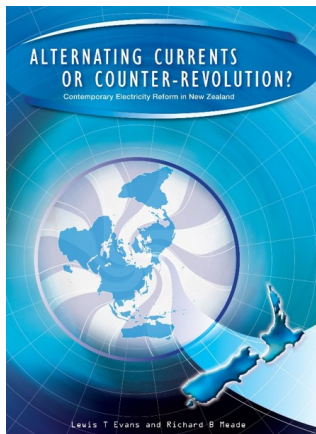


Background

- ERANZ commissioned Cognitus in August 2017 to prepare an independent regulatory think piece (“White Paper”, or “WP”):
 - To stimulate informed and coherent discussion – among regulators, industry participants (etc) – on how New Zealand electricity regulation might need to change in response to new technologies (PVs, batteries, EVs, etc):
 - Previously did similar work on Ministry of Transport *Regulation 2025* project;
 - Report was finalised August 2018, and publicly released January 2019, with usual disclaimers – see “commissioned studies”, at www.cognitus.co.nz/publications.
- As well as being independent, the paper focused on regulatory changes required “in the long-term interests of consumers”.

“Epilogue” to Evans and Meade (2005), *Alternating Currents*



Open access pdf available from:

<http://researcharchive.vuw.ac.nz/xmlui/handle/10063/4321>

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Possible White Paper Presentations – General

- The White Paper covers enough territory for a range of general, electricity-centric presentations, e.g.:
 - ① Confluence of new technologies with new business models and players – leading to *Data-Based Disruption*;
 - ② Implications of increasingly decentralised electricity generation, storage, trading and transportation – e.g. networks becoming more like grids, P2P, etc;
 - ③ Implications of (some) consumers becoming “prosumers” – who should benefit from regulation, or be its subject?; and
 - ④ High-level competitive and regulatory implications of data-based disruption – including economics of privacy.

Possible White Paper Presentations – Specific

- The Paper also goes deep enough to support some very specific presentations, e.g.:
 - ① Understanding the prosumer – see my subsequent research ...;
 - ② Who should (not) own new technologies – see later ...;
 - ③ Other specific competitive and regulatory implications:
 - Possible inversion of market power in generation and retailing;
 - Changing rationale for natural monopoly regulation;
 - Pan-sectoral vs sector-specific regulation;
 - “Regulatory market shares”, “regulatory forbearance”, and the “competition-regulation (Comp-Reg) boundary”; and
 - “Efficiently dynamic regulation” (EDR) – including strategic regulation.

This Presentation

- **Part I** – High-level overview of data-based disruption (WP ss 4-5):
 - Disruptive technologies; and
 - Disruptive business models and players.
- **Part II** – High-level discussions of (WP ss 7-8):
 - Required changes to “regulatory architecture”, including the Comp-Reg boundary and EDR; and
 - Some specific competition and regulation issues, including trade-offs when new technologies owned or controlled by different owner types.

Obvious Key New Technologies in Electricity (WP s. 4)

- *Solar PV* – enables highly decentralised (e.g. household-level) distributed generation.
- *Household-level batteries* – allow both time-shifting of own-production, and arbitraging of time-varying tariffs.
- *EVs* – as for batteries, but with potential for *physical* transportation of energy.
- Question is “when”, not “if”, such *Distributed Energy Resources (DERs)* will become affordable and attractive:
 - And how uptake decisions can be *influenced* by parties supplying the technologies and/or associated services, industry regulators and competition authorities, etc ...

Obvious Key New Technologies in Electricity (cont'd)



BIDIRECTIONAL CHARGING IS GOING TO CHANGE THE WAY WE THINK ABOUT WHAT A CAR IS (IMAGE SUPPLIED)

More than a set of wheels: How electric vehicles could soon power your home

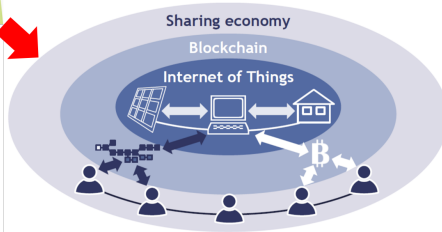
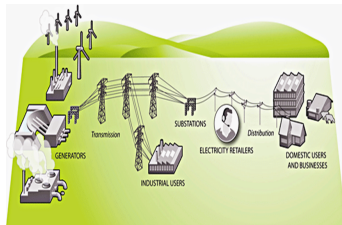
New Nissan Leaf allows V2G bi-directional charging, www.thespinoff.co.nz, 19 September 2019.

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More Subtle Key New Technologies in Electricity

- *IoT, Alexa (etc), home energy management systems, etc:*
 - Increasing ability to remotely monitor and control – and aggregate/coordinate – intra-household electricity demand and supply;
- *P2P trading platforms, block chain (etc):*
 - Enhances attractiveness of PV, batteries/EVs (etc) by providing low-cost (algorithmic) profit opportunities, not just cost savings:
 - Including ability to side-step self-generation being paid less than retail prices by retailers ...

