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The changing role of markets in Australia's transition to renewable electricity: back to where we started?

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1. Introduction

Thank you for the kind words of introduction and for inviting me to speak to you. I have been looking forward this, and to the discussion that follows.

For much of the last four decades, the trend in much of the rich world, but also in many developing countries, has been towards “deregulation” and then often also the privatisation of electricity supply. This started in Chile and Great Britain in the early 1980s with policies adopted by the Pinochet and Thatcher governments, and then followed not long after in Norway, New Zealand, several of the south and eastern states of Australia, Alberta in Canada, Texas, California and several of the eastern states of the U.S. and then still later in much of Europe.

I started my career shortly after Britain had completed the privatisation of its generators. I became fascinated with this and then worked on aspects of deregulation/liberalisation in many countries. It was intrigued to see the fever for competition, deregulation and privatisation catch on far and wide.

In Australia, or more particularly in Victoria, it is coming up for nearly 30 years since the bulk of the industry was privatised and 25 years since the creation of the National Electricity Market.

Our Victorian State Government was recently re-elected. Prominent in their re-election campaign was the promise to re-create the State Electricity Commission, 51% owned by the Government, and that it said would deliver lower electricity prices, jobs and renewable electricity.

In my own letter-box, in the first week of the election campaign, the flyer from my local Member had the promise to re-create the State Electricity Commission, on the front and back of the flyer, with promises of cleaner and cheaper electricity.

In the Premier's Victory speech, it was the first item the Premier mentioned to explain the success of the Labor Party's election campaign. Since that time, the pros and cons of private versus government-owned electricity supply and of deregulation has become increasingly topical also in other states of Australia.

So, it would seem we have come full circle since those massive changes 30 years ago. Or have we? It is this question that I hope to hold your attention with, for the next 40 minutes.

Let me put up a slide with an outline of the rest of my talk, so that you have a sense of what lies ahead.

At the expense of stealing my thunder, I don't think we can say that, to channel TS Eliot, "we have arrived at the place where we started and now know the place for the first time". The world has changed so massively. New technologies, largely not even dreamed of 40 years ago, are now our cheapest and cleanest sources of energy, and electricity can now be cost-effectively stored and reproduced in an instant. Whole new possibilities and challenges are before us.

I don't think the people of Victoria have voted for the horse and cart, when electric vehicles are available. But what is it that they want, that they feel deregulation and privatisation has not given them?

2. Before deregulation

About 180 years ago Maxwell and Faraday set out laws to explain how electrical current can be created and controlled. But it took about another sixty years – a lifetime – for the production and consumption of electrical energy to begin. Typically it was industrialists, miners, public transport (city trams and trolley buses) and street lighting that electricity was first used in. Private electricity companies popped up everywhere exploiting rivers, then dams and any bit of hydrocarbon – tallow, wood, oil, gas and coal - to boil water and make steam to drive a generator.

These private companies were initially unregulated then often regulated through multi-decadal franchises. Local authorities gradually became involved in distributing and supplying electricity along much the same lines that they operated other local monopoly services. Many franchised private suppliers, or themselves took on the job.

Four features of electricity production and transmission then led to the gradual expansion of ever larger integrated generation/transmission utilities:

1. Economies of scale in oil, coal and then gas thermal electricity production;
2. The natural monopoly characteristics of electricity transmission (power transfer rises as a square of voltage but transmission costs are linear in voltage);
3. The ability of generation and transmission to complement and substitute each other, leading to their conception universally as joint-products;
4. The inability to store electricity once it is produced (the rise of chemical batteries is changing that, as we come to later).

Often these generator-transmission companies also sold electricity at least to big customers, but as often as not they also owned the lower voltage electricity distribution networks and supplied electricity to retail customers.

The creation of these big power companies also involved extensive policy direction. Perhaps this might have been affected by capital constraints and policy-driven desire for economic expansion and electrification, or by ideological perspectives on nationalisation. Both the CEGB in Britain and EDF in France were established after WW2. By the 1980s the largest such companies globally – TEPCO and KEPCO in Japan, Electricite de France, the CEGB in Britain, Enel in Italy, Eskom in South Africa - were all government-owned bodies. Only in America the largest generation-transmission companies were investor-owned (amongst these PG&E, SCE, Consolidated Edison, Duke and so on) but few of these U.S. investor-owned companies were close to as big as the largest national government-owned companies elsewhere.

