



Barriers to entry in electricity generation

A report outline for the AEMC

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Executive Summary

1. The AEMC has asked CEG to:
 - provide a definition of a barrier to entry and describe the different types of barriers to entry that may exist, both generally and specifically for electricity generation; and
 - apply the definition to test whether there is any historical or current evidence of the existence of significant barriers to entry that may impede new investment or expansion in electricity generation in the National Electricity Market (NEM).

Definition of barriers to entry

2. A range of factors will influence how easy it is to enter a market including the existence of sunk costs and/or economies of scale; cost advantages conferred by incumbency; structural factors specific to a market such as vertical integration or regulatory requirements; and the nature of competition in the market. Nonetheless, not all factors that make entry difficult are relevant to assessing the case for regulatory intervention (i.e. where there are real and unavoidable resource costs incurred in entry then it will be efficient for entrants to bear such costs). In particular, a regulator will ultimately wish to identify whether there are features of the market that are leading to significant customer detriment that could be remedied either by altering those features or by preventing the customer detriment such that social welfare is higher over time. This requires a market specific analysis (based in sound economics) of how particular barriers to entry are leading to particular detrimental market outcomes.
3. We note that where the aim is to identify the likelihood of substantial market power (SMP), then there is a need for the analysis to consider both the intensity of competition among firms already in the market as well as the significance of barriers to new entry. If competition among incumbent firms is sufficient to align prices with costs then it may not matter whether new entry is possible. In this regard, it is likely to be useful for regulatory purposes to consider more generally any set of structural, institutional and behavioural conditions that allow incumbent firms to earn economic profits for a significant length of time. This would include conditions impacting on competition among the existing firms as well as barriers to entry.
4. In context of the NEM, we propose the following definition of barriers to entry:

A barrier to entry is any set of conditions that give rise to the ability of incumbent generators, acting individually or in concert, to set market prices above the level required to compensate for the efficient costs of new capacity required to meet demand growth in the NEM (or in a NEM region).
5. This is a very broad definition. It is not tied to any particular theory of the source of the barriers, but rather it simply describes the conditions that give rise to SMP as constituting barriers to entry.

6. In our view, it is necessary to take a broad approach. Artificially narrowing the field of research on the basis of a semantic definition has the potential to mislead and confuse the research. This can be related to the developing practice in relation to competition law, and is similar to the conclusion reached by the OECD in relation to assessing barriers to entry for the purposes of competition law:

In recent years, several competition scholars have concluded that the debate about entry barriers should be considered irrelevant to competition policy. They argue that abstract, theoretical pondering on the definition of barriers to entry is unlikely to be very helpful in investigations and policy decisions. What matters in actual cases is not whether an impediment satisfies this or that definition of an entry barrier, but rather the more practical questions of whether, when, and to what extent entry is likely to occur given the facts in each case (Competition and Barriers to Entry (Policy Brief) - OECD)

Conditions giving rise to barriers to entry

7. At a general level, barriers to entry can be classified as either arising from structural factors outside the control of incumbents or as arising from strategic barriers that are created by the incumbents themselves to deter entry. For example, structural barriers that are commonly identified (although without necessarily implying that regulation may be desirable) include sunk costs and scale economies as well as absolute cost advantages. Further, as noted, barriers to entry are relevant to the extent that competition among the existing firms is ineffective at constraining prices to long run marginal costs (LRMC).
8. In the case of the NEM, we believe that most barriers to entry can be usefully classified into the following three categories.
- i. barriers to entry arising from socially inefficient imposts on generation in general and new entry in particular;
 - ii. other structural features of the market that prevent entry from eliminating SMP; and
 - iii. strategic barriers to entry that result from the behaviour of the incumbent generators.

