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Rethinking markets, regulation and governance for the energy transition

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Prepared for the ACCC/AER Regulatory Conference, Brisbane, Australia

August 2023

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ABSTRACT

Current regulatory and market arrangements derive from a time when the energy system was more-or-less in steady state. Although the energy transition is tearing apart those steady state conditions, the regulatory approach remains largely unchanged. When given the opportunity, the economic regulators were unable to convince policy makers that the central objective of economic efficiency could adequately deal with the system's rapidly expanding uncertainties. The urgency of the energy transition means it is now necessary to look beyond *just* efficiency and to rethink the role of markets, regulation and governments. This paper identifies four pivot points for reframing the energy transition. The four points are: (1) Focussing on coordination risk, (2) Rethinking value, (3) Thinking realistically about consumers, and (4) Rethinking energy governance. Pivoting around these four points will very likely see a narrower role for markets (and regulators) and greater responsibility placed on governments (and engineers), at least in the foreseeable future. Such an outcome may have been unthinkable to the economic reformers of the 1990s, but time and circumstances have moved on. So must we.

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PROLOGUE

Will we avoid an energy dystopia?

If you are economists, please assume it is 2030-or-thereabouts. If you are not an economist, please humour the economists by just imagining it is some time around 2030. What might the energy market look like in this not-too-distant future?

- Despite all the investment in transmission infrastructure over the past few years, curtailment rates for solar and wind plants remains broadly the same as in 2023? Or perhaps conversely, there has been no acceleration of investment in transmission infrastructure despite solar and wind plants 'spilling' so much of their output.
- Most of the baseload thermal power generation on the east coast is now owned and operated by either a state or federal government. Or alternatively, these power plants are now being propped up by secret funding deals hidden behind the wall of commercial-in-confidence. In any event, billions of taxpayer dollars are now keeping these plants in operation.
- Investment in grid-scale batteries has topped-out well below expectations and now falling well short of system requirements.
- Despite billions of taxpayer and consumer dollars invested in building the hydrogen economy, not a single hydrogen kilowatt or megajoule has been delivered to consumers. All the hydrogen produced in Australia is going to exports. Questions are being asked about why there's no hydrogen reservation policy.
- Consumers are confused and furious. They don't understand why, depending on which side of the street they live, they might find themselves either being paid for their electricity exports or having to pay to export their surplus electricity. Despite all assurances that the price differentials reflect efficient price signals, consumers see such arrangements as grossly unfair and they're calling for political intervention.
- Version 426 of the National Electricity Rules has just been published at almost 5,000 pages, and the AER has had to expand to almost 750 staff to administer these sweeping rules.
- The hottest selling household electrical appliance in this not-too-distant future is a 6.5 kW diesel-powered, inverter-enabled generator. It is particularly popular among owners of electric vehicles. The gentle whir of these super-efficient generators can be heard on most suburban streets during the early evening hours.
- There is a backlog in the courts due to an avalanche of cases initiated by neighbours suing each other over access rights to sunlight, community batteries and not-so-flexible export limits.

This is, indeed, a dystopic view of what might lie ahead for the national electricity market. But these are scenarios, *not* predictions.

The reason for describing these scenarios is only to highlight that such awful outcomes cannot be discounted. They ***may*** be possible. A faltering energy transition cannot be ruled out. Whether such outcomes are possible, probable or likely, is not particularly relevant. Regardless of whether the likelihood of failure is high or low, the consequences of failure would be extreme.

If the energy transition was being assessed as a project using a standard risk assessment framework, it would be sitting somewhere on the far right hand side of the risk matrix – that is, an unsuccessful energy transition would be rated as a very high-risk outcome. Such high risks are rarely left unattended. Risk mitigation treatments would be activated and aggressively implemented.

It is time to start thinking about the energy transition in similar terms.

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An **Epilogue** to this paper imagines what might happen in a future electricity market where artificial intelligence is making all the commercial decisions.

1. INTRODUCTION

The widening gyre

Economic regulation of the energy sector began with the corporatisation, disaggregation and privatisation of the energy sector from the 1990s onwards. States implemented these reforms at their own pace and each in their own way. The reforms reached their crowning moment in December 1998 with the creation of the National Electricity Market (NEM). At that time, all the difficult challenges of running an electricity system had been solved in large, vertically integrated, state-owned monopolies. The system was effectively in steady-state. Inputs and outputs, and production and delivery technologies were known with near-certainty. The stability of the physical system delivered the conditions (**Box 1**) on which the economic reformers of the 1990s built markets and regulatory frameworks.

Box 1. Steady state conditions when the NEM was established

1. Stable, predictable and manageable demand growth
2. Stable operational and management technologies benefiting from incremental (and capturable) efficiency gains over time
3. Operational and investment risk profiles that do not vary significantly between regulatory decisions, and which are well-understood by investors, consumers and regulators
4. Capital is available for investment in non-contestable services at an objectively determinable price (rate of return)
5. Network costs, especially their long-run marginal costs, are calculated using agreed methodologies and can be used to determine prices; and
6. The overall stability of the energy system means its oversight can be removed from political considerations and left to technical specialists to regulate.

The energy transition now underway is dismantling these conditions, sometimes abruptly. Stability and linearity are being replaced by uncertainty and complexity. While uncertainty begins in the physical systems of production, storage, delivery and consumption, it unavoidably invades the market, regulatory and governance arrangements which sit atop those physical systems. These arrangements are now at risk of failure.

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The energy regulators were a product of their time. They were the product of the prevailing conditions of the 1990s identified in Box 1. In that sense, they can be said to have been created *of* those conditions, *by* those conditions, and *for* those conditions. Had those conditions not existed, the regulators we know today would not have been established. But therein lies a problem.

Despite the breaking down of the steady-state conditions in Box 1, the "regulators we know today" remain unreconstructed versions of their earlier selves (albeit significantly larger). While the *form* of their activities may have evolved somewhat over the years, the *substance* of those activities remains effectively unchanged. The substantive nature of the regulators' actions remains largely aligned with the principles and methods that emerged *of*, *by* and *for* the steady-state conditions at the time of their establishment.