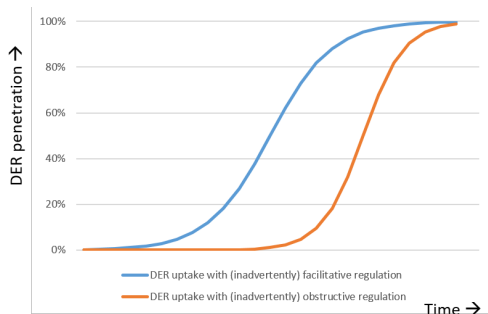
Transformed Landscape?



Four Regulatory Questions presented by New Techs

- Question 1 – How should firms and regulators think about consumers who are in fact “prosumers”?
 - At what point is prosumer penetration so great that traditional regulatory concerns (e.g. Part 4) vanish?
 - And what new issues might this create – e.g. widening gaps/(regulatory) “waterbed effects” for non-uptakers?
 - To what extent can/should firms – and regulators – influence the location of this point and its achievement?
- See Meade (2019) for formal research on modelling prosumer behaviour – *Measuring Prosumer Welfare ...* under “working papers”, at www.cognitus.co.nz/publications.

Four Regulatory Questions (cont'd) – Regulation is a Choice about Uptake ...



Even status quo regulation is a choice about uptake – it just isn't obviously a conscious choice (or the best one)!

(E.g. the LFCT and variable lines charges incentivise PV uptake – should they?)

Four Regulatory Questions (cont'd)

$$x^*(p, r; K_j, \Phi, y, \gamma) = \frac{\beta(1-\alpha)}{1-\alpha\beta} \left[\gamma K_j + \frac{(y-rK_j)}{p} \right]$$

$$K^*(r; M, \theta) = \int \frac{M(1-\theta)}{1 + e^{\alpha\beta-1} \left(1 + \frac{(\gamma_i p - r)K}{y_i} \right)} dF_y(y) dF_\gamma(\gamma)$$

$$W(p, r; M, \theta) = M\theta \int U^*(.) dF_y(y) dF_\Phi(\Phi) \\ + M(1-\theta) \int U^*(.) dF_K(K) dF_\Phi(\Phi) dF_y(y) dF_\gamma(\gamma)$$

$$U^*(.) \equiv U(f(x^*(.); \Phi), y - rK_j - p(x^*(.) - \gamma K_j))$$

Source: Meade, 2019, *Measuring Prosumer Welfare: Modelling Household Demand for Distributed Energy Resources and Residual Electricity Supply*, March.

Four Regulatory Questions (cont'd)

- *Question 2 – Who should (not) own DERs?*
 - Does it matter? – what are the trade-offs with different owner types?
 - If one owner type invests in DERs first, does this create disadvantages (or advantages) for later investors?
 - To what extent do DERs substitute for (or complement) the activities of existing players or their rivals, and/or leverage market power from one activity into the other?
 - Need to understand prosumerism before we can understand these questions.

Four Regulatory Questions (cont'd)

- *Question 4 – What is the role of “electricity” regulation when sectoral boundaries become increasingly blurred?*
 - Entry by electricity retailers into other sectors (e.g. internet, gas) and vice versa;
 - Increasing electrification of transport (e.g. EVs, trains/buses) – transport regulation affects electricity sector and electricity sector regulation affects transport;
 - Increasing importance of data – links with telecommunications and privacy/data protection regulation, and cyber-security;
 - Reliability and security of supply becoming systemic across multiple sectors;
 - “Tech Giants” bowing only to the world's strongest regulators (if at all).

Data-Based Disruptors (WP s. 5)

- But new technologies are only part of the equation – equally important are disruptive new players and business models, cf *Data-Based Disruptors (DBDs)* in other sectors:
 - *Uber* vs taxis – and public transport, and delivery services;
 - *AirBnB* vs hotels – and traditional landlords/renters;
 - *Netflix* vs free-to-air broadcasters – and video/music stores, cinemas/restaurants, etc;
 - *Facebook* vs traditional news organisations and broadcasters; and
 - *Crowd-funding* vs traditional capital markets – and charitable sectors.

Some Hallmarks of Data-Based Disruption

- At their heart, DBDs are “leapfrogging” incumbent providers and technologies in the contest to “know thy customer (and influence that customer’s behaviour)”:
 - The skills are transferable across sectors/states, so winning in one makes you better at winning in another.
- Initially this was characterised as involving *predictive technologies*, e.g.:
 - Google knowing you “better than your mother”, and figuring out what you were going to do/buy next; or
 - Amazon’s patent for predictive stocking – shipping products to depots in anticipation of locals buying them.

