

Energy Consumers Australia

The future of electricity distribution network regulation

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The application of new generation and storage technologies to provide a “distributed energy” model has prompted consideration of the appropriate regulatory model for electricity distribution networks. This paper surveys the history of the current regulatory structure and the arguments made for a reconsideration of that position. The paper concludes that the natural monopoly characteristics of distribution networks are unchanged, but that the mechanisms for economic regulation can benefit from being more adaptive to change.

Structural reform of electricity

The Australian energy market has undergone a continuing series of reforms that have been punctuated by major reports, including those associated with their leads – Hilmer, Parer and Scales.¹ Each of these progressively built on earlier work by the National Grid Forum to build a national energy market.²

The most significant, however, was the Hilmer report. Among other things, it was the widest ranging including the framework for structural reform.

Chapter 10 of the Hilmer report set out a comprehensive analysis of the structural reform of public monopolies. The report identified the value of the separation of natural monopoly and potentially competitive activities as well as the value of the separation of different elements of competitive activities.

The report used the example of electricity transmission and electricity generation as an example of the benefit of the separation of monopoly and competitive elements. The problem that arises from integration is identified firstly as the possibility for the monopoly element to cross subsidise the competitive element. Where the relationship is vertical the control of the monopoly element may be misused to stifle or prevent competition in the potentially competitive sector. The report specifically notes:

Even if access is not actually misused, the potential for such behaviour may deter new entry to, or limit vigorous competition in, markets dependent on access to the natural monopoly element. (P.219)

The report continued:

It is sometimes argued that the degree of separation required is merely “accounting” separation, so that the financial relationships between two parts of a business become more transparent. While separation of this kind may place some practical constraints on cross-subsidisation and facilitate regulation of the natural monopoly element, it will not be sufficient to remove potential incentives to misuse control over access to a vertically integrated element. Full separation at the level of ownership or control is required. (P.220)

Separation alone is insufficient control of the natural monopoly element, it will still be in a position to use its market power to charge monopoly prices. (Response to these issues was outlined in Chapters 11 and 12 of the report).

The separation of different competitive elements was identified as part of the program to reduce the market power of the previously incumbent competitive firms. It is disappointing to note that while there are three distribution network businesses in NSW and five in Victoria, there are only three retailers that owe their lineage to the previous incumbent firms.

Further the separation that initially existed between generators and retailers – each of which had been separated from monopoly transmission and distribution networks – was allowed to erode by the courts (because no one thought to include rules preventing the integration in the reforms). Analysis by Gans and Wollack shows that the increase in wholesale electricity prices that was argued by the ACCC would occur from the acquisition of Loy Yang by a consortium including AGL did occur.³

These last points about the consequences of not pursuing the separation of competitive elements are salutary in the context of the proposition for the need to separate the natural monopoly elements and competitive elements.

Natural monopoly and access regulation

The preceding section has referred to “natural monopolies” and the regulation of access and/or prices.

The incentive and ability for a monopoly to restrict output and hence obtain prices higher than those that would apply in a competitive market was detailed explicitly in 1890.⁴ From Adam Smith on to the 19th century “monopoly” primarily referred to cases that arose from the grant of governmental privilege.

In the 8th edition of his *Principles 1927*) Marshall realised that in declining cost industries (those with increasing returns to scale) monopoly may be socially desirable. The precise definition of the circumstances in which monopoly is socially desirable – a “natural monopoly” was developed in the 1970s. There is a natural monopoly in a particular market if and only if a single firm can produce the desired output at a lower cost than any combination of two or more firms.⁵ Technically this is referred to as cost subadditivity.

More generally the definition applies to not just the “desired output” but to any level of output.⁶ King and Maddock emphasise that it is the technology of production that has the attributes of cost subadditivity, not the industry structure. They also note that technology change may change the cost characteristics of production.