Of course, the energy regulators are not blind to the radically different conditions which now prevail. They are fully cognisant of the uncertainties surrounding them. Their response to these uncertainties, however, is to try to corral them using the same methods developed *of*, *by* and *for* steady-state. This has seen market rules and regulatory frameworks rapidly propagating in response to changing market conditions — for example, the national electricity rules alone have doubled in length since 2006 (to over 1,800 pages).

Further on, this paper refers to these efforts to corral uncertainty as a "plug-n-play" approach to market design and regulation.[2] The regulators see their role as enabling market-based participation for any new inputs or outputs someone might imagine on the assumption the market will sort out the most efficient outcome. The only relevant consideration is whether the production of these inputs or outputs might be subject to an identifiable market failure. Therein lies a second problem.

When it came to the delivery of electricity services, the steady-state conditions of the 1990s and 2000s allowed all the parties to adopt a standard (microeconomic) framework for assigning functions to markets, regulators and governments. Markets would be responsible for discovery. Regulation would deal with market failure. And governments would be responsible for, well, nothing much.

But, the concept of market failure requires a clear understanding of the outcomes that can be sustained by a competitive market. Likewise, it requires a clear understanding of what the physical system can sustain in terms of supporting new inputs and outputs. The energy transition means these two requirements are subject to deep 'Knightsian' uncertainty – that is, it is not possible to assign objective probabilities to the reliability of any assumptions made about the capacity of the market and physical system to integrate new inputs and outputs. This leaves the definition of market failure an object of subjective judgment. Not surprisingly, then, governments are now adopting widely varying interpretations of market failure and even more widely varying views about the response that requires from them.

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[2] This 'plug-n-play' approach is the corollary to the philosophy of not 'picking winners'.

The energy transition is now swirling in an ever widening gyre around markets, regulators and governments.[3] The centrifugal forces it has unleashed are tearing apart the steady-state conditions of yesteryear and with that, any shared understandings about the respective roles of markets, regulators and governments. As W. B. Yeats poetically noted, the time will come when the "centre cannot hold" and "things fall apart".[4]

This paper therefore proposes a framework for rethinking market, regulatory and governance arrangements before "things fall apart.

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Section 2 represents the body of the paper. Section 2.1 begins with a very brief exploration of the impact of the energy transition's centrifugal forces on the coherence of the regulatory framework and market rules. The discussion continues in section 2.2 with a short meditation on just a few of the questions to which there are currently no answers. In the absence of answers, proceeding with current regulatory and market-based approaches represents a risky act of faith. In response, section 2.3 outlines a framework for rethinking the roles of markets, regulation and governments in shepherding a successful energy transition. Four pivot points are identified. They involve:

#1. Focussing on coordination risk

#2. Rethinking value

#3. Thinking realistically about consumers

#4. Rethinking energy governance

Thinking about how to coordinate a successful energy transition must now pivot around these four points to realign the roles to be played by markets, regulation and governments, respectively. The four pivot points are not solutions *per se*. It will take many minds – across many disciplines – over many years – working together – to solve all the coordination problems that need to be solved for a successful energy transition. But there is no time left to waste. The best and most realistic arrangements currently available need to be identified and implemented without delay.

The paper's conclusion acknowledges that a pragmatic approach to the energy transition will lead to arrangements that are likely to be sharply at odds with the vision of the economic reformers of the 1990s, but time and circumstances have moved on.

[3] William Butler Yeats (1919) *The Second Coming*. Turning and turning in the widening gyre / The falcon cannot hear the falconer / Things fall apart; the centre cannot hold / Mere anarchy is loosed upon the world / …
[4] ibid

2. DISCUSSION

Reframing the energy transition

The following discussion briefly explores the impact the energy transition is having on the coherence of the regulatory frameworks (including market rules) governing electricity markets and network services. This is followed by a short discussion about energy market economics and some of the questions to which there are still no answers. Without these answers, alternative approaches are required to coordinate a timely energy transition. The remainder of the section identifies four 'pivot points' for reframing how we should go about answering the question at the end of section 1. The four pivot points are (1) Focussing on coordination risk, (2) Rethinking value, (3) Thinking realistically about consumers, and (4) Rethinking energy governance.

2.1 Beyond efficiency

As already noted, the energy transition is tearing apart the regulatory frameworks operating in the energy sector. At times, the regulators firmly adhere to the traditional beliefs that have guided their regulatory thinking since the 1990s even though everything is changing around them.[5] At other times, regulatory actions seem to wander without clear explanation into areas where economic regulators would have never gone in the past. When viewed in their totality, these actions increasingly appear to lack coherence. A few examples are provided in Appendix A.

It is also clear that each of the market bodies (or regulators) is interpreting its role – and pursuing outcomes – through the lens of its own history, culture and methods. This approach does not accord with a single unifying vision of the future or how they will collectively shepherd us through a successful energy transition.

The diverging perspectives of the market bodies has been evident and concerning for some time. The Energy Security Board (ESB) was created to overcome this lack of regulatory unity, but it ultimately failed to meet expectations.[6] The regulators' philosophical, structural and cultural differences just ran too deep. Few observers were particularly surprised when energy ministers announced they were disbanding the ESB. History may show the regulators' failure to deliver a coherent plan for navigating the energy transition to be one of the great lost opportunities in Australia's economic history.

[5] Ben-David (2023b) describes these traditional beliefs; their origins and their consequences.

[6] The Energy Security Board (ESB) was established in 2017 following the Independent Review into the Future Security of the National Electricity Market (Finkel Review). It consisted of an independent chair and deputy chair and the heads of the AEMC, AER and AEMO. In March 2019, the ESB was tasked by energy ministers to advise on a long-term, fit-for-purpose national electricity market design. In May 2023, Ministers disbanded the ESB and replaced it with an Energy Advisory Panel (EAP) consisting of the heads of the AEMC, AER, AEMO and an ACCC commissioner. The EAP's remit is narrower than the ESB. It will coordinate advice from the energy market bodies on security, reliability and affordability.

The ESB's demise also tells us something more immediate – something about whether governments still share the economic regulators' views about the centrality of efficiency in the national energy objectives.[7]

At a minimum, economic efficiency refers to maximising the rate at which inputs are converted to outputs (thereby minimising the misallocation of scarce resources).[8] Back in the 1990s and 2000s, pursuing efficiency appeared to be a logical objective to assign to independent economic regulators. At that time, the system was broadly in steady-state. The inputs and outputs at every point of the energy system were known with near-certainty. Technological advances in system engineering and business practices were incremental; and demand grew steadily and predictably. Under these circumstances, there was little else for regulators to do other than focus on efficiency.