From Prediction to Persuasion (cont'd)

We built an algorithm to track bots during the European elections – what we found should scare you

The bots were markedly overrepresented in hashtag campaigns supportive of the far-right Movement for a Europe of Nations and Freedom group

Emmi Bevensse, *Alexander Reid Ross* | @areidross,
Sabrina Nardin | 10 hours ago |

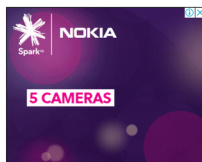


Click to follow
The Independent Voices



Computer programmes aren't going to drag the pencil out of your hand and scrawl an X on the ballot paper for you, but they are doing everything they can to make sure you head to the polling station with a warped idea of popular politics. And by a large majority, it is the right wing of politics that is doing the warping.

Using a **programme** we developed to study bot interference in elections, we found that some 12 per cent of tweets using hashtags promoted by far-right EU parties came from users which showed tell-tale signs of full automation. That is double the average across all parties.



The Independent, 22 May 2019.

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Network Effects

- Knowing customers (or voters) inside out, and being able to predict/influence their behaviour exhibits strong “network effects”:
 - The more users there are on a particular “platform”, the better the platform can be.
- Induces firms to “get big fast” (“data gold rush”), and leads to “winner takes all” competition that can “tip” to monopoly;
 - Once DBDs have accumulated vast customer data, newer firms can struggle to match them – “data moats”;
 - *Open access and data portability are possible responses* – but do they increase competition *in* the market (an incumbency story) at the expense of competition *for* the market (a disruption story)? Which is more important?

Discrimination/Personalisation

- Better technologies for knowing customers leads to highly-granular differentiation (a.k.a. discrimination, or personalisation) – e.g. *personalised* pricing or quality offerings:
 - Can create “waterbed effects” – better deals for some accompany worse deals for others (*relative to uniform offerings*).
- Economics tells us that the overall welfare effects are *ambiguous*:
 - Society can be better off, provided more customers are served in a differentiated world (subject to equity concerns, though are they increasingly likely anyway ...).

Bundling

- Another emerging global business trend is that of bundling – i.e. offering a combination of goods or services for a fixed price:
 - Having better technologies to distinguish customer segments allows offerings – and pricing – to be increasingly tailored to specific segment preferences;
 - Note – bundling is yet another form of price discrimination ... (EPR implications?).
- Imagine “utilities”/“grudge purchases” being bundled with value-added retail offerings:
 - cf P&P with Amazon purchases, recharges with Tesla EVs, broadband with entertainment ...

Likely New Players and Business Models in Electricity

Bundling (cont'd)

Check if I can get Vodafone TV	
Naked broadband	Broadband and voice
Save \$10 with an eligible On Account mobile: <input type="checkbox"/> No <input type="checkbox"/>	
Standard	Standard+
SKY Basic	SKY Basic
Unlimited Broadband (Fibre 100 or FibreX200)	Unlimited Broadband (Fibre 100 or FibreX200)
Record up to 200 hrs of content	Record up to 500 hrs of content
1 Vodafone TV Box Watch on your TV & 1 extra screen	2 Vodafone TV Boxes Watch on 2 TVs & 1 extra screen
✓ Vodafone Ultra Hub ✓ Virus Protect (New Fibre only) ✓ Free Standard install	✓ Vodafone Ultra Hub ✓ Virus Protect (New Fibre only) ✓ Free Standard install
\$139.99 (12 month term)	\$159.99 (12 month term)



What consumers want:

- Paying a fixed monthly fee for this (and ability to access similar web-based content)

What consumers need to get what they want:

- Getting this bundled/included with what they actually want;
- Do the same with electricity?*

* E.g. standard fixed price heating and lighting package, with add-ons for EVs, DERs, spa pools, differentiated by customer/household demographic ...

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Bundling (cont'd)

Electric car owners 'can drive for free by letting energy firms use battery'

Savings from a new scheme will cover the £350-£400 annual cost of charging a Nissan Leaf, says electricity supplier Ovo



1 Ovo will offer the 'vehicle-to-grid' service to buyers of the Nissan Leaf from next year. Photograph: Okauchi/Rex/Shutterstock

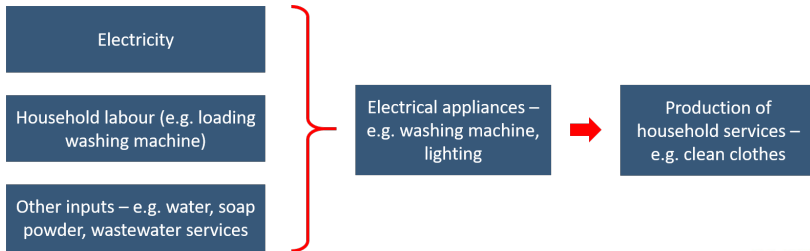
Electric car owners will be paid for letting an energy company use their vehicle's battery in a pioneering scheme to increase take-up of the cleaner vehicles and

The Guardian, 2 October 2017.