In addition to the integration of generation-transmission into regional or national monopolies, these entities were often also integrated with ownership and control of lower voltage distributors and retail supply (the sale of electricity to homes and small businesses). As often as not the distribution and supply was undertaken by local authorities, often municipalities, but also co-operatives.

Often the government-owned entities were established as commissions or with government-appointed councils. But, such as here in New Zealand and in Great Britain, the monopolies were often also overseen directly by government departments and ministers.

At this time, generation scheduling and dispatch was often based on a heuristic assessment of variable production costs, and often constrained by take-or-pay coal contracts or the must-run constraints of nuclear plant and hydro plant. In some cases such as in England, constrained optimisation models - Generation Operation And Loading (GOAL) - were used to determined least-cost generation dispatch. As I will discuss later, it was the use of optimisation models such as these that made the transition to a wholesale spot market easier than might have been imagined.

It would be wrong however to say that electricity markets did not exist before the deregulation era. In fact in 1963, Nordel was established to facilitate co-operation between the monopoly transmission system operators in Norway and then Sweden and then subsequently also Denmark, Finland and Iceland and later still some of the Baltic states. This led to the development of a price-based electricity exchange between the hydrological power system in Norway, and the thermal system in Sweden. In the United States voluntary "power pools" were also used, of which the Florida Broker is a fascinating example – in 1980 it traded 2% of the electricity produced in Florida, and it did not involve central dispatch. These U.S. "pools" were quite different to the first mandatory centrally-settled pool in England and Wales.

By the end of the pre-deregulation/pre-liberalisation era it seemed as if the fundamental questions on electricity industry structure had been well and truly settled. There was a globally dominant industry structure and the only major structural issue to argue over

seemed to be the merit of integrating distribution and retail supply also with generation and transmission or whether it should remain separated. In fact it was this question that was the first substantive question I had the good fortune of being involved in trying to answer, at the beginning of my career.

3. The deregulation/liberalisation era

It is hard to put a precise date on the beginning of the deregulation era. In 1982 the liberal (at least economically) Pinochet Government passed the Electricity Act to create a cost-based merit order dispatch and started to lay the ground work for independent power production and competition. Privatisation occurred around this time in Chile and a little later in England. The Electricity Pool started trading in England and Wales in 1990, a similar market started in Norway in 1991. In April 1993 the monopoly franchise for the sale of electricity to small customers was removed in New Zealand, but a wholesale electricity exchange only started in October 1996, the same year an exchange started in Victoria and New South Wales. Wholesale exchanges of a similar nature started up in the east coast of the United States and then briefly on the west coast and then later (from the late 1990s) in various countries in Europe. I worked in the economics division of Electricite de France in the early 1990s and they were greatly interested in liberalisation, which at the time was described to me, perhaps a little patronisingly it seemed, as “the British experiment”.

Let me describe the essential features of this deregulation, before pondering why it happened. The essential feature is the split of electricity transmission from generation, regulation of the former, and contestability in the latter, and the explicit development of administered short term electricity markets. Unlike markets for the free trade of just about any good or service I can think of, electricity spot markets (as we understand them now) did not organically arise, they needed government policy to make them happen. Perhaps it might also be argued that their absence of organic development reflected limited private ownership. In Britain perhaps privatisation was the primary driver, and structural change followed that.

These are the fundamental structural changes, but the details vary greatly. In some cases transmission asset ownership was separated at the outset from power system operation. This was particularly the case in federal countries – like the U.S. and Australia - where markets extended beyond state boundaries (but transmission asset ownership did not).

In other cases, like in England and Wales (and separately in Scotland) transmission asset ownership and operation remained linked to power system operation, although these two were subsequently split apart.

In the case of Victoria in Australia, not just was transmission asset ownership split from power system operation, but transmission system planning (for large augmentations) was split from transmission asset ownership. This is a model that has since become increasingly popular elsewhere.

If you think the heterogeneity in the structural arrangements for transmission are obscure, spare a moment to consider the huge diversity of the detail design and operation in the electricity markets. Careers have been made in consideration of this. In the early days, many electricity markets, building on the England and Wales example, were “gross pools”. In other words, all production above a certain threshold had to be sold into the Pool and all demand had to buy from the Pool. This model applied also in Australia, Texas and New Zealand.