In addition, these conditions allowed the regulators to adopt many simplifying assumptions – for example, equating the three concepts of contestability, competition and efficiency. They assumed that if a service could be provided via a contestable market, then it could be assumed such a market would be competitive; and in turn, it could be assumed that such a market would produce efficient outcomes (expressed and coordinated through the production of efficient price signals at every transaction point).

These days, the system's inputs and outputs are far from clear. It is no longer certain or predictable how and where electricity will be produced, by whom and for whom. How it will be used, stored and controlled is similarly uncertain. Whether contestability delivers competition, and whether competition delivers efficient outcomes in this highly uncertain environment can no longer simply be assumed.

As discussed in section 1, the centrifugal forces of uncertainty are pulling apart regulatory efforts to focus on the regulators' objective of promoting efficiency. It is apparent from their actions that the regulators are no longer clear about how they should pursue this objective. There is an increasing lack of coherence in their activities (see Appendix A for examples). This lack of coherence would seem to be a symptom of a regulatory framework that is not coping with the changing realities within which it operates.

There is an urgent need to step back from the prevailing regulatory view about efficiency and how it is promoted. It cannot simply be taken for granted that the regulatory approaches of the past can reconcile the objective of efficiency and the uncertainties of the energy transition. The question must now be asked: *What responsibilities and functions should continue to be delivered under a regulatory framework singularly focused on efficiency?*

[7] The national energy objectives consist of the National Electricity Objective (NEO), National Gas Objective (NGO) and National Energy Retail Objective (NERO) – see: https://www.aemc.gov.au/regulation/neo

[8] Economists often refer to this form of efficiency as technical or productive efficiency. While allocative and dynamic efficiency are also important, technical efficiency must surely be *the* necessary condition for persisting with economic regulation.

2.2 So many unanswered questions

One of the central intuitions of economic regulation has held that efficient price signals are the optimal mechanism for coordinating investment in, and operation and use of, the energy system (including investments by consumers). This intuition has driven regulators' efforts to establish markets for contestable services as well as their efforts to mimic outcomes from competitive markets when regulating non-contestable services.[9] In the past, it was clear which markets needed to be created (or mimicked) but that clarity is rapidly fading as the energy transition takes hold. Even so, the regulators seem committed to doing more of the same despite all the uncertainties.

Regulatory intuition seems to contend that the efficiency objective will be satisfied by enabling market-based participation for any new input or output that someone might imagine. It is assumed market generated price signals(or regulated market-mimicking price signals for non-contestable services) will thereafter coordinate the efficient mix of inputs in order to deliver all the outputs required for a successful energy transition. In other words, it is inherently assumed that the energy market will efficiently self-organise in response to the price signals generated through market participation.

When it comes to the energy transition, this is a risky assumption on which to 'bet the house'. It relies on an article of faith that 'cost reflective price signals' will emerge and flow up, down and across all parts of the energy market to coordinate efficient investment and usage decisions at every transaction point. But so many questions remain unanswered. For example:

- Will market participants be able to generate cost-reflective prices at every transaction point in a highly decentralised and non-linear energy system?
- What happens when frictions affect the flow of signals up and down, and back and forth, between the different inputs and outputs in this market?
- If efficient price signals cannot be accurately isolated at every critical point and/or other frictions exist, then when does the theory of the second best caution against simply relying on the *best available* price signals?
- How will price signals interact with each other when they are emanating from a vast multitude of points in a non-linear energy system? If price signals interact 'out of phase' at a particular transaction point, will they neutralise each other thereby leading to no market response? Conversely, if they are 'in phase' might they prompt an excessive market response?
- Is there evidence supporting the intuition that price signals will emerge to efficiently coordinate an inherently stable energy market despite its non-linearity and

[9] For example, see AER (2021a) p.7. *"We seek to incentivise network service providers to run an efficient business so that customers pay no more than necessary for services that they value the most. The framework is designed to mimic the outcomes from effectively competitive markets."*

extraordinary complexity? Might there be tipping points in market activity which trigger either an unstable or chaotic[10] market; or the emergence of market power?

- How will contracts be formed at seemingly countless points of transaction in this energy market? Can it be left to the participants to determine the nature of such contracts? That is, what ensures private and social interests align at every transaction point and, therefore in total?

While all these questions are economic in nature, they are, of course, preceded by the many questions the system engineers are asking about the viability and stability of the new plug-n-play energy system envisaged by the economic regulators (discussed further in section 3).

In the absence of strong theoretical foundations, broadly agreed modelling and empirical testing, it is just not possible to proceed with the current regulatory approach (including market rules) with any confidence. There is too much at stake to proceed on the basis of a mere act of faith.

2.3 Four pivot points for rethinking the transition

For 25 years, it has been held as a regulatory article of faith that market-generated price signals can coordinate efficient investment and usage decisions at every transaction point in the energy system – including investment and usage decisions by consumers. In the case of non-contestable services, it is assumed these types of signals can be mimicked through incentive-based regulation.

The previous section highlights just some of the questions that need to be answered about the assumed efficacy of price signals to coordinate the energy transition. There is no longer enough time to answer all these questions given the pressing realities of the transition. The following discussion, therefore, identifies four points around which thinking about the energy transition must now pivot. These are pivot points not solutions and the answers to which they lead may not be 'forever solutions'. For now, however, the priority should be on identifying pragmatic and readily actionable ways to facilitate the energy transition – including a realignment of the roles to be played by markets, regulation and governments. In the meantime, research should continue apace to identify alternative, and more efficient, coordination mechanisms.

[10] In the mathematical sense of the term 'chaos'.