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Electricity Retailing Now – Derived Demand/Grudge Purchase

- Hard to imagine anyone buying electricity because they like electrons:
 - Rather, we buy electricity because we combine it with other things to produce the household services we really want, e.g.:



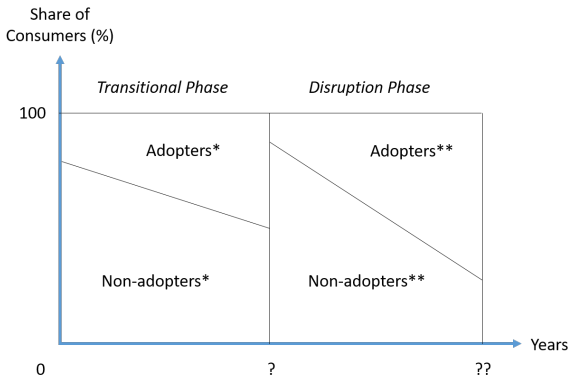
What might Disruption look like in Electricity?

- Imagine (e.g.) Amazon using new techs like Alexa and its Big Data advantages to:
 - Offer households an all-up electric [heating, lighting and appliances] package for [\$100] per month on a [24 month] plan;
 - Predict who is about to put on their oven when wholesale prices are high, but persuade them to stream a show instead;
 - Turn down the brightness of their screen(s) by [5%] to imperceptibly shave extra consumption savings;
 - Manage their PV or storage to supply what they need, and draw some off for sale to reinforce the network or supply other users' energy; and
 - Measure and *aggregate* this in real time, arbitraging wholesale prices as a "Virtual Power Plant" or algorithmically trading P2P, and bulk-buying supply ...

Electricity Sector Ripe for Disruption by DBDs

- With possibilities like these, DBDs could re-invent electricity retailing around highly consumer-focused offerings:
 - And will leverage their market power from data into both retailing and DER aggregation. Is that clearly bad?
- DBD entry could cause a seismic shift in the balance of electricity sector market power:
 - Away from generation – and even natural monopoly functions – towards retailing;
 - Would likely result in a substantial realignment of industry ownership (or exit).

Possible Sequencing to Disruption



* Of bundled variable-price “utility” offerings by traditional firms, including electricity.

** Of bundled fixed-price value-added product/service offerings by DBDs, including electricity.

Oil Companies Entering Electricity Retailing

Shell Energy is offering 700,000 UK homes 100% renewable electricity for first time

Oil giant to take on UK's heavily criticised 'Big Six' suppliers which have lost millions of customers in recent years

Ben Chapman | @b_c_chapman | 1 hour ago |



Like

Royal Dutch **Shell** has announced its arrival as a household gas and electricity supplier, moving 700,000 First Utility customers to its **Shell Energy** brand.

All of Shell's residential energy customers will be supplied with 100 per cent renewable electricity. Shell Energy customers can take advantage of a 3 per cent discount at **Shell** petrol stations, as well as discounts on home technology like smart thermostats and electric vehicle chargers.

Shell Energy chief executive Colin Crooks said the company would use fuel forecourts to promote the new offer.

Roaming for \$5 a

Use your plan's data,
mins & TXTs in 70+ co

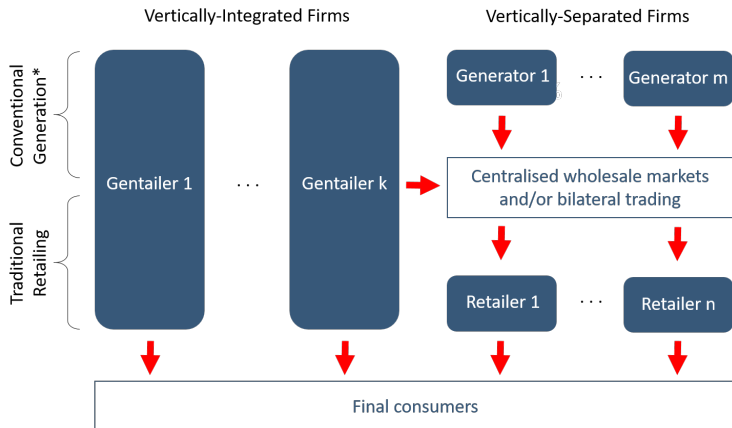
Find out more

The Independent, 26 March 2019.