Shiplee argues that there are five essentially distinct objectives that justify the imposition of some regulation in a natural monopoly market, being:⁷

1. Society may wish to protect buyers from a price that is too high and to recapture the loss in consumer surplus associated with monopoly pricing.
2. Society may wish to protect a natural monopolist from opportunistic behaviour on the part of customers or other firms.
3. Society may wish to promote stability in an unstable market.
4. Society may wish to delineate the market boundaries that separate a natural monopoly sector from a closely related competitive sector of a given market.

5. Society may wish to prevent collusion among incumbent firms or certain behavioural abuses, such as predatory pricing.

The existence of natural monopoly does not immediately imply that competition is impossible and hence regulation required. If the product or service has a number of reasonably close substitutes, then there may be little or no scope for monopoly abuse.

King and Maddock use the example of domestic gas supply. The technology for gas distribution through pipes is clearly a natural monopoly, however the larger market for “fuel and energy sources” may well provide sufficient competition to constrain monopoly power. The concept that is important is that of an “essential facility”. In the case described the gas distribution network is not an essential facility because it is not necessary to access the service provided by the technology in order to compete in the market. (P. 78)

One solution to the issue of a natural monopoly technology which is an essential service in a market is to impose price regulation on the integrated firm. This approach, however, forgoes opportunities for innovation in the downstream market.

To gain the benefit of competition in the downstream market a regulated access regime can be introduced for the “essential facility” that requires the service to be made available to other downstream providers and regulate the price and non-price terms under which this access is provided.

An access regime that leaves entrants competing with the vertically integrated provider of the essential facility is an incomplete solution. The vertically integrated firm has both the incentive and opportunity to “sabotage” its competitors in the downstream market.

Structurally separating the natural monopoly technology provision from the firm that competes in the downstream market resolves this problem, but it is not a sufficient action on its own. It will reduce welfare over an integrated monopolist if the downstream market is anything less than “perfectly” competitive. This is the issue of “double marginalisation.”

That is, structural separation is an adjunct to the economic regulation of the natural monopoly technology, it is not a substitute for it. As described in the introduction this is the strategy that has been (mostly) employed in Australian energy markets.

The distinction by King and Maddock between a natural monopoly technology and an essential facility deserves greater treatment. The specific example provided was of a gas distribution network facing competition from electricity in the delivery of energy services. Despite this example gas distribution networks are subject to the same economic regulation as electricity (though there are differences in the transmission/pipeline markets).

There are two bases for this regulation of gas. The first is that the substitution between the two forms of energy is only partial. Gas isn’t competitive for the provision of light or to drive motors, it is however competitive for heat. That means that the substitution effect could be used to justify there being no access regulation for gas, but still having one for electricity.

This asymmetry then has its own problems in determining efficient outcomes because the gas distribution monopoly doesn't face enough competition to price as if it were in a competitive market, only to match the price points from electricity regulation.

The second reason is related. The development of the competitive retail energy market is premised on retailers who offer a suite of services. Not having an access regulation for gas would distort this market. That said, the creation of a highly competitive retail market could provide the eventual lever by which the access regulation on gas could be removed. The countervailing market power of the vibrant retail sector combined with its ability to substitute could alleviate the need for access regulation of gas.

The call for reform

Through 2015 the large installed base of solar PV generation in households and the rapidly declining costs of PV panels, inverters and storage has resulted in reviews of the appropriate policy response to these developments.

The AEMC reviewed the matters in its report *Integration of Energy Storage: Regulatory Implications*.⁸ The AEMC has concluded that for the purposes of the regulatory framework storage should be considered a contestable service.

The AEMC has, however, noted that under the Rules there appears to be no ability for the AER to restrict the ability of Distribution Network Service Providers from competing in "behind the meter" storage markets so long as the assets involved are "ring-fenced" from the network services. The AEMC made ten recommendations and advised that a "work program will be developed and discussed with stakeholders."