#1. Focussing on coordination risk

The electricity market and its regulation were established in very different times and under very different conditions to those that prevail today. The market reformers of the 1990s had the benefit of 70-80 years during which all the coordination problems of running an electricity system had been resolved inside monolithic, vertically integrated, state-owned monopolies. Production and delivery technologies were broadly in steady-state, and all the key transaction points were known. To the reformers' good fortune, the key transaction points were linearly arranged. In these circumstances, the risks to be managed via markets and regulation could be readily identified and managed.[11]

As already mentioned, the inputs and outputs comprising the future energy system cannot be known with any certainty. What is clear, however, is that transaction points will be multitudinous and scattered widely. Many will be bidirectional and some (or many?) may be multilateral. These complexities and non-linearities could not have been imagined when the current market and regulatory arrangements were put in place. Of course, thousands of modifications and additions have been made to the rules and regulations in the meantime. For all intents and purposes, these modifications and additions largely sought to extend the reach of existing methods of regulation or market design.

While this self-propagating approach to market and regulatory design may be reasonably innocuous at the margins, there is no reason or evidence to suggest this approach will be sufficient to manage all the coordination risks of the energy transition. A more comprehensive and integrated approach to managing these risks is now required.

The first step for managing these risks requires identifying them. This will require a range of disciplines working together with policy makers and regulators to map all the known and foreseeable transaction points in the future energy system and market. They would then identify the coordination risks at each of these transaction points by asking: *What could go wrong…*

- *operationally* (engineering)
- *commercially* (investment)
- *behaviourally* (consumers)
- *economically* (distortions)
- *environmentally* (emissions, land use)
- *politically* (any of the above) ?

The next steps involves assessing these coordination risks in terms of their likelihood and, more importantly, their consequences for a successful energy transition. If the risk is significant, then a risk treatment must be identified. Market-based mechanisms (including market-mimicking regulation) need to be assessed for their efficacy in mitigating the risks at the relevant transaction point(s). This assessment must be grounded in evidence, not just

[11] We can only wonder how – or whether – these reforms would have proceeded had the conditions of stability and linearity not existed.

theory. The energy transition no longer affords enough time to experiment with, as yet, unproven methodologies.

When there is insufficient evidence supporting a market-based mechanism, coordination at the relevant transaction point(s) would need to be managed via an alternative mechanism. Responsibility for designing and implementing alternative (non-market based) mechanisms will require policy leadership – see pivot point #4.

Uncertainty, non-linearity and complexity mean coordination failure is now the most significant risk facing the energy transition. Taking a realistic and determined approach to mitigating this risk must now become the *primary* objective of energy policy and economic regulation. Of course, efficiency remains important but the role of market-based approaches must now be treated as part of the question, rather than the presumed answer.

#2. Rethinking value

For 25 years, non-contestable network services were reserved for oversight by economic regulators. The regulators have endeavoured to mimic market-like outcomes by designing incentive-based regulatory mechanisms through labyrinthine rules, guidelines, standards, regulatory schemes and processes.[12] Deep within this tangled web of regulatory machinery lies the notion of 'value'. What is meant by this notion is obscure. 'Value' appears to mean whatever the regulatory machine delivers. That is, because the regulatory machinery is focused on efficiency, it is asserted *a priori* that it delivers value to consumers.

Electricity and gas networks' $118 billion regulatory asset base (RAB) is the 400-pound gorilla sitting in the corner of this oddly obscure notion of regulatory 'value'. Everyone knows it is sitting there but no-one wants to look in its direction. This down-casting of the regulatory gaze has emerged as a primary concern in the ongoing economic regulation of the gas networks. The move to a decarbonised economy will, in all likelihood, see these assets stranding (ie. becoming obsolete). The current combined value of the gas networks' RAB is $12.3 billion.[13]

In the *real* world, owners and financiers of stranding assets would 'take the hit' as they progressively wrote-down the value of those assets. The assets would be written-down to broadly reflect the diminishing net present value of the future stream of profits those assets were expected to generate.

By contrast, in the regulatory world, the value of these assets is shielded from such a market-based outcome through annual indexation of the RAB. Moreover, the regulator has allowed investors to speed up the rate at which they extract this protected value (in cash) by approving the accelerated depreciation of the gas networks – adding to the prices paid by

[12] Refer footnote 9

[13] The RABs for electricity distribution businesses are collectively valued at $82.6 billion, electricity transmission businesses at $22.8 billion, gas transmission businesses at $1.7 billion, and gas distribution businesses at $10.6 billion. See AER (2022e) pp. 59 and 161.

gas customers.[14] More inexplicably still, the regulator has not lowered the rate of return earned on the RAB by gas networks despite having further de-risked the value of those investments by approving its accelerated depreciation (and despite continuing with unchanged annual indexation even in the face of asset stranding).[15]

All of this incongruity has emerged despite the regulator's own claim about designing regulatory frameworks in order to mimic the disciplines of a competitive market.

The energy transition is tearing apart the coherence of the regulatory framework and how it assigns 'value' to gas network assets. The impact of the transition on asset values is unlikely to stop there. Regulated electricity assets may also face stranding. It will depend on the technologies that emerge in the years ahead. It is unreasonable and unrealistic for regulators to continue to offer investors an unlimited financial indemnity over the value of regulated assets.

For now, the arcane discrepancy between how assets are treated in the regulatory world versus how they are valued in the 'real' world has escaped public scrutiny. A day of regulatory reckoning must come eventually. When that day arrives, regulators will need a more realistic approach for valuing regulated assets – probably linking the value of the assets to the stream of benefits those assets are expected to deliver to customers.

While the RAB is the 400-pound gorilla sitting in the corner of the regulatory framework, there are many smaller regulatory inventions all allegedly delivering value to consumers. Indeed, the regulators are adding to this regulatory menagerie every year as demonstrated by some of the examples in Appendix A. The value or value-add delivered by these regulatory efforts is often specified poorly, if at all.

The notion of 'value' needs to be reviewed given the pressures the energy transition is placing on the regulatory framework. At a minimum, regulatory methodologies, schemes and other arrangements should be scrapped unless they demonstrably contribute to solving the coordination problems discussed under Pivot Point #1. A simple regulatory assertion of value – usually by some vague reference to efficiency – is no longer good enough.