Testing for the significance of barriers to entry

9. In this report, we have considered a wide range of evidence as to the significance of barriers to entry.
10. As a preliminary step, we have first provided an overview of the level of competition among incumbent generation firms. This is important as market outcomes will depend on both competition among existing market players as well as the risk of new entry. Thus, an understanding of the level of competition among incumbents helps in determining what conclusions can be drawn from market outcomes about the

significance of barriers to entry. We have found that overall concentration levels are below the ACCC's threshold for competition concerns except in Tasmania and, to a less concerning extent, in New South Wales and South Australia. These findings suggest that evidence on market outcomes is likely to be most useful in assessing the significance of entry barriers in Tasmania and South Australia. In the other NEM States, competition among incumbent firms could be expected to be stronger and thus ease of entry may not be required to constrain prices to LRMC.

11. Conceptually, the comparison of prices with LRMC in the NERA/Oakley Greenwood report, provides the most direct evidence of the significance of barriers to entry. The evidence in that report of prices generally in line with LRMC does not support a conclusion that any such barriers to entry are of regulatory concern in the four mainland States of the NEM (Tasmania was not included in the analysis). Nonetheless, for practical reasons, that report compared LRMC with historical prices rather than expected future prices. Further, there is always a risk that prices in the recent past years may not provide a good guide to future prices. For example, there has been more moderate weather in the mainland NEM States in 2010 and 2011 compared with the warmer, drought-affected years of 2006 and 2007 for which NERA found that prices were more likely to have exceeded (or to be close to) the upper bound of their LRMC estimate. Thus, there is some uncertainty over whether prices in the future will remain close to LRMC particularly if years of temperatures above the long-term historical average and limited rainfall become more common. It may also be the case that positive net retail/contract cover in recent years has given any generators with SMP an incentive to lower prices than raise them. Accordingly, we believe that, rather than being definitive on its own, evidence of past pricing should be considered alongside other key evidence.
12. We have examined investment and capacity decisions. Generally, investment in new capacity has maintained a reserve over demand which suggests that difficulties in entering have not led to incumbents having the ability and/or incentive to limit capacity so as to drive up prices. We conducted a relatively high level examination of whether capacity has been withheld in particular markets. This found strongest evidence that capacity was most frequently withheld in Tasmania and South Australia, although this warrants further investigation particularly as to whether other factors may have been responsible.
13. We also found evidence that vertical integration could be increasing costs for independent new entrants in South Australia. In particular, vertical integration appears to be reducing liquidity in contract/futures markets and it is reasonable to assume that, in this context, high volatility in South Australian prices (including frequent negative price spikes) may be creating a barrier to entry by independent non-vertically integrated generators.
14. The overall evidence suggests that barriers to entry are unlikely to be a significant concern in New South Wales, Queensland and Victoria.
15. The Tasmanian market raises significant concerns regarding SMP and barriers to entry, reflecting the dominant position of Hydro Tasmania. This conclusion is



consistent with the final report of the Independent Review of Tasmanian Electricity Supply Industry of March 2012 which recommended significant restructuring of that market.

16. For South Australia, the evidence is less clear. AGL has a significant market share in South Australia and concentration is relatively high (although the market has been getting less concentrated over time). We found evidence consistent with capacity being withheld to drive up prices and that vertical integration may be creating a barrier to entry by independent non-vertically integrated generators. On the other hand, pricing evidence from the NERA/Oakley Greenwood report suggests that competition among incumbents is effective and/or barriers to entry are not significant.
17. Our review suggests that further action is warranted in relation to Tasmania and South Australia. Restructuring is already being considered for Tasmania. In South Australia, we recommend that the relationship between prices and LRMC in South Australia be subject to ongoing review to identify whether the historical evidence was atypical. In addition, the impact of vertical integration and the problem of contracting for new entrants in South Australia should also be kept under review. In this regard, this report and the related report by NERA offer a framework that market participants can use to assess concerns in relation to SMP and the potential need for regulatory intervention.
18. We have also noted the findings of several studies which suggest that certain emissions reduction measures are inefficiently raising costs in electricity generation. These should be treated as creating a barrier to efficient new entry and do warrant review by governments.