Relocating Market Power

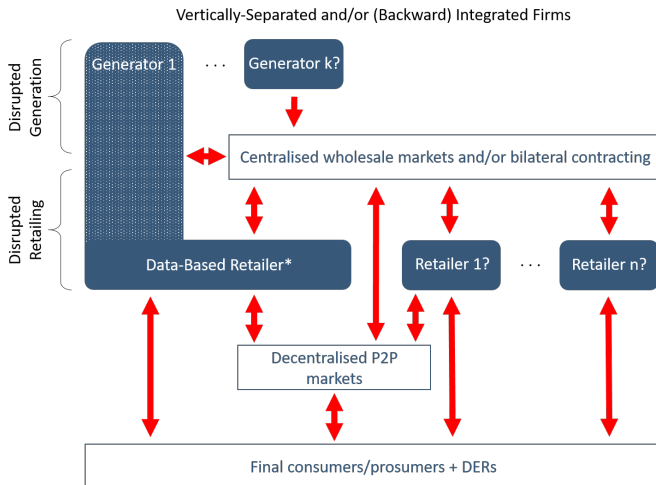
- Incumbents with “upstream” market power now face prospect of heavily-concentrated DBDs downstream:
 - DBDs can drive hard bargains with suppliers – cf Amazon vs USPS/FedEx, major supermarkets vs farmers, etc.
- Especially when backed up with credible threat of upstream entry (make vs buy):
 - E.g. Amazon backward integrating into logistics – US\$25b investment in 2017 (cf Facebook and Microsoft investing in Trans-Atlantic fibre);
 - E.g. major supermarkets creating store brands;
 - E.g. imagine Amazon (etc) backward integrating into PVs and batteries/EVs ...

Relocating Market Power (cont'd) – Now



* Market power relatively more concentrated at this level.

Relocating Market Power (cont'd) – Future?



* Market power relatively more concentrated at this level.

Incumbents' Counterstrategies

- Incumbents aren't passively awaiting disruption, e.g.:
 - Walmart, The Warehouse (etc) boosting online presence to counter threat of disruption by Amazon;
 - Financial sector firms using DBDs to get closer to customers – though only to then have their lunches cut;
 - Horizontal mergers or entry across sectors – e.g. power companies into broadband; and
 - Vertical tie-ups between content and infrastructure providers – e.g. AT&T/Time Warner, Vodafone/SKY.

Competition Authority Dilemmas

- Competition authorities are facing dilemmas:
 - Traditionally such vertical mergers raise foreclosure concerns – but against muscular disruptors?
 - If they block *ownership*-based mergers, can/should they also block *contractual* tie-ups (a less-efficient alternative)?
 - Should authorities worry about competition *in* the market if there is imminent or actual competition *for* the market?
 - Don't authorities make disruptive entry more likely by blocking defensive incumbent tie-ups? Should they!?
- New Zealand taking different stance to the US:
 - AT&T/Time Warner merger allowed – how will Vodafone/SKY fare against the merged entity, Netflix, etc ...

Post-Script – Vector's Tie-Up with Amazon Web Services

- On 28 July 2020, Vector and AWS announced a three-year strategic alliance to develop a New Energy Platform (NEP).
- The alliance's aim is to “transform how the energy industry operates”, and get closer to the consumer:
 - The longer-term aim is to take the resulting knowledge, technologies and products to the world – i.e. using Australasia as a “sandpit”.
- The alliance combines:
 - AWS's big data analytics, machine learning and IoT capabilities; and
 - Vector's real-time data from 1.6 million smart meters in Australia and New Zealand.
- The birth of data-based disruption in electricity? ...

Regulatory Architecture (mainly WP s. 7)

- Focus on six broad aspects of “regulatory architecture” that are likely to need rebalancing due to disruptive new technologies, business models and players:
 - ① Better understanding who needs what type of regulation – unpacking the “consumer” (WP ss 4.2, 4.8, and 7.2-7.3);
 - ② Wider range of regulatory tools (WP s. 7.7.1);
 - ③ Relatively greater reliance on general competition regulation than on industry-specific regulation (WP s. 7.7.2);
 - ④ Greater flexibility and responsiveness, and performance focus (WP ss 7.7.3-7.7.4);
 - ⑤ Increasingly “horizontal”/pan-sectoral rather than “vertical” regulation, and international focus (WP ss 7.7.5-7.7.6); and
 - ⑥ Related to (3) and (4), the need for efficiently dynamic regulation (WP s. 8)

Unpacking the Consumer (WP ss 4.2, 4.8, and 7.2-7.3)

- New technologies, business models and players create *increasingly divergent consumer interests*:
 - Indeed, new technologies *enable* much greater personalisation;
 - Regulators need to account for this just as businesses do – perhaps using DBDs' tools ...
- Willingness and ability to pay will become increasing drivers:
 - E.g. some households cannot afford PV panels, don't own a roof to put them on, or live where the sun doesn't shine;
 - However, DBDs offering affordable fixed-price bundles might dampen any equity issues arising.

Unpacking the Consumer (cont'd)

- Personalisation is increasingly the new “normal”:
 - In principle this is not bad for welfare, and could lead to currently *under-served* customer classes being better served;
- Regulatory challenge – what are the price-quality trade-offs and other regulatory needs of households with DERs versus those without?
 - Conventional consumers like *low* energy prices and *relatively low* variable lines charges – prosumers will likely prefer (*relatively*) *high* ones.
- Regulation needs to be much more nuanced, based around better understanding of different types of “consumer” – some of whom are more like “competing firms”.