#3. Thinking realistically about consumers

Since the advent of full retail competition, the standard formulation of economic regulation for solving consumer discontent has been to seek to provide consumers with more choice, more information, more price signals to guide their decision-making, and to urge them to shop around for a better deal. This formulation will not be sufficient as the consumer-facing energy market becomes increasingly more complex.[16]

As the energy transition deepens, consumers will not just be shopping around for price. They will need to negotiate market contracts potentially involving multiple decision variables –

[14] For further discussion see: AER (2021a) and Robinson, Bartley and Ben-David (2022) Chapter 7
[15] AER (2023e) Section 8.3.5
[16] Ben-David (2022a,b)

see Appendix B. Regulators are not only enabling, but also actively facilitating and even encouraging this 'complexification' of the consumer-facing market.

It is certainly true that these new contracts will offer consumers many beneficial opportunities, but it will also greatly increase the likelihood that they enter contracts that do not align with their individual best interests. Many or most consumers might be expected to find these contracts either incomprehensible or just too tiring to deal with. It is also worth bearing in mind the oft-cited finding from the AER that 44 per cent of Australians lack sufficient literacy skills to readily understand energy websites, bills and common contractual terms and conditions.[17] And this finding pertains only to the 'simple' contracts of the past when consumers only needed to shop around for price, let alone all the contract features described in Appendix B.

So who is this new market being designed to serve?

In effect, the regulatory system no longer views consumers as people just using electricity, installing energy resources (such as solar and batteries) and buying appliances. Instead, consumers are increasingly being treated as 'market participants' — energy traders who take market positions by virtue of the contracts they choose to enter.[18] The then CEO of Energy Consumers Australia, Lynne Gallagher, cautioned eloquently against taking such an unrealistic view of consumers.[19]

> *Without […] evidence and knowledge we are doing our community and consumers a disservice because our system and market design will embed consumer archetypes, stereotypes and old tropes which I describe as "imaginary friends". The consequences could be the difference between nailing and failing the energy transformation.*

The warning is clear. Economic regulators must not simply enable market-based approaches according to how they believe people *should* behave ("imaginary friends"). Such normative regulation, no matter how roundly supported by textbook theories, applies moral judgements for which the regulators have no authority or accountability. But conversely, it would be unwise to have regulators intervening to restrict access to service offerings from which consumers might benefit.

There is only a narrow path between these two unwanted outcomes. It involves at least three steps.[20]

First, it requires regulators (and policy makers) discussing openly, honestly and in consultation with the community, what might 'go wrong' for consumers in the new markets they envisage. This discussion would explore how consumers might enter contracts that do not reflect their best interests, and the consequences from doing so. The aim would be to

[17] AER (2021c) p.9
[18] Ben-David (2023b, section 5) describes the 'mass conversion' of consumers into market traders.
[19] Gallagher (2023)
[20] Ben-David (2022b) provides a more detailed exposition.

develop a robust and shared understanding of the harms that complex contracts could cause. Elsewhere, I have referred to this exercise as developing a 'theory of harm'.[21]

Second, the theory of harm would be used to inform the insertion of a harm minimisation objective into the national energy laws. This legislated objective would have equal status with the exiting efficiency objective – that is, *both* objectives would need to be satisfied in regulatory decisions and rule-making. In making and administering rules and schemes (etc), the energy regulators would be bound to consider and demonstrate how they have addressed the risk of consumer harm.

(Where both conditions could not be satisfied, regulators would need to seek guidance from the relevant policy maker(s).)

The third, and perhaps most important reform would involve the creation of a statutory duty of care. The duty would require service providers to act in the best interests of a customer when offering or providing services under contract.[22] Of course, this would require service providers working with customers to identify their interests before entering a contract. The duty would prohibit a service provider from taking advantage of a customer by acts of omission or commission. It would require service providers to advise customers proactively, conscientiously, reasonably and demonstrably, of the risks associated with the contract(s) being offered. And having entered a contract, the duty would oblige service providers to monitor that the contract continues to serve the customer's best interests.

There is no viable alternative to a duty of care model for consumer protection in the rapidly 'complexifying' energy market. All other options will fail consumers.[23]

Consumers will not tolerate having to navigate the most complicated market in the economy just to access an essential service without fear of error or exploitation. If they lose confidence in the energy market and, by implication, how it is regulated, then they will lose confidence in the energy transition. And if that happens, the community will strike out against the reformation of the energy system. The stakes are simply too high to bet the future on the assumed endorsement of some "imaginary friends".

[21] ibid.

[22] Ben-David (2022a, p.24) defines a service provider to be any party who "can (or is seeking to) control, constrain or prevent the flow of electricity to, around, or from, a customer's premises."

[23] Alternative options of consumer protection span: (i) continuing with the self-evidently inadequate approach of providing consumers with more choice, more information, more price signals to guide their decision-making, and urging them to shop around; (ii) implementing heavily interventionist industry regulation prohibiting products and services, (iii) pursuing efforts to regulate ever-changing services or products, destining the regulator to be forever 'chasing' the market, or (iv) the complete withdrawal of industry specific consumer protections and, say, leaving it to consumers to exercise their common law rights.

#4. Rethinking energy governance

To some extent, the fourth pivot point is a derivative of the other three. It pertains to leadership. It involves asking difficult questions, reviewing the ongoing relevance of traditional regulatory methods, mapping all the relevant transaction points, assessing coordination risks, and leading an open and honest discussion with the community about all of the above. The relevant risks are those that jeopardise a successful, timely, and widely supported energy transition.

Can the energy regulators be a part of answering these questions? Can they answer these questions free of the burden of their histories, structures, cultures, practices and traditions? As noted in section 2.1, it would seem the Energy Security Board (ESB) was the regulators' special opportunity to determine the shape of future energy arrangements. But the ESB is no more; and the Energy Advisory Panel appears to be something less.

Whatever the backstory to the ESB's demise, it would seem government(s) concluded the regulatory bodies were not well-suited to being their chief advisors on the energy transition. This is understandable. Each regulatory body has its own traditional way of interpreting and solving problems in the world it occupies. Regulatory tradition is no different from any other tradition. It limits the perspective that can be brought to new challenges.[24]

> *[T]raditional thinking only permits questions whose answers are already contemplated by those traditions.*

The traditional perspective of economic regulation also tends to view "bad politics as getting in the way of good economics". Maybe that's right. Maybe it's not. It doesn't really matter anymore. Governments are now re-engaged in the energy market in ways that would have been unimaginable only a few years ago. Their re-engagement is not party political. It cannot be dismissed as an ideological flourish by one side of politics or the other. Nor can their re-engagement be viewed as a populist sop, after all, no two governments are pursuing the same policies.