1. Entry in general and specifically in generation

19. Before assessing the relevance of barriers to entry for regulatory purposes, it is useful to first consider the general processes and costs faced by a new entrant. We do that in this section by considering entry strategies in general (which enables comparisons across industries) as well as specifically in relation to generation. We then turn in the later section to examine the implications for determining what constitutes a barrier to entry.

1.1. Entry strategies (and entry deterrence strategies) in general

1.1.1. At a conceptual level

20. A wide range of market features will affect a firm's ability to enter the market. Some features relate to the fundamental structure of supply and demand conditions in the market. Others are the result of the behaviour of firms already in the market. In this section, we discuss a range of features that are commonly identified in evaluating the ease of entry into markets.

Sunk costs and economies of scale

21. Sunk costs are investments that cannot be recovered if a firm exits the market. For this reason, they are also called irreversible investments. Sunk costs should be distinguished from fixed costs because some fixed costs may be recoverable. For example, land for a specialised factory may be resold (i.e. fixed but not sunk) but some of the costs of assembling the factory at that particular location may not be recoverable if that factory goes out of business. Empirical studies have shown that sunk costs are a key factor affecting entry, with the presence of significant sunk costs acting to limit the occurrence of entry compared with other industries where sunk costs are less significant.¹ Types of sunk costs can include investments in highly specialised equipment, acquiring and training specialised staff, spending on advertising to build a brand name in an industry and industry-specific R&D.
22. Sunk costs affect entry in several ways. Most immediately, they raise the risks of entry. Entrants may not have perfect information on the costs of supply and demand for a product and, in any event, costs and demand could rapidly change because of general economic and/or market-specific factors. If sunk costs are large, then an entrant may face large losses if they enter and then find that their revenues are insufficient to cover their costs including the costs of entering. On the other hand, in the absence of sunk costs, a firm could enter to see whether it will be successful and, if not, sell the assets without being significantly worse off.

¹ For instance, see A. Gschwandter and V. Lambson (2002) "The effects of Sunk Costs on Entry and Exit: Evidence from 36 countries" 77 Economic Letters 109.

23. Sunk costs also affect entry by creating a difference in the pricing considerations of incumbents versus potential entrants. An incumbent who has entered will, by definition, not be able to recover its sunk costs even if they exit. As such, the sunk costs would not be expected to affect its pricing decisions. In particular, an incumbent should be prepared to price as low as the level that only recovers its costs that are not sunk and still remain in the industry.
24. A potential entrant, however, will only be prepared to enter if they expect to earn sufficient revenues to cover both their sunk costs of entry as well as the non-sunk costs. Thus, in the presence of sunk costs, a potential entrant will need to carefully assess whether entry is likely to be profitable given the potential for the incumbent to respond by pricing at a level which does not generate sufficient revenues to cover the sunk costs. This is not to say that entry will never be profitable as the likely pricing of the incumbent firm post-entry needs to be assessed with regard to the specific market circumstances. Nonetheless, significant sunk costs make profitable entry less likely.
25. Sunk costs will have a greater impact on a market where they are related to economies of scale. In particular, in industries with large scale economies relative to the size of the market, entrants will need to achieve large volumes to realise a competitive cost per unit. However, if that large scale can only be achieved by substantial irreversible investments, then the risks of entry may be high relative to the expected profits. There may be no positive expected profits from entry if the entrant does not expect to be able to capture enough market share to realise an efficient scale or if the incumbent is expected to significantly cut its prices should entry occur. On the other hand, the need for large investments that are not sunk will not generally prevent entry if capital markets are working effectively.

Absolute cost advantages

26. Absolute cost advantages arise where the incumbent has lower costs than an entrant at every level of output. For example, the incumbent may have better access to capital markets or have taken the best locations or the best employees. An incumbent may also have a patent over the best technology. Absolute cost advantages can enable the incumbent to price above its costs but below the costs that would be faced by an entrant. Note that absolute cost advantages do not necessarily imply a market failure. For example, in the intensely competitive global wheat market, some farmers in more fertile locations may enjoy higher profits than farmers in more arid locations. However, the higher profits really reflect a return to the fertile land. Attempting to limit the profitability of the more fertile farms may result in the land instead being used less efficiently, such as for a different crop or for industrial use.