Closely following the AEMC report the Energy Council published the *National Energy Productivity Plan 2015-2030*. Measure 19 of the plan, titled 'Emerging technologies in the electricity system' stated:

*A strategic work programme is considering the impacts of technological and market changes in the electricity sector, such as the emergence of solar PV and storage options, which are challenging the centralised, grid-based supply model on which the energy regulatory frameworks are based. This work will assess whether existing regulatory arrangements are likely to be sufficiently flexible to enable future market change which will allow customers to benefit from innovative products and services while ensuring that appropriate consumer protections and safeguards.*⁹

It is understood that this "strategic work programme" is the work program being developed by the AEMC.

The detail of the AEMC recommendations makes it clear that networks directly investing in storage is not the preferred option, but is premised on the idea that it cannot be prohibited so long as it is ring-fenced. The adequacy of ring-fencing as a remedy will be discussed below.

A more radical view of the regulatory implications of emerging technologies is adopted in the CSIRO-ENA Network Transformation Roadmap.

The Interim Report of the CSIRO-ENA Network Transformation Roadmap contains six chapters.¹⁰ The first three are described as “major Chapters” which cover the work activities that were the main focus of Stage 1 and made significant progress in 2015. The remaining three chapters are described as “supporting Chapters” that cover work activities that also progressed in 2015 but mainly summarise what is known about the topic and provide a sense of direction for Stage 2 of the Roadmap program.

The last of these supporting chapters is titled “Priority Directions for Electricity Policy and Regulation.” The earlier description that these chapters as merely providing a “sense of direction” is reinforced at the start of this chapter by delineating what has supposedly happened as part of Stage 1 and what will happen in Stage 2.

Hence Stage 1 is described in this chapter as:

So, rather than setting out prescriptive ‘answers’, the Stage 1 work program focused on developing high level principles to guide how the broad economic regulatory framework may evolve over 2015–25 to provide appropriate outcomes across different scenarios.

The current regulatory model presumes a persistent natural monopoly over network services. So, to protect energy users from the potential exploitation of monopoly power, the regulatory regime has primarily focused on infrastructure access. Current network regulation provides a ‘right of access’ to monopoly infrastructure. It seeks to ensure charges for the services delivered via monopoly infrastructure reflect the efficient costs of that service provision.

This goal is critical for two main reasons. First, electricity is an essential input into broader economic activities. Second, a stable and efficiently priced electricity service is important to Australia’s economic competitiveness in export markets and as an attractive investment location. (P.104)

However, despite only being positioned as providing a sense of direction the chapter goes on to draw quite extreme conclusions and propose major regulatory reform.

The impact of future energy scenarios on the second major driver – the protection of consumers from monopoly power – is less clear. Overall, an increasing capacity for consumers or communities to employ distributed generation, store energy and manage their electricity demand is likely to reduce network service providers’ ability to exercise significant monopoly power. The availability of either partial or full grid substitutes, for example, means traditional monopoly regulation may not be required. That is, regulation may no longer be a cost effective or proportionate policy response to this driver.

Electricity grids could move from market circumstances that a decade ago were like those of water distribution networks, to a position more similar to that of fixed line telecommunication providers after the emergence of mobile phone technologies. In the telecommunications case, traditional monopoly regulation is retained for only a (shrinking) set of specific ‘bottleneck’ services. In the electricity sector, as consumers enjoy greater choice in how their electricity is supplied, and alternatives to core grid services, the regulatory regime may no longer need to focus so heavily on controlling monopoly power.

The goal of minimising the cost of electricity supply will probably continue to underpin regulatory and policy concern. However, evolving market and technology developments are likely to mean Australia will not need as much regulatory focus on limiting network prices to prevent high prices to customers. Instead, the focus will shift to ensuring prices are as consistent with as many consumers and communities as possible accessing the benefits of new energy technologies that are falling in cost.

As a result, policy measures may be needed to ensure the efficient, dispersed access to new energy technologies and the services that they enable. (P.105)

Unfortunately for the argument, the proposition that fixed line telephony has found regulatory relief from weak substitution from mobiles is not supported by facts. Indeed, the opposite has occurred. The enduring power of the natural monopoly in fixed line services – especially as voice has emerged as simply an application on high speed data – has seen telecommunications follow the same route as electricity with the (prospective) full structural separation of the access network (NBN Co) from backhaul (transmission) and content services (generation).