By contrast most of the North American markets and then much later many of the European markets were ”net” markets (in other words buyers and sellers were free to exchange with each other, and the organised market became just a mechanism for settling imbalances and so that the power system operator could buy more or less electricity as needed to operate the power system within its tight oscillating frequency operational bounds.

Markets also differed as to whether they compensated both capacity (paying plant to be available to produce) as well as to produce. Formal mechanisms to pay plant to be available to produce are now common in all markets except in Australia’s NEM, New Zealand and Texas. However, when you dig deep enough in all markets you will find some form of

compensation for availability, even if such payment is not established through formal markets.

Other differences in market design relate to technical details, very important ones nonetheless on “gate closure” (how long before the market price are generators allowed to vary their offers; how offers are defined; the number and type of ancillary markets (for plant to increase or decrease production with different levels of notice); the extent of demand-side participation and so on.

When the original England and Wales Pool got started, generators specified a no-load price, a start price and three price/volume combinations (often referred to as the “Willans line”). Generators made these offers once per day for each half-hour of the day ahead, and if I remember correctly had to fax them to the system operator in Surrey by 4pm of the day before the next trading day.

In Australia now, generators offer 10 price/volume combinations for each 5 minutes of a day and they can vary these as frequently as they like up to 30 minutes before that 5 minute market occurs. That rebidding data is publicly available in enormous datafiles that can be downloaded daily.

In Australia, the software to make all this possible will have cost in the hundreds of millions if the not billions to develop and operate. I estimate that there are now probably about two thousand people who are employed including (by the market operator, the regulators and market participants) to develop and operate this giant, very highly engineered market.

Can you think of any other market in any other good or service that requires so much effort to operate, and that would not exist in this form other than by administrative instruction?

If policy makers could have anticipated that this is where our electricity markets would have got to over time, do you think they would have still pursued them? I wonder, and so this brings me back to the rationale for the decision to tear up the generation/transmission

monopolies and in their place end up with the arrangement that is now common in many but certainly not all rich countries.

I spoke earlier about the settled state of integrated transmission and generation monopolies. How did such radical changes occur when, seemingly, there was no big problem to be solved? No doubt historians will have a range of perspectives. In my own reflections on this over the years, I have come to view that it was the changes adopted in Britain in the 1980s that have been of such fundamental importance in the global shift. Indulge me for a bit while I make some sweeping generalisations.

Britain of the 1970s was a country of labour strikes, an IMF bailout and rampant inflation. In 1979 Margaret's Thatcher's Conservative Government was elected and "Rolling back the frontiers of the state" became the defining phrase in an economic policy focussed on privatisation (or reduction of government holdings) in coal, electricity, oil, gas, water, banks, much public housing, telecoms and electricity.

Similarly across the Atlantic at about the same time, Ronald Reagan said that "the most frightening thing you can hear is I am from the government and I am here to help", now one of the phrases Reagan is most associated with.

At this time economic freedom became associated with political liberation: the fall of the Berlin Wall, the collapse of the Soviet Union, Glasnost, Perestroika, democracy in Poland and the Baltic states, Hayek, Popper and the Open Society. Huge political changes and that were largely unanticipated.

In the context of such big political and economic changes, the time was ripe for big ideas in industrial economics, of which competition in electricity was out on the frontier of radical ideas. The idea that big customers should be allowed to buy electricity from competing suppliers, transmission separated from generation and a common "pool" created to facilitate the trade was given the benefit of the doubt. It was such a huge innovation and such a big departure from the existing arrangements.

At the time and since I have sought to understand what contribution academics and academic research had made to this enormous change. I recall many conversations around the time of these changes and not long after when people much more knowledgeable than me would cite "Caramanis, Bohn and Schweppe", prominent MIT engineer-economists, whose paper on spot prices they said provided the "proof" that spot markets were possible and would work very well.

I recently read the paper, having not ever previously read it (as best I can recall). I don't quite have the stomach anymore for several pages of partial differential equations and so I jumped to the conclusions. This famous paper promised that "optimal spot prices" were "the best possible prices": they would maximise social welfare, reduce oil and gas consumption, increase utility and customer profits and encourage customers to invest in demand reduction. Who would not want that?

But was this 1980s paper influential in bringing about the creation of the Pool in England and Wales in the late 1980s? I discussed this recently with Stephen Littlechild who many of you will know was prominent in the corridors of power in steering the British restructuring and subsequently as the Director General of Electricity Supply.