Other structural factors

27. Other structural factors that can impact entry include vertical integration (i.e. where supplying a market requires presence in or access to another part of the production chain such as a distribution network), legal and regulatory barriers (such as environmental and safety regulation), reputational effects (i.e. customers prefer a



known brand), and network effects (i.e. where the benefit to a customer of joining a network, such as Skype, depends on how many other customers are on that network).

Intentional over-investment in capacity and sunk costs

28. An incumbent may invest in excess capacity that can be used to credibly threaten that if entry occurs it will price down to the low level of marginal costs that results from having excess capacity. Excess capacity also means that it can readily expand its own supply in the face of entry. The incumbent's threat is made particularly credible where the investment involves significant sunk costs, as otherwise the entrant might believe that the incumbent would simply remove capacity from the market if it did face entry.

Contractual arrangements

29. There are various ways in which an incumbent can structure its contracts with customers or suppliers that make entry more difficult. For example, if customers are made to enter into long-lived contracts, then few customers may be coming out of a contract at any particular time. Accordingly, an entrant may face long delays in growing its customer base to an efficient level. Other contractual arrangements include volume discounts or loyalty rewards (such as frequent flyer schemes) and exclusive dealer arrangements (such as where particular car dealers only supply cars from one manufacturer. These contractual arrangements may sometimes have legitimate justifications but they nonetheless can make entry more difficult than it would otherwise be.

Pricing behaviour

30. Predatory pricing, where an incumbent prices below its own costs for a period of time sufficient to cause a new entrant to exit, is a clear example of pricing behaviour designed to deter entry. Predatory pricing is a breach of competition law. However, proving predatory behaviour is not always straight-forward, especially where there is uncertainty over the relevant costs or where other factors could explain the pricing, for example if the firm has set low prices to build up demand for a new product.

Other strategic behaviour

31. Other types of behaviour of incumbents that can affect entry include product proliferation (i.e. to avoid gaps in the market that would support entry), bundling and tying and patent hoarding. Again, not all behaviour that has the effect of deterring entry has been deliberately adopted for that purpose. Customers may be worse off if certain behaviour is stopped that actually promotes efficiency and social welfare.

1.1.2. Empirical evidence from other industries

32. The previous section identified a wide range of factors that influence the ease of entry. One danger for regulators is that such a wide range may encourage the identification

of barriers to entry across the economy. To avoid this danger it is important to assess the significance of a particular factor in practice in the context of the relevant market. Salop (1986), for example, published an important early paper on assessing the significance of barriers to entry in practice.²

33. In considering the market for electricity generation, it is useful to note some stylised facts relating to entry that have been found in empirical studies across a range of industries such as by Bain (1956), Scherer et al (1975) and Geroski (1995).³ These studies found that most industries are not characterised by substantial scale economies and hence can support ten or more firms. Thus, in most industries, entry is possible by focusing on particular niches or by building scale slowly over time. Indeed, Geroski's review of a wide range of studies found that entry of new firms into industries is common, but so is exit of existing firms and therefore the rate of net entry is relatively modest (except in the early stages of new industries when overall demand is growing strongly or where there has been a major change to the industry such as after liberalisation or with new innovation). The survival rates for new entrants also tend to be quite low according to the same review.
34. Some empirical work has also considered strategic entry deterrence. Smiley (1988) surveyed actual business practices and found that almost all firms use some entry deterrence; with common strategies relating to advertising, patenting and product proliferation.⁴ He also found that the frequent strategic use of excessively long-term contracts, product specifications, pre-emptive input purchases, targeting of critical buyers, premature product announcements, and aggressive attacks on rivals' promotional efforts. This work suggests that it is also important to examine evidence in relation to strategic barriers.
35. We turn now to the case of entry into electricity generation.