Wider Range of Regulatory Tools (WP s. 7.7.1)

- Part 4 of the Commerce Act anticipates regulatory alternatives that might become increasingly relevant and viable, e.g.:
 - *Negotiate/arbitrate* as an alternative to price-quality regulation – e.g. where formerly individual “consumers” combine forces through P2P platforms and/or aggregation by DBDs or others:
 - They then have bargaining power with their suppliers;
 - *Information disclosures* – e.g. lines network “hot spot” maps highlighting profitable entry points for entrant suppliers;
 - *Regulation exemptions* for specific customer classes – e.g. “prosumers” with sufficient capacity to be net sellers enough of the time (or at the right times).
- These should be complemented by other increasingly prominent regulatory tools – e.g. (un)privacy regulation (WP s. 5.4), open access and data portability rules, etc.

More Antitrust and Less Industry Regulation (WP s. 7.7.2)

- Competition/antitrust regulation is typically applied *after* the fact, in whichever sector where problems arise:
 - Contrast industry-specific regulation – applied *before* the fact, presuming there is a problem which regulation solves.
- Accordingly, competition regulation is “responsive” and horizontal, whereas industry specific regulation is often “prescriptive” and vertical:
 - With increasingly rapid and cross-sectoral change, regulation needs to be relatively more responsive and horizontal.
- This implies a relatively greater reliance on antitrust regulation, and relatively less reliance on industry regulation.

More Antitrust and Less Industry Regulation (cont'd)

- It means the Comp-Reg boundary shifts in favour of greater reliance on competition regulation (see graph later):
 - I.e. towards greater “regulatory forbearance”;
 - In a world where consumer-enhancing innovations are becoming more common, it can be more important to allow innovation than to address static market power concerns.
- If DER disruption is likely to be beneficial, use less Part 4 and more general competition regulation – i.e. become relatively:
 - Less tolerant of regulating against market power in contexts where it could turn out to be not such an issue, e.g. due to innovation (“*Type I error*”); and
 - More tolerant of failing to regulate against market power in contexts where it could turn out to be an issue, e.g. due to non-innovation (“*Type II error*”).

Greater Flexibility/Responsiveness, and Performance Focus (WP ss 7.7.3-7.7.4)

- Relatedly, with increasingly uncertain future technologies, business models and players, a rebalancing is required:
 - From *certainty and predictability* – which usefully supports long-term investments;
 - Towards greater *flexibility and responsiveness* – which avoids entrenching outdated ways of doing things when better alternatives emerge.
- What is a “long-term” investment anyway, in an increasingly uncertain environment?
- Investment certainty matters, as does coordination, but regulation shouldn’t insure businesses against inherently increasing technology risks.

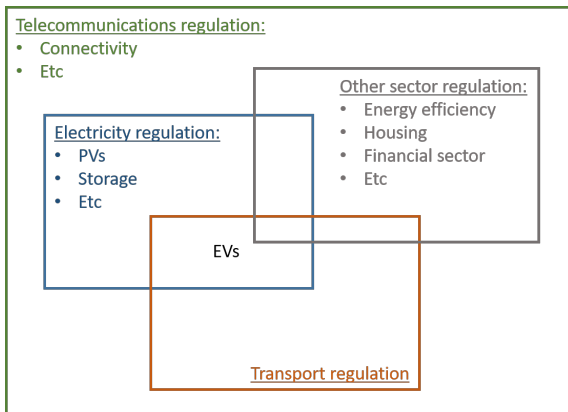
Greater Flexibility/Responsiveness, and Performance Focus (cont'd)

- Likewise, new technologies, business models and players require – and enable – a rebalancing:
 - From *process-based regulation* – i.e. regulating *how* things are done;
 - Towards greater *performance-based regulation* – i.e. regulating *what* is done.
- The former is easier to achieve when defining and monitoring performance are hard:
 - But it impedes innovation by entrenching certain technologies.
- The latter is more viable when technologies enable better performance measurement (as they are), and induces innovation.

Increasingly Pan-Sectoral Regulation (WP s. 7.7.5)

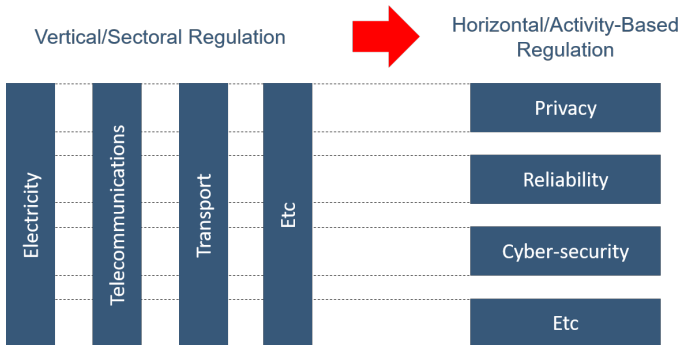
- Regulation can be:
 - *Vertical/sector-specific* – e.g. transport regulation focuses on all matters (safety, reliability, etc) for just that sector; or
 - *Horizontal/activity-based/pan-sectoral* – e.g. privacy, workplace safety or competition regulators focus on one activity, but for all sectors.
- Traditional sectoral boundaries are increasingly blurring – e.g. Uber into deliveries, power companies into broadband, EVs spanning electricity and transport:
 - Potentially heightens traditional regulatory concerns – e.g. safety, reliability – and creates new ones (e.g. privacy);
 - Regulatory choices in one sector affect the other, but often not coherently (or even wittingly, by design).