Stephen told me that Treasury promoted marginal cost pricing in its 1967 White Paper, but found none of the nationalised industries except electricity took any interest. It basically abandoned marginal cost pricing in 1978 and looked to financial disciplines as a way of addressing general cost inefficiency, which was increasingly the problem. Then with election of Mrs Thatcher in 1979 the Treasury looked to competition plus privatisation (and regulation) as the solution. So the Thatcher Government certainly saw competition as a way to reduce CEGB's costs, but had no particular interest in marginal costs per se.

4. Australia's electricity deregulation journey

Let me now narrow the focus to electricity deregulation in Australia, firstly with description and then critique. The reforming Hawke (1983 to 1991) and then Keating (1991 to 1996)

Labor governments radically changed the Australian economy and society, in a direction that was similar to that set by the earlier Thatcher Government, although without much of the privatisation.

In the micro-economic area this focussed on competition with a bias towards for privatisation. Constitutionally, electricity in Australia is the province of the jurisdictional governments, not the Australian Government. The Hawke-Keating governments supplied the zeitgeist and encouragement for jurisdictional governments' political and economic leadership to be receptive to the competitive restructuring well advanced in Great Britain and also New Zealand, and then becoming widely discussed in the United States at this time.

It was the enthusiasm of two State Premiers, the Liberal Premier Nick Greiner in NSW and Liberal Premier Jeff Kennet in Victoria that become the early driving force for the creation of the NEM. Jeff Kennet in Victoria was focussed particularly on privatisation. Victoria was the first state to privatise, selling its brown coal generators to North American investors who, it was said, were keen to learn from the Victorian experience to advantage them in subsequent developments in North America. They left the scene not too long later, having sold out well below the prices they paid.

By the time it first started trading – in 1997 – the National Electricity Market was therefore primarily a market in which Government-owned generators competed (only the Victorians had privatised). South Australia subsequently privatised its generators but it would take NSW another 16 years before they had sold all of their generators to private investors, in total for much much less than the Kennett Government had extracted from investors in its privatisation. In Tasmania and in Queensland, the Governments did not ever accept privatisation and so have continued to own their generators.

Australia's particular contributions to the topic of electricity "deregulation" are the concepts of "co-operative federalism" and "competitive neutrality". Ironically both are perhaps better described as regulation (where once there was none) rather than deregulation.

"Co-operative federalism" refers to a process that seeks to ensure that the States co-operate ostensibly in the national (or at least multi-regional) interest. The underlying

premise is that such “federalism” offers economic benefit. In the creation of the NEM, the arguments made by the Productivity Commission and then by the Australian Competition and Consumer Commission in its authorisation of the NEM, was that through such “co-operative federalism” there would be better sharing of resources (cheaper generation in one state would displace more expensive in another State, and uncertain demand and generation risks would be diversified). In fact the Productivity Commission said that of all the micro-economic reforms associated with the Hawke-Keating Governments, the creation of the National Electricity Market would be the largest single source of productivity gain.

As I will come to later, I think “co-operative federalism” has a grand ring to it, but when push comes to shove has fallen well short of what might have been claimed of it.

“Competitive-neutrality” is an idea enshrined in the “Competition Principles Agreement” between the jurisdictional governments and the federal government, signed in the term of Prime Minister Keating. It was meant to be a fix for the reality that many state governments were open to competition but not willing to privatise their businesses.

State Government’s antipathy to privatisation is perhaps less ideological than might be supposed: the Commonwealth is constitutionally unable to tax the States or their businesses. So, relative to private corporations whose profits are taxed by the Commonwealth, State government corporations have a tax advantage which can be passed back to consumers in the form of lower prices, or higher profits to the State or it can fund operational inefficiency or some combination of these.

To deal with this “unlevel playing field” as well as other advantages that state-ownership may entail (economies of scope, access to shared resources, a more patient owner, the ability to diversify risks through ownership and so on) the Competition Principles Agreement is meant to somehow bind state governments not to allow corporations it owns to gain an unfair advantage. This is obviously terribly problematic: how do you trick yourself to ignore your tax advantage. And how can State governments be encouraged to sacrifice genuine economies of scope, scale etc. in favour of promoting a level field. A government would need to be convinced that the benefit from competition will be so much greater than the

foregone tax receipts in order for a government to hobble its businesses it owns in order to achieve the benefits from competition.