There is nothing in the development of storage technology that changes the natural monopoly characteristics of electricity distribution networks. It may put emphasis on the need for greater granularity in pricing so that where two or more customers want to share storage capacity they are able to make the efficient choice to use the existing distribution infrastructure for that purpose.

Structural integrity of electricity market regulation

As described above, the reforms to the Australian energy market required strict separation between the potentially competitive retail and wholesale energy markets, and the natural monopoly elements of transmission and distribution.

The diagram below shows the expectation of how developing distributed generation and storage technologies change the model that was adopted post-Hilmer.¹¹

The principles that applied in the initial market design need to apply to this evolving market – the strict separation of competitive from monopoly elements. The DER/storage markets that are distribution network connected and that are behind the meter are both potentially competitive markets.

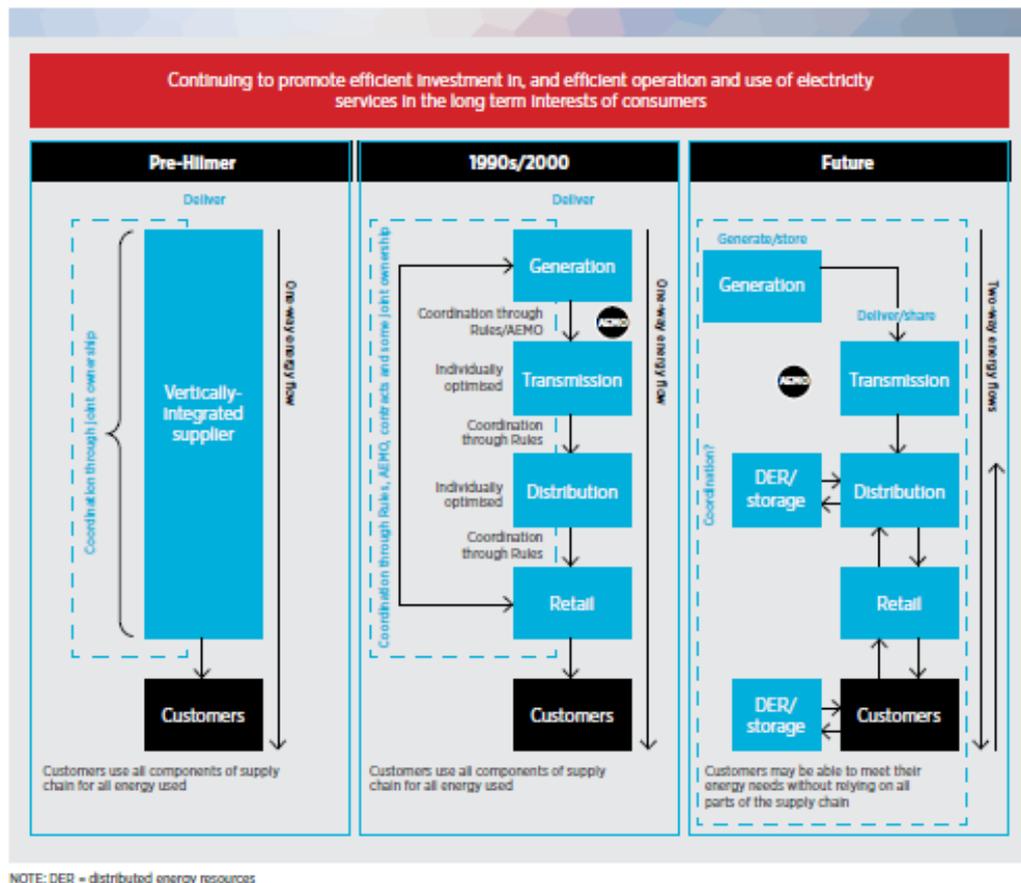
The fact that the network connected services may also provide important services to the networks does not necessitate their incorporation within the networks. They will, no doubt, require networks to engage in new relationships. They may also warrant review (as flagged by the AEMC's recommendation number 3) of the regulatory arrangements to ensure networks are not incented to prefer capex solutions over opex solutions to providing these services.