Increasingly Pan-Sectoral Regulation (cont'd)



Increasingly Pan-Sectoral Regulation (cont'd)

- Should therefore expect to see regulation becoming increasingly horizontal, and decreasingly vertical ...



Increasingly International Focus (WP s. 7.7.6)

- New technologies, business models and players will increasingly originate overseas:
 - Data-based disruption is essentially “weightless”, and features strong scale and scope economies; and
 - DBDs will likely develop approaches for high-value markets (e.g. US, EU), and then roll them out to smaller markets (e.g. New Zealand) at low marginal cost.
- Regulation will increasingly confront jurisdictional issues and muscular regulated firms:
 - Instead, international regulatory coordination and cooperation will take a more prominent role – especially to avoid DBD “techlashes” (cf Australia’s “Amazon tax”?);
 - Also, to encourage local innovation by overseas DBDs, rules may even need to be relaxed (e.g. Amazon facing antitrust penalties in New Zealand based on global profits).

Bottom Lines – Regulating Uptake

- *Regulators, firms* (incumbents and entrants/disruptors) and *consumers* are engaged in a multiplayer “game”:
 - Innovation, entry and uptake of new technologies and business models reflect the combined choices of all three groups.
- Regulation therefore matters, and can play an important role in helping to resolve critical strategic uncertainties:
 - Beta/VHS, CDMA/GSM, BEV/hydrogen represent key strategic choices not clearly best resolved through competition alone;
 - Existing regulation (and approaches for updating it) affects those choices, for better or worse.

Bottom Lines (cont'd) – E.g. Battery vs Hydrogen EVs

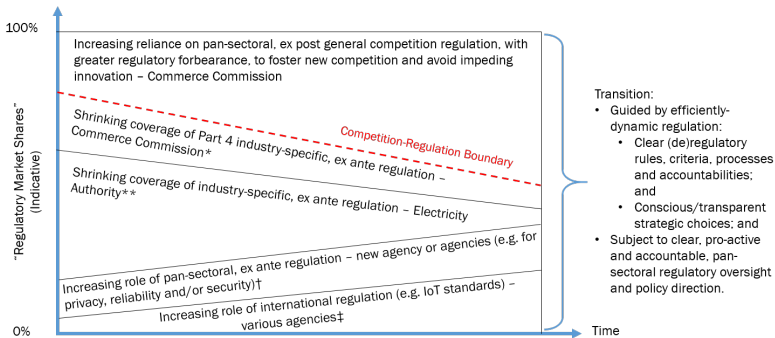
- A very salient regulatory choice is whether to mandate battery-based EVs, hydrogen fuel cell EVs, neither, or both:
 - Battery-based EVs need investments in vehicles, renewables, network reinforcement, and charging and servicing infrastructures;
 - Hydrogen-based EVs need investments in vehicles, clean hydrogen production, and distribution and servicing infrastructures.
- Another consideration – “Big Oil” likely to see a greater role for itself in a hydrogen-based solution, and hence might find it profitable to support such a decarbonisation solution (vs oppose a BEV solution):
 - Disclaimer – only oil sector work I’ve done is on the *other* side of oil companies (co-authored MBIE’s 2017 Fuel Market Study).

Bottom Lines (cont'd) – E.g. Battery vs Hydrogen EVs (cont'd)

- Investments in either technology are less attractive, and enjoy lower scale economies and uptake, in a world where there is the competing technology:
 - N.B. they are *both* worth less, and enjoy lower scale economies and uptake, in a world with increased investments in public transport (and/or reduced investments in roads);
 - N.B. they are *both* worth more (etc) in a world where internal combustion engines face a sunset.
- Due to scale economies (for producers), and network effects (for producers and consumers), there is a case for *reducing* competition *for* the market by *mandating* a technology ...

Regulatory Architecture

Bottom Lines (cont'd) – Changing “Regulatory Market Shares” (WP Figure 13)



* Anticipating (or observing) that new technologies, business models or players alleviate traditional market power concerns.

** Anticipating (or observing) consumer-benefitting competition emerging from new technologies, business models, and players – but also recognising need for residual ex ante regulation to be more pan-sectoral and/or international.

† Recognising ongoing need for ex ante regulation – which becomes more flexible/responsive and performance-based – but with increasingly pan-sectoral/horizontal focus.