Governments' renewed interests should be seen as efforts to solve some of the coordination problems jeopardising the energy transition in their jurisdictions. Governments have intervened because they have concluded the regulatory and market arrangements to which they signed-up 20-30 years ago are not solving these problems, or at least not quickly enough. Whether that perception is right, also doesn't matter anymore. State governments are back in the game and the federal government continues to search for its role. It is now abundantly clear that regardless of who is in power, governments will not sit by quietly while economists reassure them that "high prices are the solution to high prices". It's just not going to happen that way.

What this means, however, is that governments can no longer stay 'half pregnant'. Diffuse and unclear accountabilities just won't deliver a successful energy transition. Each government must fully grasp the nettle within its jurisdiction.

[24] Ben-David (2023b) p.12

Each government must take charge by implementing a comprehensive end-to-end strategy for delivering a successful energy transition within its jurisdiction. This may include taking responsibility for some or all of:

- jurisdictional system planning
- centralised procurement of land, infrastructure and/or services
- service delivery through state-owned authorities
- withdrawing fully or partly from national arrangements and implementing state-based regulatory arrangements – including consumer protections
- creating state-based market and non-market mechanisms (potentially at local or regional scale)

and so on.

Governments will also need to resolve which functions remain subject to national regulatory arrangements. At a minimum, it would seem national frameworks should continue to play a role in standardising system architectures, the form of certain contracts, and any other factors enabling inter-operability across jurisdictional arrangements.

The upcoming amendments to the national energy objectives attempt to placate states' concerns about the national regulatory arrangements, but it would seem these amendments are too little, too late, and too vague (see Appendix C).

Re-balkanisation of energy policy is the new reality. It might flow against the tide of most of the past 25 years but, as they say, "It is what it is."

3. CONCLUSION

Where does this leave efficiency?

Back in the 1990s, the energy market reformers believed they could defy the gravitational forces of the Australian Constitution and political economy. Whether that was ever a realistic ambition is a discussion for another day. For now, there are more urgent matters to which we must attend – namely, the coordinated decarbonisation of the energy system and the electrification of the economy.

It is now a matter of urgency that governments, regulators, academics, engineers, economists, system planners, consumers and social scientists, work together to identify all the known and foreseeable transaction points in the future energy system; and ask what could go wrong at those points.

In the hierarchy of questions that must be asked, the first must go to the technologists and engineers, namely: ***Does the technology exist for solving all the coordination problems at a given transaction point?*** If the answer is no, then solving the coordination problem at that point must be handed to the engineers and researchers to solve as quickly as possible.

If a technological solution exists, then the next question should go to the economists and regulators: ***Do we know how to design an efficient market mechanism (or incentive framework) to solve the coordination problems at that transaction point?*** Any equivocation would see that transaction point excluded, for now, from a market-based approach to system coordination. Work would continue in the academy on how an effective and efficient market-based approach may be designed, tested, implemented and monitored.

If the economists and regulators are confident they can design a market-based mechanism, then the final question would go to the broadest audience: ***How reasonable are the assumptions underpinning the proposed market-based solution?*** Where those assumptions are found to be realistic, the regulators would be tasked with implementing their proposed solutions.

This three-tiered hierarchy of questions – when asked in the context of the four pivot points discussed in this paper – would make clear where policy makers could confidently implement market-based mechanisms (or market-mimicking regulatory methods) to solve a coordination problem. Everything else would shift to governments to coordinate through: determinative regulation, centralised procurement, direct ownership and provision, or any other approach they consider appropriate. Each government would be responsible for implementing the mechanisms most likely to succeed in its jurisdiction.

It is hard to see what alternative remains for timely progress towards an energy transition.

Needless to say, this approach will result in some (or much?) re-balkanisation of the energy system's governance. But in reality, this is already happening. Accepting and advancing a confederated approach is the only realistic way forward for now. So be it. In this day and age, embracing diversity is hardly a foreign concept. If we value market competition, then we should now embrace a competition of ideas and invention among the jurisdictions.

Pivoting around the four points identified in section 2 will help answer the question at the end of section 1, namely: *What responsibilities and functions should continue to be delivered under a regulatory framework singularly focused on efficiency?*

In all likelihood, pivoting around these four points will see a narrower role for markets (and regulators) and greater responsibility placed on governments (and engineers) for shepherding forth the energy transition – at least for now.

For those elements that remain with economic regulators, it would seem logical to retain the efficiency objective – though supplemented with a harm minimisation objective and a statutory duty of care for service providers. Overall, however, we can expect that some (or many?) of the coordination challenges currently sitting with the regulators will shift to others to manage. Of course, no-one would suggest that those parties should not seek to solve their coordination problems efficiently. But for those parties, efficiency is likely to take on a more pragmatic definition than in the past. That is, efficiency may come to mean something like "as efficiently as possible within current constraints, particularly the time available."

This is not the vision of the economic reformers of the 1990s or their torchbearers who still carry the flame of those long ago reforms. It flies in the face of the regulatory intuitions and beliefs that have dominated the oversight of the energy system since those times. But those traditional perspectives emerged at a very different time; and under very different conditions. Those conditions no longer exist. Time has moved on. So must we.

— END —

Epilogue

Batteries, AI and Conspiracy theories

Among all the foreseeable developments in the electricity market, the likely economic behaviour of batteries is probably the least well understood. While batteries will obviously look to arbitrage prices across different market conditions (ie. charge when prices are low and discharge when prices are high), their likely market behaviour is not well understood.

How a battery operates at a given point in time will depend on its recent activity in the market as well as expected future market conditions. The battery's operation would be highly conditional on both backward and forward-looking path dependencies. The impact of this conditionality can be expected to increase in significance as batteries of all sizes and configurations become more pervasive. Modelling such a market presents an extraordinary challenge. All the more so, at times of relative energy scarcity.

These backward and forward-looking path dependencies would seem to suggest even a tiny variation in the model's initial conditions – let alone a stochastic perturbation along the way – would see the model produce wildly divergent forecasts of future market conditions. What would an electricity market captive to this 'butterfly effect' mean for market participants or the market operator? Would it render the electricity market unmanageable and unbankable?