Finally, by way of description, a consequence largely of the co-operative federalism has been an alphabet soup of regional regulatory institutions that seek to share oversight between the Commonwealth and States. In the NEM, we effectively have four multi-regional regulatory institutions: the Australian Energy Market Operator, the Australian Energy Markets Commission, the Australian Energy Regulator and the Energy Security Board. Each of the states and the Commonwealth also have their own bureaucracies and in some cases also regulatory agencies. The cost of these bureaucracies and regulators runs into the many hundreds of millions of dollars each year. Transaction costs again. The NEM seems to have a very bad dose of it.

5. How has the sector restructuring – the creation of the NEM - worked in out in Australia and Victoria ?

Enough description. Let me now turn to some critique of the outcomes starting with electricity distribution.

Electricity distribution

The first thing that I think can be clearly said is that network regulation in Australia, particularly of electricity distribution, has been a disaster. Regulatory asset values, per connection, more than tripled after the network monopolies became regulated by the AER. Pretty much exactly the opposite of what the "deregulation" promised. Outcomes were bad overall but much worse for the government-owned distributors.

My PhD sought to explain this. I concluded that ownership per se could not explain this. Rather, pursuant to the Competition Principles Agreement, the economic regulator assumed that the government distributors were privately owned, and so ignored that the owning Governments collected income taxes. The economic regulator also imagined that State

Treasurers would be convinced by the Capital Asset Pricing Model and so would ignore that owning governments could borrow at 4% and get a guaranteed 10% return on assets in their regulated network businesses. Were State Treasurers so inclined to ignore what would be counted in the State's accounts as a wonderful profit? Of course not. Instead the government-owned network monopolies did as would be expected of their owners: they gold-plated their assets and delivered to their owning governments their guaranteed 10% return on the enormous amounts of wasteful expenditure, particularly on imported transformers. But it is perhaps also useful to be mindful that of course the profits were collected by the people, so this was a system for transfers from electricity consumers to governments albeit with very undesirable incentives for wasteful expenditure.

Transmission

In electricity transmission, outcomes have been more benign at least relative to electricity distribution. Perhaps this reflects on transmission monopolies' lesser ability to respond to incentives to expand capital expenditure – building transmission lines is not easy.

To my mind the NEM's big transmission story is diseconomies arising from the absence of co-ordination of transmission and generation and now also of storage. This is a complex story and it has long history.

When the ACCC authorised the NEM in the 1996, it pointed to the importance of locational transmission charges and suggested that the claimed benefits of the NEM may not arise if such charges were not put in place. Since that time there have been several reviews and I have lost count of the number of times that regulators and policy makers have tried to implement locational transmission charges. Every attempt has failed, I would suggest mainly because the incumbents (fossil -fuel generators) insisted that their free access to the grid should be grandfathered. The introduction of locational charges could therefore always be portrayed as support for fossils at the expense of new renewables.

The failure to include locational charges for transmission had already led to some stunning failures of policy and regulation. Foremost here is the 2000 MW Snowy 2.0 pumped hydro

power station being developed by the Commonwealth Government's Snowy Hydro Corporation. It was claimed it would cost $2bn to develop and take 4 years to build. In the latest estimate, the all-up cost including massive 500 kV transmission lines is likely to be around $20bn, and although Snowy Hydro has been at it for 4 years already, they say it will take another 7 years to complete.

When Snowy Hydro proposed this pumped hydro they ignored the cost of the necessary transmission: "not our problem" they said, generators don't pay for transmission. Then when the transmission monopolies worked out the net benefit of the transmission lines, they ignored the cost of Snowy 2.0 that those lines were built to connect. They did this because they said the decision to build Snowy 2.0 was already made, so it was a sunk cost.

Further evidence of co-ordination diseconomies is becoming evident in Victoria. Wind and solar developers, encouraged by government policy, set up shop in Victoria, typically seeking out the best wind and solar sites. Available transmission capacity has been soaked up and some significant spills are now happening. Expanding transmission to eliminate these spills and make space for further entry is proving to be very difficult and expensive. Much cheaper supply would be possible had these generators been exposed to the cost of transmission scarcity and so located in parts of the State that might not have the best wind and sun, but have much lower transmission charges.

In addition, batteries greatly improve transmission access when they are used to store what would otherwise be spilled electricity, and then discharge it to the grid when the transmission lines are no longer congested. At the end of last month, the results of an auction for policy support for long duration storage was announced. An eight-hour battery won the competition against pumped-hydro hopefuls, to the surprise of some.