‡ Recognising that (ex ante or ex post) regulation will become more international to some degree due to key technologies (e.g. IoT, 5G, etc.), and business models/players (e.g. DBDs), being global, and affected by overseas regulation.

Efficiently Dynamic Regulation (WP s. 8)

- “Set and forget” prescriptive regulation works fine in an unchanging environment:
 - Its “commitment power” can be a virtue when long-lived investments are required of regulated firms.
- But in a rapidly changing environment both the rationale for regulation, and its feasibility, can quickly become outmoded:
 - Potentially becoming *impotent* (i.e. new technologies leapfrogging regulation) and/or an *obstacle* to desirable innovations;
 - As above, balance of convenience shifts (relatively at least) away from *commitment* towards *flexibility/responsiveness* ...

Second-Order Commitment Power

- At the same time, commitment power can be preserved at a second-order level at least:
 - Any *regulatory compact* between regulators and firms qualifies “I promise to allow you to recover investment costs” by adding “... provided no technologies or business models emerge that better serve (specific types of) consumers in the long-term”.
- Signalling this *in advance* as the “regulatory rules of the game” makes it clear that regulators are not going to favour any given firms, technologies or business models:
 - Only those best serving long-term consumer interests.

Who Should Own New Techs – DBDs? (s. 7.6.1)

- Pros – include:
 - Highly value-adding bundles of services, priced and tailored to serve larger market;
 - Natural platforms for aggregating otherwise highly-disaggregated generation and demand;
 - Possible DER investment acceleration, and countervailing buyer power (against generation and lines ...).
- Cons – include:
 - Increasing retail market power, with risk of tipping to monopoly (protected by “data moats”);
 - Privacy trade-offs; and
 - Possible “waterbed effects” for non-adopters.
- Might DBD entry mitigate need for Part 4, or make it more important for “left behind” customers?
 - Might it also relieve concerns about incumbent firm mergers?

Who Should Own New Techs – Gentailers? (s. 7.6.3)

- Pros of integrated generator-retailer ownership – include:
 - Improved coordination between DERs and conventional generation (base/peaking) and storage;
 - Relatedly, reduced spill, and lower peaking capacity requirements; and
 - Greater ability to compete at retail level with DBD entrants.
- Cons – include:
 - Potential strategic under-investment in DERs;
 - Possible strategic under-investment in peaking capacity to leverage greater peaking market power; and
 - Possible foreclosure of DER investment by parties without strategic incentives to under-invest.
- Raises some more subtle issues to look out for in mergers – e.g. (unseen) impacts on storage, or peaking capacity.

Who Should Own New Techs – Separated Generators, or Retailers? (s. 7.6.4)

- Pros – include:
 - Separated retailers have less strategic incentive than either gentailers or separated generators to under-invest in DERs;
 - Separated generators have less incentive than gentailers to foreclose retailers.
- Cons – include:
 - Lesser ability to coordinate DERs with conventional generation (base/peaking) and storage;
 - Competing retailers have lesser ability to coordinate DERs to countervail against generator market power; and
 - Separated generators and retailers pose “vertical coordination costs” in pricing, and could facilitate “inefficient entry”.
- Mergers that increase market power in DERs could provide countervailing benefits against other market power.

Who Should Own New Techs – “Conclusions”

- I found surprisingly little research on the subject of who should (not) own new technologies in electricity:
 - Certainly there was nothing at all about DBD or gentailer ownership; and
 - Research relevant to EDB, generator or retailer ownership was extremely thin, non-specific or inadequate.
- Bottom line is that there are in-principle pros and cons of new techs being owned by any given incumbent/entrant party:
 - Relevant question is: which owner type(s), under what circumstances (e.g. overall “industry ecosystem”), provide greatest net consumer/prosumer benefits over time?
 - Formal analysis is required to answer this question – the research field remains wide open!

Conclusions

- Electricity sectors are ripe for disruption by new technologies, and the new business models and players they enable:
 - This challenges the presumptions around how electricity sectors have been organised and regulated;
 - At the heart of this is how consumers should be understood, and reinvented.
- As a consequence, these new technologies, business models and players:
 - Potentially alleviate many traditional regulatory concerns, though likely with a messy transition; and
 - Create new regulatory concerns, likely to be more shared with other sectors than traditional sectoral regulatory concerns.

Conclusions (cont'd)

- While disruption is likely, it is also highly uncertain:
 - Regulation, whether left unchanged or redesigned, will affect the course of any disruption;
 - Regulation can also help to reduce uncertainties – e.g. by creating focal points for future change.
- This also involves regulation that is more antitrust-based, responsive and performance-based, horizontal, and global.
- Where uncertainties remain, regulation has a key role to play in terms of signalling the “direction of travel”, i.e.:
 - Helping to resolve strategic uncertainties, such as through coordinating standards or technology choices; and
 - Pre-signalling rules, in a credible way, for how future regulation will be changed as uncertainties are resolved, if not signalling precisely what future regulation will be.