The usual response elicited by such questioning tends to computational solutions – algorithmic decision making, machine learning, artificial intelligence, the internet of things, and so on. Clearly, the computations required to model such a vast and dynamic array of market potentialities will surpass anything possible at a human scale. At the same time, the market's timescale could contract to tiny fractions of a second. After all, if the physics of the electricity system operates in milliseconds, then presumably the electricity market can deliver the most efficient outcome if it operates on the same timescale.

Once the technology exists, market-based algorithms could be programmed to make tens, hundreds or maybe thousands of trading decisions per second at every transaction point in the electricity market.

After many years of debate and planning, the NEM finally moved to five minute settlement in 2021. With the advent of AI-driven markets, will the next move be to a five millisecond settlement market? Will debates about day-ahead markets, soon be replaced by debates about millisecond-ahead markets?

That may not be the end of the story in an algorithm-driven electricity market.

Thousands (or maybe millions) of smart trading algorithms will start observing each other's every action at superhuman frequencies. The algorithms, once powerful enough, will begin to identify all the action-reaction relationships in this hyper-traded electricity market. The algorithms will eventually learn about the relationship between their own actions and the reactions of the other algorithms. They could then be expected to use this knowledge to send signals to each other in order to produce a particular market outcome. And, free of human

vicissitudes, they will be able to self-organise in the way that most efficiently maximises their individual and joint objective functions. They will have learnt to collude.

Whether algorithmic collusion produces a stable or unstable energy market is not obvious. What can be surmised, however, is that there is no *a priori* reason to expect the product of such collusion to align with the long term interests of consumers.

But how will anyone know? How will the regulators know if the market they have enabled is, in fact, meeting their statutory objective of promoting efficiency?

APPENDIX A

Some regulatory oddities

This section very briefly provides a few examples of odd regulatory approaches that have emerged in recent times. Some of the examples demonstrate how economic regulation-as-we-know-it is struggling to respond to the challenges of the energy transition.

The examples listed below are not exhaustive or presented in any particular order.

A.1 DIY regulation[25] *(electricity exports)*

In August 2021, the AEMC determined that electricity networks should be able to charge export tariffs and that an incentive scheme promoting investment in export-supporting infrastructure should be established.[26] The AEMC handed responsibility for designing these arrangements to the AER. In turn, the AER handed this responsibility to the network businesses with only limited guidance.[27,28] Both mechanisms treat electricity exports as a standalone service rather than a fully integrated part of a transformed and efficient energy system. Barely any attention has been given to how the two mechanisms intersect, how they interact with Flexible Export Limits, or how they will interact with existing regulatory arrangements (for example, considering alternatives to capital expenditure during a regulatory reset).[29]

➔ *It is not clear why the regulators have outsourced the design of these schemes to the networks despite their potential conflicts of interest and their lack of economic expertise*.

A.2 Impromptu regulation (accelerated depreciation)

Since November 2021, the AER has been contemplating how it should respond to the likelihood of gas networks stranding. A discussion paper resolved none of the issues it raised.[30] When the gas network businesses submitted revenue proposals seeking the accelerated depreciation of their regulatory asset bases (RABs), the AER lacked a framework for addressing these claims. The Consumer Challenge Panel (CCP) foresaw, and warned of, the risk of ungrounded decision making.[31] The AER's silence in response to these concerns was conspicuous.

➔ *The AER's final decision acceded in part to the networks' requests, albeit by concocting a methodology which it neither modelled beforehand nor subjected to public scrutiny*.[32]

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[25] Do it yourself (DIY)
[26] AEMC (2021)
[27] AER (2022a,b)
[28] AER (2023b,c)
[29] Export limits constrain how much electricity a small-scale owner of distributed energy resources can export to the grid. Static export limits impose a fixed cap. Flexible export limits vary with constraints in the distribution system. An arrangement supporting flexible export limits is sometimes called a Dynamic Operating Envelope
[30] AER (2021a)
[31] Robinson, Bartley and Ben-David (2022) Chapter 7
[32] For example, see: AER (2023d)

A.3 Regulatory inertia (consumer protections)

In 2022, the AER initiated a review of the National Energy Consumer Framework (NECF) in recognition that its traditional remedies for consumer protection won't be sufficient as the energy transition unfolds. Even though the AER has tentatively acknowledged the merits of a paradigmatic shift to a 'duty of care' model (as described by section 2.3, pivot point #3 of this paper), it appears unable to reconcile this approach with its traditional views about regulating the consumer energy market.[33]

➔ *The opportunity to redesign the consumer protection framework is being inhibited by traditional regulatory thinking*.[34]

A.4 Regulatory over-reach (declining block tariffs)

In May, the AER published an issues paper proposing a move away from the long-standing practice of applying declining block tariffs for gas distribution networks.[35] The AER argued that declining block tariffs could be inefficient because they "incentivise customers to consume larger quantities of natural gas."[36] No evidence was proffered in support of this contention.[37] Despite the potentially very significant redistributive impacts for consumers, the AER provided no modelling of the likely consumer impacts of its proposal (as it would have demanded of the networks had they come forward with such a proposal).[38]

➔ *If the AER proceeds with its proposal, then it will be over-reaching into matters of equity for which it has no "expertise, authority or accountability"*.[39]

A.5 Over-engineered regulation (efficient investment)

The AER recently initiated an own-motion review of some of its incentive schemes, including its Capital Efficiency Sharing Scheme (CESS). The AER appointed a Consumer Challenge Panel (CCP) to bring a consumer perspective to the review. In one of its submissions, the CCP identified at least nine (!) regulatory mechanisms acting as bulwarks against inefficient capital expenditure by network businesses.[40] The CCP's submission queried why nine mechanisms were required in pursuit of a single objective.[41] No answer was forthcoming from the AER.

➔ *Even jumbo jets are not engineered with nine layers of redundancy*.