I will return to the important topic of co-ordination diseconomies in my thoughts on next steps.

Retail markets

What about retail electricity markets, how have they done? These were opened to competition in Victoria in 2003 (subject to capped prices) but all price caps were removed in 2009. Other states in the NEM followed Victoria's retail deregulation later. When they were in place, the price caps sought to establish "headroom" (a premium above estimate costs) so as to encourage new entry and competition. An ongoing concern in the development of the retail market in the NEM, has been persistent market concentration. Unlike in Britain, we have not seen new entrants establish significant market share. The retail market remains highly concentrated.

Price interventions were re-introduced from 2018: a regulated default offer in Victoria and a price-cap (sort-of) in other states. Constraints have also been placed on the how discounts are to be expressed (i.e. relative to the default offers), the frequency with which prices may be increased (once per year in Victoria) and on door-to-door selling (this is now very infrequent). In Victoria retailers are also obliged to tell customers how much they can save if they switch to their cheapest offer.

A review of the retail electricity market in Victoria in 2017 (for which I undertook research) concluded that there were problems with search costs, high levels of price dispersion and "bait and switch" pricing strategies. The review concluded that the market obliged consumers to actively engage in the electricity market in order to get a good deal. The outcome of this review – whose recommendations were accepted by the Government - was the introduction of an obligation on retailers to offer to sell electricity at a regulated "default" rate. This is also the rate to the small number of customers who have not ever previously exercised their choice of offer (or move home and do not explicitly choose a new offer).

Perhaps it is the case that while small consumers value the opportunity to choose their retailer and offer, they resent the effort involved in searching and switching. There have been a number of new entrant retailers but their aggregate market share, 21 years after the introduction of competition, remains small (less than 10% in Victoria).

The extent of innovation in retail markets has been the subject of much discussion and divergent views. The rise of solar (about 1 in 3 dwellings – even higher if you counted only detached and semi-detached dwellings) and the rise of storage (about 200,000 Australian homes) is creating enormous opportunity for innovation. Some retailers now offer to supply homes substantially from solar plus battery bundles installed on the premises and financed through retail offers at a discount to conventional grid-only supply, and at the end of the financing period the household obtains outright ownership and control of the solar+battery bundles and their output.

Evidence of electric vehicle (EV) owners' responsiveness to time-variant rates for charging such vehicles is expected to greatly increase the responsiveness of consumers to time-varying prices. An EV with a typical home charger will draw as much electricity as a large oven on its highest setting. Retail customers now have a powerful incentive to shift demand. We can see in Great Britain (which has much higher EV penetration than Australia) that EV charging pricing is becoming a major source of innovation in the retail market.

Distributed energy resources (DER)

DER is one of those things that was not anticipated at the start of the NEM. But there are now 3.5 million homes with rooftop solar (more than 1 in 3 eligible homes) and 20 GW of solar capacity on household rooftops, and about another 4 GW on the roofs of commercial premises. More renewable electricity is produced on the roofs of homes, than from grid-connected wind and much more than from transmission-connected solar. In South Australia (where nearly every second eligible home has solar) on sunny weekend days, the entire State's grid demand is met from household rooftop solar. The other states of Australia are surely likely to follow in this path.

Rooftop solar certainly has had political support from all sides. But it has often been opposed by regulators. Regulators have failed to introduce charges for grid-scale generators to use the transmission system, but they have managed to introduce charges for network usage for rooftop solar grid exports. In Victoria the Government has however (rightly) refused such charges.

Distributed energy resources are now increasingly being referred to as “consumer energy resources” (CER), reflecting rising consumer power. I think it is fair to say that there is a steadily intensifying turf-war in the DER space. Regulators (and the power system operator and network monopolies) are pushing for ever more control over access and operation of DER/CER, while consumers are resisting “big brother”. A particular focus now is what is often referred to as VPP (Virtual Power Plant) which is a general term to refer to remote control of PV inverters and also batteries by the power system operator and network provider monopolies. The monopolies argue the common good, safety and so on to justify their desire to control CER through their control of VPPs. Perhaps customers are suspicious that their motives may be somewhat more self-serving (the protection of their monopoly). These battles have a long way to go, and the expected major growth of EVs will add fuel to this fire.