1.2. Entry into electricity generation

36. There are factors that make entry into electricity generation particularly risky for investors relative to entry into many other industries. Most electricity generation technologies have high up-front sunk costs and very long asset lives. Moreover, low marginal cost plant tends to have large economies of scale relative to the market being served.
37. These factors materially increase the risks associated with entry. High upfront sunk costs mean that investors will be unable to recover their investment if market circumstances do not turn out as predicted. Large scale economies relative to the

² Salop, S (1986) *Measuring ease of entry* 31 *Antitrust Bulletin* 551, 552

³ Bain, Joe (1956) *Barriers to New Competition*, Harvard University Press; Pratten, C.F (1971) *Economies of Scale in Manufacturing*, Cambridge University Press; Scherer, F.M., Alan Beckenstein, Erich Kaufer and R.D. Murphy (1975) *The Economics of Multiplant Operation: An International Comparison Study*, Harvard University Press; and Geroski, Paul (1995) *What Do We Know About Entry?*, International Journal of Industrial Organization.

⁴ Smiley, George (1988) *Empirical Evidence on Strategic Entry Deterrence*, International Journal of Industrial Organization



market mean that investors cannot simply rely on the existing market prices as a guide to the market prices post entry. This is because their own entry will have a significant impact on the market capacity and, hence, market prices. This also means that investors need to have a good understanding of market dynamics, including the ability to forecast post entry dynamics, if they are to be confident of their post entry revenue predictions.

38. It is particularly hard for investors to be confident about future wholesale electricity prices. This reflects fundamental uncertainty about the future of generation fuel costs (in absolute and relative terms) and the future of generation technology over the life of the asset. Such uncertainty is not unique to generation and is present, for example, in commodities markets. However, it is worth noting that the competitive electricity generation market has a shorter history than other markets and also, potentially, a shallower market for long-term contracts. In the absence of long-term contracts, a potential new investor cannot hedge future market price risk to any appreciable degree prior to entry.
39. There are other important sources of uncertainty and risk that a generation entrant must deal with. These include long lead times required in order to plan, finance, navigate regulatory approvals and finally construct the generation plant. The protracted investment process heightens risk because significant sunk expenditure may have already been incurred on initial stages (such as in project development) which may be lost if the project hits a roadblock at a later stage (such as in relation to financing) or if market circumstances change.
40. A further important source of uncertainty for entry into the electricity generation market is associated with regulatory risk. Generators face a range of regulatory risks. These include changes in regulations that might affect their absolute and relative costs (such as a price on carbon), affect the market supply of generation (such as schemes encouraging renewable generation), or regulated caps on market prices or their own prices (such as already exist and which are the subject of the MEU Rule change proposal). In addition, generators rely heavily on infrastructure spending by transmission businesses to 'get their product to market'. Without firm transmission rights, generators face uncertainty about the future capacity offered to them by the transmission network.