The ENA-CSIRO paper has not made the case that there is any change in the monopoly characteristics of distribution technologies.

However, their position that there has been excessive emphasis on the economic regulation of network revenues/prices is well made. The effectiveness of the market reforms depends on the

potentially competitive markets being highly effectively competitive. Greater attention needs to be paid to these markets.

Figure 4.1: Electricity system transformation



The ongoing focus on setting prices for network services through an adversarial process can also be reformed. This is the intention of the emphasis placed on a greater role for consumer engagement by networks.¹²

The promotion of the Long Term Interests of Consumers is the objective of the AEMA and of the NER; the latter acknowledges that this objective is achieved through economic efficiency. That efficiency occurs through effectively competitive markets where the production technology supports competition, and through well-regulated structurally separated firms that own natural monopoly technologies.

Ring-fencing is an inadequate response

Ring-fencing as a regulatory tool is usually utilised where a previously integrated firm is being separated or subject to new regulation. It is usually regarded as a “second best” to actual separation. Ring-fencing is not usually used as a remedy when a new business activity is proposed because if the ring-fencing is effective the firm should be neutral between building the capability itself or buying a service.

Ring fencing has been proposed as the remedy to DNSP desires to be directly involved in the provision of distributed energy and storage technologies. This should be the last resort. The practical

consequence of even suggesting that DNSPs be allowed into these competitive markets risks foreclosing the development of these markets.

In making the case for DNSP involvement two basic arguments are employed, whether in network or behind the meter. One is based on efficiency of provision of the service; the other is based on network management.

The argument from efficiency is based on the claim that the network has efficiencies in scale or scope in managing these services. It is unclear exactly what aspects of network operation or asset base create this supposed efficiency. Certainly there is the prospect that network embedded storage has a scale efficiency over individual household storage. It may, however, have limitations that don't apply to household storage. This argument is often related to a desire from DNSPs to develop "unregulated" revenue streams.

The argument from network management is that embedded storage can work as an alternative to other network investments to manage peak loads. In its strongest form it has been argued that only the DNSP can properly manage these resources for the purposes of generating system stability.

There are only two possible outcomes from ring-fencing; that it will be effective or it will be ineffective. The only party that can genuinely know whether ring-fencing is effective is the DNSP.

If the ring-fencing is effective then the DNSP no longer has an incentive to exploit economies of scale or scope in the provision of the service. Indeed, meeting the ring-fencing requirements introduces additional costs and is an inefficient solution. If the motivation is for network management purposes these costs are probably greater than the costs the DNSP would face acquiring the benefits of storage as a contracted service.

Given these considerations, the DNSP has no incentive to invest in storage services if the ring-fencing is effective. As a consequence if the DNSP invests in storage under the ring-fencing rules it can be inferred that the ring-fencing is ineffective.

Other firms considering making an investment can only determine the effectiveness of ring-fencing on the basis of the behaviour of the DNSP.

If the DNSP makes its own investment then other firms are more likely not to, because they will infer that the DNSP is making the investment to exploit its economies as the network owner and operator.

If the DNSP has supported a regulatory outcome which permits their participation on the basis of ring-fencing, potential storage service entrants will infer that the DNSP is likely to invest.

Consequently, even if ring fencing can be effectively enforced, permitting DNSPs to provide storage services will foreclose the market that would otherwise develop.

In general consumers will be better off with more choice in the provision of energy services. Existing and potential retailers are logical participants. Retailers have been slow to enter the market and their service offerings tend to be more focussed on churn-reduction through long term contracting rather than active engagement in the opportunity for customers.

Adapting to change

The commitment to the regulatory principle of structurally separating and containing natural monopolies and actively promoting competition in potentially competitive markets does not preclude a commitment to change.

The Network Transformation Roadmap said that the set of long term perspectives originally outlined by the Future Grid Forum and refreshed in the Interim Report supports five propositions about network transformation.