Wholesale markets

Finally on wholesale electricity production and the wholesale market – the focus of so much attention in the early deregulation of the market: have things turned out as hoped? My view is that the market has successfully “privatised” operational risks. For the most part tax payers and consumers have not had to bear the cost of operational failures, or at least not obviously so.

But on investment risk, I think it would be fair to say that the vast bulk of investment has depended on policy support either through government ownership or obligation certificate support for gas and then for renewable electricity generation. State governments have invested directly in storage (batteries) and in gas and diesel back-up capacity and have provided contracts for differences to support renewable generation, and most recently have offered price floor contracts to encourage storage and renewable generation expansion. They have also funded exploratory development of storage and renewables (offshore wind in particular). Contracts have been entered to ensure flexible supply by coal generators in their last years. And most recently there is the prospect that a state government will buy

back a coal generator that it only sold 8 years ago, as a way for the government to manage uncertain closure risk.

This is not to say new investment has been entirely under-written by tax-payers. In the last month a 200 MW/400 MWh battery was announced for development by Shell in Melbourne, apparently without any policy support. Such outcome was almost unimaginable as recently as a year ago. Nevertheless this remains the exception to the rule.

These "interventions" have not been for want of trying by regulators and administrators to develop "market mechanisms" to ensure reliable supply. The instinct of these regulators has often been to see any problem in the market as one of either "missing money" (markets are not adequately compensating producers) or "missing markets" (producers can sell different services but the markets for them do not exist). I have lost count of the number of proposals that have come and gone – each precipitating many consultations, reports and so on. But none have stuck. What has stuck is policy support outside the market and government-underwritten investments, and most recently the recreation of new government agencies.

Industry associations lament the scepticism that policy makers seem to have found for "the market" and fear being crowded out by activist governments. But there seem to be quite different views on just what "the market" is, that they fear being crowded out of. With government, directly or through policy, supporting the vast bulk of new investment, the fear is perhaps less about intervention in privately arranged contracts – what the restructuring of the electricity market was meant to be all about - but fear that governments will themselves become participants through the re-establishment of government electricity commissions, rather than procuring or underwriting production from private investors. This is certainly quite a different conception of "the market" from the one envisaged and aspired to in the restructuring.

Finally, I can not finish a critique of wholesale markets without speaking about market power. The NEM, like the New Zealand market, relies on the prospect of extraordinarily high prices to stimulate investment to ensure reliable supply. But of course the prospect of such

prices also provides incentives for the exercise of market power through the withholding of production from the market.

This has been an ongoing concern in different regions in the NEM, particularly in South Australia when AGL had such a dominant market position in gas generation. It has also arisen in the coal states, most recently when the Hazelwood coal generator suddenly closed in 2017. Again, AGL's dominant position provided it with the opportunity to withhold coal production so that its remaining coal generators could achieve prices when setting the market prices, equivalent to those of much more expensive gas generators. The same criticism has frequently been levelled at the Queensland government's coal generators who are able to exercise market power as a result of transmission constraints.

The Australian Competition and Consumer Commission has drawn attention to these concerns, but its attempt to stop AGL from obtaining a dominant position in coal generation was overturned in the courts.

While market power concerns remain topical – particularly in response to coal generation closure and the prospect that renewable supply will not expand quickly enough to replace what is leaving – it seems to be increasingly accepted that fossil fuel generation is becoming an albatross around the incumbents' necks. The previous chairman of the ACCC, for example, has spoken favourably of the competitive pressures that renewables are bringing to the power system. To some degree therefore, the conviction that coal is on its way out is leading to the perception that policy-makers might be less worried about market power in the future than they have been in the past.

Summary

We have covered a great deal of ground very quickly, let me summarise the main points of my critique:

1. "Competitive neutrality" in the regulation of a government monopoly (i.e. imagining government monopolies are privately owned) has proved to be a delusion and a

damaging one. It has underpinned the idea of independent regulation of a government-owned monopoly which has also been demonstrated to be an oxymoron. Direction regulation through ministerial accountability – the approach over the long pre-deregulation history - is as good as it gets. Go back to that in the regulation of government-owned transmission and distribution.

