine. Seeing how she is pushng us, she would make a great barbarian.

For a utility considering a greater role in distributed energy resources, it is important to look at what its business model is today and what it wants to be in the future.

One approach is to building on the <mark>traditional, linear business models</mark> of asset builder and service provider. Build up fortresses and put up guns, defending the existing business model by <mark>owning and controlling DERs and by providing customers exclusive products and services</mark>, putting as much assets as possible in the regulated base.

This is a comfortable approach, but it may entail slower growth and smaller margins, and it is not guaranteed to succeed if you look at what happened in telecoms. I would say that the greatest weakness of this approach is loosing the credibility to help set the agenda by being the ones who put up barriers. You just can't act to prevent customers from doing what they want and, at the same time, claim to drive change for their greater good. That won't work – you'll just loose control of the agenda, and change will be done to you.

Photo credit: Annapolis Royal, B. Marcoux, 2011.



Nevertheless, there is a lot of money in energy and it has attracted all sorts of people trying all sorts of things.

Both new players and traditional utilities have tried to gain the trust of customers with energymanagement system, but mostly failed. It has become an elephant graveyard. Those failed experiments should be a warning to companies entertaining new energy services to customers.

Europe is ahead of North America in experimenting with deregulated markets – effectively, anything that can be competitive there is competitive. Forget the image of state-owned energy monopoly that you may have – it certainly is not the case for energy in Europe. In France, the electricity distributor (EDF), the natural gas distributor (Engie) and the largest entrant in energy services (Énergie Direct) all failed in introducing smart home platforms. Those are very smart people, and they did not failed for the lack of trying.

EDF has now launched a new platform called <mark>Sowee</mark>, but, for all their efforts, only have <mark>a few thousand</mark> customers. EDF also lowered what success would mean – they are aiming at 1 millions Sowee customers in 2025, out of 30 millions households in France. All those efforts for an objective of 3% of the market in 7 years. I do not know if it is worth it.

However, to succeed, utilities can learn from the lessons of other industries that went through deregulation and the introduction of competition, such as airlines and telephone companies. There are also a few bright spots in the utility industry itself.

Illustration Credit: The Lion King, Walt Disney



As the threat of barbarians coming from the East receded, Europe entered the Age of Enlightenment. Some of the characters still looked somewhat barbarian, and it was a violent struggle at times, but the Enlightenment period laid the foundation for our modern Western civilization.

Rather than building fortresses, utilities could lead the change by orchestrating the exchange of energy, services and data. This means being in the connection business, not the power business. It means putting the customer at the beginning and the end of everything utilities do. The world is becoming more and more connected, and the functional value of the power grid will actually increase as more and more distributed energy resources will get attached to it. A much stickier relationship with customers and partners will result, with reduced risk profile. Don't expect grid defection on a large scale – the energy density of renewables simply does not allow it. In fact, as it has over the last few years, peak power balancing on the grid, between sources and loads, will keep increasing, although overall energy delivered might not increase due to self-generation. The logical consequence it that holding the asset that link energy resources to consumers can only be good. Its like a tollbooth on a highway.

Utilities should pursue this grid-as-a-platform business model. The grid-as-a-platform model seeks to unlock the value of distributed energy by engaging customers and then networking their DER assets. The grid-as-aplatform is untested in the power industry, but it is really just like the Internet. The Internet is just an interconnected network of independent providers linking information resources and consumers. And Internet companies are doing just fine, thank you.

We are starting to see examples of success in the industry.

- Green Mountain Power, just South of here in Vermont, markets smart thermostats, water heaters, solar panels, battery storage, and electric vehicle chargers to its customers. GMP is doing it by leveraging partners Nest thermostats, Aquanta controllers, Tesla Powerwalls and Flo EV chargers connected to Internet clouds through the customer Internet access, without a smart home hub in the home. Standard interfaces, like OpenADR, are used to eliminate dependencies to specific vendors. GMP does not want to reinvent Tesla and Google, but it leverages the names, and the GMP logo is everywhere for customers to see.
- Another great example is the Electric Power Board of Chattanooga, in Tennessee. EPB built a self-healing grid controlled by a high-speed fiber optic network. Then it leveraged its fiber optic network to offer telecom services. EPB provides residential Internet access (up to 10 gigabits per second), cable TV and telephony services that are recognized as among the best in the United States., accelerating the transformation of this old industrial city towards a high-tech economy and giving it the nickname "Gig City". It is an incredible success and a good example to watch.

Examples like GMP and EPB show that good vision can bring real excitements to the utility business.



Preparing for the future is essential for Canadian electric utilities and new players.

In an industry traditionally defined by centralized generation and rigid geographic boundaries between utilities, new linkages need to occur: utilities and customers, vendors and entrepreneurs, cities and businesses. We will need to cease the opportunities that didn't exist before and get means to get ideas to market quickly.

The structure of the industry will emerge transformed, hopefully with Canadian-owned service providers offering novel energy solutions in Canada, backed by a web of hardware, software, and professional service vendors.

Realizing this vision will increase competitiveness and opportunities for Canadians to <mark>export their</mark> energy, their expertise, and the fruit of their labor.

Thank you.

Photo credit: Dirt road in the Magdalene Islands, 1998, B. Marcoux.