Convergence of Electricity Systems and Digital Technology

Dean Gowans - Embrium

"Prediction is very difficult, especially if it's about the future"

Niels Bohr - Nobel Laureate in Physics

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Delivering Innovation to the Electricity Customer

Embrium:

Technology development company based in Wellington

Built upon 30 years of industry experience

Mission:

Reviews local and global trends for metering, control and customer interfaces

Focuses development of IP around where it expects market will be in 3-10 years

Drivers:

Customer Driven Innovation, IOT, Sharing Economy, Ancillary Services, Price Signals, Cloud Computing, “As-A-Service” Subscription Economy

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Where Might the Industry be by 2035?

- How much can technology change in 19 years?

- One possible way to comprehend this is to look back 19 years
  - What was the landscape like in 1997?
  - At that time, what was anticipated for 2016?

Back Then...

- “Gold standard” for metering half-hour smart meters read via cellular network
- Load control is predominantly via ripple signalling
- Billing of energy predominantly totalised kWh
- Cost of electricity is 16.69c/kWh*

...and Today

- Half Hour Meters ostensibly the same. Read via the digital cellular networks
- Load control is predominantly via ripple signalling
- Billing of energy predominantly totalised kWh
- Cost of electricity is 28.86c/kWh*

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**CPI Adjusted Values 1997-2015, Sources: MBIE and Statistics NZ*

In that Time, Mobile Phones have:

- Become 10,000 times more powerful
- Reduced to a ¼ of the weight and size
- Evolved into a myriad of variants to satisfy customer requirements
- Supplanted many other utility items (watches, cameras, calculators)
- Become indispensable to many.

1997

2016

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Meanwhile, Smart Meters have:

- Become about 20 times more powerful, yet much of that extra processing sits idle
- Changed little with respect to to bulk, size, accuracy
- Few variants, a “one size fits all” approach to implementation
- In some cases, supplanted the “separate” ripple receiver with an “integrated” ripple receiver.
- Instead of indispensable, remain almost indistinguishable from “dumb” Ferraris meters.

1997

2016

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Why Less Technological Change in the Electricity Industry?

- Decision making largely in the hands of regulators and retailer incumbents
- Little opportunity for the customer to influence the process
- Industry thinks in terms of large-scale, top-down implementation
- Changes are imposed, not offered
- Opaque back-office systems
- Technology seen as a threat, rather than a benefit

What are the Impacts?

- Moves to entrench existing metering technology, processes and tariffing will further detach industry from demand side drivers
- Industry is ill-prepared for exposure of gap between how it charges for services and how it incurs costs.
- Using punitive measures to discourage customers' investment in renewables and distributed energy will create resentment and may spur non-economic reasons for grid defections.
- *Environment seems ominously similar to taxi industry.*

How will Customers React to This?

- Industry resistance to innovation will not stifle progress
- Convergence of industry and digital technology will be driven by customers
- Way is clear for customers to make individual decisions, such as investment in solar, EVs, storage that will collectively hit (and hurt) existing market participants
- Much of this innovation will be evident “behind the meter”, in the residential home or in the school, office building.
- Survival of some long-term participants is arguable

“Behind The Meter” Innovation will Drive Convergence

- Customers will opt to monitor and control their own load through investment in metering, smart agents and networks could see weakened ability for mass supply side control
- Off market peer to peer systems will emerge
- New real-time off market platforms will facilitate Prosumer energy transactions
- Lightweight cloud-based billing services will allow simple micro markets to operate within apartment buildings, offices, malls,
- Where too expensive to justify capital investment for a single connection,
    - connections will be aggregated,
    - new technology will be packaged by 3rd parties as a service,
    - or deployed as shared investments such as “community solar”.

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When Can We Expect This to Happen?

- Futurists such as Ray Kurzweil, Elon Musk and Amory Lovins are staking money and reputation on demand-side driven upheaval in the industry.
- IEA International Energy Agency

2020 - Sustainable sources gain serious momentum, grid parity in NZ
2025 - Tipping point for sustainable products
2035 - Transition towards full energy autonomy
2050 - Autonomy reached

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A Prediction

"And I'm confident the day is just around the corner when consumers will take it for granted that choice is in their hands - choice of supplier and choice of time of use electricity, be it the dishwasher or manufacturing machinery. The information to make those choices will be ***displayed in the home kitchen****, on your* ***TV*** *screen,* ***through a business's computer system****, or simply by* ***dialling the phone.****"*

Max Bradford - Minister of Energy 1997-1999

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