1. Disruptive change is upon us –Electricity networks face significant and transformative challenges.
2. The change is multidimensional – The transformative forces are not solely technological. They represent a convergence of business model, regulatory and societal changes, together with technological shifts. Modern electricity systems function as complex ‘ecosystems.’
3. The pace and scale of change may outstrip current change management – Regulatory change processes are at risk of being outpaced by disruptive threats; mechanisms were not designed to facilitate transformative change. Regulators increasingly expect network businesses to lead their own reinvention rather than wait for external guidance.
4. A ‘critical decade’ of transition is ahead – The 2015–25 decade is expected to be a critical window for ensuring Australia’s electricity networks are configured and enabled to provide the best outcomes for customers and the nation through to 2050 and beyond.
5. Agility, collaboration and co-design are needed – No single player or industry sector can ‘engineer’ the energy system transformation. To survive and prosper in this context, network businesses, energy institutions and diverse market actors alike need to learn, collaborate and innovate. Structured, whole-of-system collaboration and co-design by all participants is needed.¹³

Later the NTR develops the theme that organisations will need to develop partnerships, writing:

It is difficult to predict the new energy innovations that customers will require. Some innovations may even seem surprising and counterintuitive. It is likely each network business will behave differently, depending on its operating environment and on the future business model it adopts.

It is also unlikely a single business will accommodate customers’ needs on its own. Rather, the business will need strategic partnerships with other service providers and suppliers. Together, they may create an integrated ‘value-network’ that seamlessly delivers customised offerings to individual end-users.¹⁴

The emphasis on collaboration is given further weight when considering the report from Accenture on network business model evolution. In particular identified as one of the key initiatives of “progressive” utilities, under the sub-heading ‘Partnerships to build capabilities and accelerate pace of change ‘ that:

Utilities should look externally to source expertise and technology, including how to incorporate or interact with renewable resources or distributed energy resources. Partnerships not only help to spread the risk of investment but can speed up deployment

*through use of existing best-in-breed products and services. Partnerships also provide access to a broader range of expertise than may be available within one company.*¹⁵

“Partnership” is a difficult word when used in the context of advice from consultants. It is often used to mean a tight symbiotic relationship sought between two firms, like the relationship between McDonalds and Mc Cain. But in other contexts it means a far more open version of partnership.

When EFT-POS was introduced in Australia it was delivered through the tight partnership between a group of retailers and their bankers. Only the customer of the retailer’s bank could use the service at the retailer. Banks imagined that this tight relationship would result in a beneficial network effect attracting the retailer’s clients to develop a relationship with the bank. Customers didn’t.

EFT-POS only thrived once it was an open model in which a consumer’s banking card worked at the retailer no matter who they banked with.

The same is true of networks. The value to consumers from new business models will occur through the consumer’s ability to make that choice irrespective of the network they are connected to. The “partnership” that networks need to develop is an open partnership in which the network migrates from an electrical energy transportation business to a transactional platform.

There is a valid argument that this isn’t even a transformation or a migration. In the terms of Theodore Levitt’s marketing classic ‘Marketing Myopia’, this is the answer to the question “what business are you in?”¹⁶

The second paragraph of the article reads:

The railroads did not stop growing because the need for passenger and freight transportation declined. That grew. The railroads are in trouble today not because that need was filled by others (cars, trucks, airplanes, and even telephones) but because it was not filled by the railroads themselves. They let others take customers away from them because they assumed themselves to be in the railroad business rather than in the transportation business. The reason they defined their industry incorrectly was that they were railroad oriented instead of transportation oriented; they were product oriented instead of customer oriented....

The customer oriented view of distribution networks is that they have always been a transactional platform, and what has changed is the scope of the transactions.

What needs to occur to encompass this changed scope is the development of additional transactional capability by the networks. None of this changes their natural monopoly characteristics.