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[33] AER (2022d)
[34] Ben-David (2023b) describes the inhibitory role of regulatory tradition.
[35] AER (2023a)
[36] ibid. p.2
[37] Ben-David (2023a) p.6
[38] Ben-David (2021) describes the supposed exclusivity of efficiency as the "original sin of economic regulation".
[39] See Ben-David (2023a) for further discussion.
[40] Ben-David, Chai and Prins (2022) p.11
[41] The AER noted the CCP's query on p.40 (of 42) but offered no explanation in response. See: AER (2022c)

A.6 Regulatory proliferation (incentive schemes)

There is now a proliferation of incentive schemes in place for electricity networks.[42] These schemes include the AER's: Efficiency Benefit Sharing Scheme (**EBSS**), Capital Expenditure Sharing Scheme (**CESS**), Service Target Performance Incentive Scheme (**STPIS**) including the Customer Services Incentive Scheme (**CSIS**), Demand Management Incentive Scheme (**DMIS**), Demand Management Innovation Allowance (**DMIA**) mechanism or Small-Scale Incentive Scheme (**SSIS**), and Export Services Incentive Scheme (**ESIS**).

➔ *The profusion of incentive schemes comes at a considerable cost to consumers, while the benefits are only ever asserted*.[43]

A.7 Regulatory regression (game changer)

The AER is currently pursuing a vision of creating a "fund that pools resourcing dedicated to supporting vulnerability".[44] Rumour has it that the AER sees this pool being funded by regulated network revenues. No matter how noble the intention of "supporting vulnerability", it is not clear why a regulator committed to incentive-based regulation is contemplating an arrangement that weakens the incentive on retailers to support their customers. Further, the development of such a scheme seems contrary to one of the core justifications for introducing economic regulation – namely, the elimination of cross-subsidies.

➔ *It is odd the AER is advocating for the type of cross-subsidy it was established to eliminate*.

A.8 Regulatory discombobulation (Integrated System Plan)

Since 2018, the Integrated System Plan (ISP) has been a central feature of the regulatory framework for the energy transition. It is produced by the Australian Energy Market Operator (AEMO).[45] While the ISP is called a "plan" it does not address *how* the scenarios it models could be delivered. In fact, AEMO has made clear that it is up to the other market bodies to establish mechanisms to deliver the appropriate outcome.[46] There is no mechanism in place to ensure alignment between AEMO's system "design", the AEMC's rule-making, and the AER's regulatory activities.

➔ *It is deeply worrying that a successful energy transition is dependent on a happy regulatory coincidence*.

[42] Listed in AER (2023c) p.10
[43] AER (2021b)
[44] See: https://www.aer.gov.au/industry-information/innovation-reform/game-changer
[45] See: https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp
[46] AEMO (2023) p.69

APPENDIX B

Multi-dimensional consumer contracts[47]

For most of the past 25 years, consumers have had to negotiate a retail electricity market constructed around a single decision variable, namely, the price of purchased electricity. The emerging consumer-facing electricity market is looking very different. With the advent of new technologies, services and business models, consumers will find themselves having to negotiate market contracts involving multiple decision variables including:

- the price of electricity supplied via the grid as well as the price of electricity exported to the grid
- volumetric limits on how much electricity can be exported to the grid and maybe even limits on how much electricity can be drawn from the grid
- delegated control over onsite electricity production and storage appliances, as well as controls over load
- price, access, ownership and control of electricity stored offsite (say, in community batteries), and
- maybe even payments for ancillary system services

We can expect contracts to be further complicated by:

- dynamic decision variables such as prices or volumetric controls which change in real time (reflecting underlying system conditions) rather than having set values specifiable in a contract
- different types of penalties (not necessarily monetary) depending on which type of contract term a customer may breach
- financing arrangements that are indistinguishable to the customer from their payments for energy services, and
- customers relying on multiple suppliers providing interacting services.

It is now well-established that customers have not been particularly effective in navigating a retail energy market involving just one decision variable, namely, price. This invites the obvious question: How can consumers be expected to navigate a labyrinthine market consisting of all the decision variables noted above? This question usually prompts one of two answers.

First, it is suggested the competitive market will solve complexity -- whereby either retailers or new service providers create products consumers can readily understand. Unfortunately, 20 years of experience with full retail competition lays bare the falsity of this claim.

Second, it is suggested 'machines' (algorithms or the Internet of Things) will do the work for consumers by optimising across multiple decision variables in real time. It's an understandable response given the platform technologies now emerging, however, it misses the point entirely. How will consumers assess the value of each machine? How will they compare the benefits promised by competing machines? Having entered a contract, how will consumers verify whether a 'machine' is delivering the value it promised?

[47] From Ben-David (2023b) and Ben-David (2022b)

APPENDIX C

Too little. Too late. Too vague.

In May 2023, Energy Ministers agreed to amend the national energy laws to include a reference to emissions reduction targets in the national energy objectives. While yet to be legislated, the revised National Electricity Objective (NEO) will read as follows (new text highlighted).

> The objective of this Law is to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to:
>
> (a) price, quality, safety and reliability and security of supply of electricity
>
> (b) the reliability, safety and security of the national electricity system; **and**
>
> **(c) the achievement of targets set by a participating jurisdiction**
>
> **(i) for reducing Australia's greenhouse gas emissions; or**
>
> **(ii) that are likely to contribute to reducing Australia's greenhouse gas emissions.**

The AEMC and AER have released consultation papers discussing how they will interpret and apply the amended NEO.[48] The AEMC's paper explains:[49]

> *Incorporating emissions reduction into the national energy objectives means energy market bodies, including the Commission, will need to balance emissions reduction with the existing considerations of price, quality, safety, reliability and security in applying the objectives.*

The notion of balancing emissions reductions "alongside the other existing objectives" also features in the AER's consultation paper.[50]

The ClimateWorks Centre at Monash University anticipated the risk of this relativist approach.[51] Its submission on the proposed amendment highlighted that the coordinating conjunction ("and") at the end of clause (b) should be replaced with the subordinating conjunction "while". That is, the amendment should have been drafted along the following lines:

> **…while (c) supporting the achievement of targets set by a participating jurisdiction…**

As it stands, the amended NEO places no special responsibility on the regulatory bodies to support jurisdictions' emissions reduction targets. What each regulator does will depend on judgements it alone will make – creating yet another suite of coordination risks for a successful energy transition.

[48] AEMC (2023), AER(2023f)
[49] ibid. p.2
[50] ibid. p.6
[51] ClimateWorks Centre (2023)

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