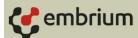
# Convergence of Electricity Systems and Digital Technology

Dean Gowans - Embrium

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

Niels Bohr - Nobel Laureate in Physics



# **Delivering Innovation to the Electricity Customer**

#### **Embrium:**

Technology development company based in Wellington

Built upon 30 years of industry experience

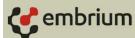
#### Mission:

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

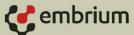
#### **Drivers:**

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



# Where Might the Industry be by 2035?

- How much can technology change in 19 years?
- One possible way to comprehend this is to <u>look back</u> 19 years
  - What was the landscape like in 1997?
  - At that time, what was anticipated for 2016?

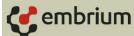


#### **Back Then...**

- "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

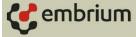
- Half Hour Meters ostensibly the same.
  Read via the digital cellular networks
- Load control is predominantly via ripple signalling
- Billing of energy predominantly totalised kWh
- Cost of electricity is 28.86c/kWh\*



#### 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.





#### **Meanwhile, Smart Meters have:**

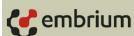
- Become about 20 times more powerful, yet much of that extra processing sits idle
- Changed little with respect to to bulk, size, accuracy
- Few variants, a "one size fits all" approach to implementation
- In some cases, supplanted the "separate" ripple receiver with an "integrated" ripple receiver.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

1997



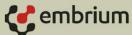
2016





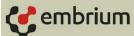
# Why Less Technological Change in the Electricity Industry?

- 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



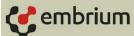
# What are the Impacts?

- 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.



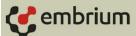
#### **How will Customers React to This?**

- 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



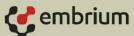
### "Behind The Meter" Innovation will Drive Convergence

- 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".



# 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



#### **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