However, concerns about the regulation of natural monopoly can be valid. Any process of regulation that involves a repeated “game” in which one party makes a proposal and the other party (effectively unilaterally, but required to give reasons) can vary the proposal will trend to greater “ambit” claims and exponentially increasing volumes of data. The decision from the first reset doesn’t become the benchmark for the second, it instead becomes a more detailed hurdle to be scaled.

The addition of anything to the model, like cost reflective tariffs or charging for two way flows, only makes the formal model more complex.

There is an alternative to the escalating regulatory burden which involves integrating greater direct consumer engagement in rate setting.¹⁷ DNSPs will more productively turn their minds to developing these models than in seeking regulatory reform on the basis of an unfounded proposition of technology change eroding natural monopoly characteristics.

Conclusion

ECA is committed to evidence-based advocacy.

On the basis of currently available evidence, the fundamental framework of the separation of competitive and natural monopoly elements of the electricity industry remains sound. The distribution and transmission networks continue to be natural monopolies and should be regulated as such.

The distributed energy and storage markets are potentially competitive and, along with generation and retail, competition should be promoted in these markets. It is acknowledged that regulation of aspects of the competitive market (e.g. the structure of tariffs) can have impact on the effective regulation of the monopolies. The solution lies in rectifying the retail market not in changing network regulation.

Ring-fencing DNSPs from the distributed energy and storage markets is an inadequate remedy. If necessary the Rules need to be changed to prohibit the conduct of new business in these markets.

¹ Hilmer, Fred (Chair) 1993 *National Competition Policy Review* AGPS. Parer, Warwick (Chair) 2002 *Towards a Truly National and Efficient Energy Market: Report of the COAG Energy Market Review* Scales, Bill (Chair) 2007 *Energy Reform: The way forward for Australia* (A report to the Council of Australian Governments by the Energy Reform Implementation Group)

² Landels, JA (Chair) 1992 *National Grid Protocol* National Grid Management Council

³ Joshua Gans and Frank Wollack 'A Comparison of Ex Ante versus Ex Post Vertical Market Power: Evidence from the Electricity Supply Industry' unpublished paper available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1288245

⁴ In Chapter 14 of Book 5 of Alfred Marshall's *Principles of Economics* <http://socserv2.socsci.mcmaster.ca/~econ/ugcm/3ll3/marshall/index.html>. The original work was by Augustus Cournot in 1838.

⁵ William Sharkey 1982 *The Theory of Natural Monopoly* P. 54

⁶ Stephen King and Rodney Maddock 1996 *Unlocking the Infrastructure* P.72

⁷ Shipley P.147

⁸ AEMC *Integration of Energy Storage: Regulatory Implications* 3 December 2015 (<http://www.aemc.gov.au/Major-Pages/Technology-impacts/Documents/AEMC-Integration-of-energy-storage,-final-report.aspx>)

⁹ Energy Council *National Energy Productivity Plan 2015-2030* December 2015 (<http://www.scer.gov.au/workstreams/energy-market-reform/national-energy-productivity-plan/>)

¹⁰ ENA-CSIRO *Electricity Network Transformation Roadmap* (NTR) http://www.ena.asn.au/sites/default/files/roadmap_interim_program_report.pdf

¹¹ NTR P.87

¹² ECA is also of the view that in a more effectively competitive retail market the retailers would also participate more directly in price setting, including potential agreement on longer term regulatory contracts.

¹³ Paraphrased from P. 3 of the NTR.

¹⁴ NTR P.28

¹⁵ NTR P.90. It should be noted that the same report highlights as an initiative the diversification of the products and services offered by network utilities. It is unclear why a firm that enjoys the privilege of a regulatory compact that guarantees return of and for capital at a stable return rate should seek to pursue a strategy of diversification and hence risk. But that is a topic better discussed in a different paper.

¹⁶ Theodore Levitt 1960 'Marketing Myopia' *Harvard Business Review* 53 (5): 26–183.

¹⁷ Note that while the AER only regulates total allowed revenue, each year it approves network tariffs on the basis that the proposed tariffs applied to forecast volumes do not exceed the revenue.