2. Retail electricity markets have been problematic. Customers value choice but many seem to resent being made to go to the effort of engaging in a market for what they consider to be an essential service. Nevertheless technology change in PV, batteries and EVs are presenting huge opportunities for innovation. Customers' ability to choose will protect the prospects of such innovation and is likely to prove very valuable. But ensuring customers can easily access a reasonably priced offer is valuable, particularly for those who do not wish to engage in the market. The regulation to ensure the supply of "reasonably priced offers" may have adverse effects on the market although this is not yet well understood.
3. Wholesale markets have not turned out as hoped: even though operational risk has been privatised, governments continue to bear large amounts of investment risk. Nonetheless the rise of independent producers has been encouraging and remarkable. There certainly is rivalry *for* the market even if not *in* the market, as initially hope-for. Preserving the opportunity for entry by independent producers is valuable.
4. The remarkable decline in renewable generation costs, the rise of battery storage and rooftop solar were not anticipated at the time of the restructuring. The pace of change has been stunning. Whereas fossil generation technologies changed gradually, these technologies have changed incredibly quickly (and are continuing to do so). We should surely anticipate further big improvements that we can not imagine now. What institutional arrangements make the most of such unforeseen possibilities?
5. There are now big co-ordination problems for expansion in transmission, storage and renewable electricity. "The market" is not co-ordinating effectively and price-based mechanisms have not been possible to implement.

6. The road ahead

Let me finish with some thoughts on the road ahead. I am not sure how relevant what I have to say here will be to New Zealand's electricity challenges. Perhaps some ideas might resonate.

Australia's most pressing electricity challenge now, established by its policy makers and evidently reflecting the will of its people, is the very rapid decarbonisation of electricity supply. This is not an easy task: coal fired generation is a concentrated source of production and the whole power system has been built around it. A new system whose production is much more distributed will need to take its place and, according to policy-makers, very quickly. While much progress has been made, very much more lies ahead. Context is (almost) everything in thinking about how to meet the challenges that lie before us now. Here is what strikes me:

1. There is a pressing need for co-ordination in the development of transmission, storage and production. The complementarity and substitutability of each has been greatly enhanced through the rise of chemical (battery) storage. Continued failure to effectively co-ordinate will mean higher electricity prices and will also have big social costs through unnecessary and wasteful generation, transmission and storage development.
2. Wind and solar costs have reduced to the point that higher yields are now typically much less valuable than the additional cost of transmission needed to extract those higher yields (at least in Victoria where the best wind and solar are not co-located with the strongest transmission). As a rule of thumb, locating production closer to demand is most often likely to be the cheapest option.
3. The transition is taking place in the context in which customers can choose their supplier. While some customers may resent having to make a choice, they are also likely to be irate if you take this freedom from them, not least because many have ever greater ability to largely or completely meet their own needs.
4. Private investors and lenders have plenty of appetite to invest in renewable electricity, transmission and storage. Australia's lenders and investors are

experienced in it. While there is a willing supply, there is little trust in our electricity market by suppliers, lenders, investors or governments. Investment at the scale and pace needed, will require a great deal of price risk to be absorbed by governments.

5. There is a lively market of competing technology-providers and developers. Most of the technology providers service global markets, and Australia is a small part of that global market. Many of the developers are global operators, they seem to be experienced, customer-focused and good at what they do.
6. State government electricity corporations have a competitive advantage inasmuch as their profits are not taxed. Without this (likely large) advantage it is difficult to imagine that a government corporation will be able to compete effectively with private developers in the development of renewable production and storage.

Given this context, a state government energy corporation might usefully have:

- a monopoly on transmission planning,
- the right to control transmission system access (through the implementation of independently established rules);
- the right (although not a monopoly right) to procure, develop and operate variable renewable generation, transmission and storage; and
- the right (but not a monopoly) to sell electricity directly to customers.

The spot electricity market will continue to be used in scheduling and dispatch of all generation and storage, though no doubt some changes will be needed here too.

I put this forward as an idea for consideration and critique. It is quite a different conception of the market from the one that is commonly thought we have now. It will mean putting to one side the idealistic and unworkable “competition principles agreement” and allowing the transmission monopoly to also own and operate generation and storage, and administrate generation access. There will still be plenty of scope for private investment in generation, storage and transmission, just as now, offering competition *for* the market, and competition *in* the market.

Some might suggest this is winding back the clock. I prefer to think of it as a new clock that offers competition, choice, private endeavour with public provision at least in part. It promises at least the prospect of effective co-ordination of investment in generation, transmission and storage.

You have heard enough from me, thank you for inviting me to speak to you, and I look forward to questions and discussion.