2. Conceptual framework for analysing barriers to entry

41. Effective competition can be achieved in a market where there is sufficient competitive interaction between existing firms within the market and/or where there is a sufficient threat of new entry. Conversely, competition will be ineffective with the potential for significant customer detriment where there is limited interaction between the firms in the market and where barriers to entry fail to constrain the behaviour of incumbent firms to efficient levels.
42. Where there are significant barriers to entry, incumbent firms will not face the threat of new firms challenging them for business, and will therefore face reduced incentives to price competitively and operate at least cost. Significant barriers to entry can also increase the risk that incumbents will be able to reach and maintain coordination rather than competing vigorously between themselves. Analysis of barriers to entry is thus fundamental to assessing the competitiveness of a particular market and whether there may be the potential for regulation to improve outcomes for customers.
43. Attempts to develop a single definition for barriers to entry have a long history in economics. McAfee, Mialon and Williams (2004) have identified seven separate definitions of a barrier to entry from the economics literature as well as adding their own:⁵
 - *Definition 1 (Bain, 1956 p. 3): A barrier to entry is an advantage of established sellers in an industry over potential entrant sellers, which is reflected in the extent to which established sellers can persistently raise their prices above competitive levels without attracting new firms to enter the industry.*
 - *Definition 2 (Stigler, 1968 p. 67): A barrier to entry is a cost of producing (at some or every rate of output) that must be borne by firms seeking to enter an industry but is not borne by firms already in the industry [this is normally interpreted as also including costs that firms already in the industry have borne in the past].*
 - *Definition 3 (James M. Ferguson, 1974 p. 10): A barrier to entry is a factor that makes entry unprofitable while permitting established firms to set prices above marginal cost, and to persistently earn monopoly return.*
 - *Definition 4 (Franklin M. Fisher, 1979 p. 23): A barrier to entry is anything that prevents entry when entry is socially beneficial.*
 - *Definition 5 (C. C. von Weizsacker, 1980 p. 400): A barrier to entry is a cost of producing that must be borne by a firm seeking to enter an industry but is not borne by firms already in the industry, and that implies a distortion in the allocation of resources from the social point of view.*
 - *Definition 6 (R. Gilbert, 1989 p. 478): An entry barrier is a rent that is derived from incumbency.*

⁵ McAfee, Mialon and Williams (2004) *When are sunk costs barriers to entry? Entry barriers in economic and antitrust analysis*, The American Economic Review, Vol. 94, No. 2, p.461-463.

- *Definition 7 (Dennis Carlton and Jeffrey Perloff, 1994 p. 110): A barrier to entry is anything that prevents an entrepreneur from instantaneously creating a new firm in a market. A long-run barrier to entry is a cost necessarily incurred by a new entrant that incumbents do not (or have not had to) bear...*
 - *Definition 8 (McAfee, Mialon and Williams, 2004): An economic barrier to entry is a cost that must be incurred by a new entrant and that incumbents do not or have not had to incur.*
 - *Definition 9 (McAfee, Mialon and Williams), 2004: An antitrust barrier to entry is a cost that delays entry and thereby reduces social welfare relative to immediate but equally costly entry.*
44. The various definitions presented above highlight useful aspects of the relevance of barriers to entry for market outcomes. However, there are issues in relation to each of them that suggest that no single definition can be considered best for all purposes. For example, some of the definitions are somewhat circular and do not really advance a regulator's understanding of what market features/entry barriers are likely to lead to prices above the competitive or welfare maximising level.
45. Bain's and Ferguson's definitions can be considered too broad because they could include factors such as superior management skills or a better quality product that may enable incumbents to enjoy higher profits but do not harm efficiency. These same definitions can also be considered too narrow in that they may fail to recognise even large entry barriers if there are other factors (internal to market such as weak demand) that are preventing the incumbents from earning supra-normal profits.
46. Stigler's definition is much more specific than Bain's and is useful in identifying cost based reasons why incumbent firms earn economic rents (above normal returns on investment). For example, incumbent mining operations may earn economic rents. These firms may have explored and developed the lowest cost tenements (in terms of ore quality, extraction and transport costs). These incumbent operations may have materially lower costs than the costs of a new entrant developing less attractive tenements. In this circumstance, market prices may well be determined by new entrant costs and incumbent operations will earn 'rents'. The Stigler definition can thus be reasonably used to identify the higher costs of a new entrant as a 'barrier to entry' which explains why incumbents earn rents.
47. However, in another context (more similar to the context of electricity generation) the objective might be to assess the case for regulation of an industry because of a belief that 'barriers to entry' were causing inefficiently high prices. In this context, relying on the Stigler definition as a trigger for the imposition of price controls could, in our opinion, give rise to type 1 and type 2 errors. For example, Demsetz (1982) showed that both the Bain and Stigler definitions could be too narrow.⁶ Demsetz gave the example where taxis are required to obtain licences to operate and where the Government sells the licences at market-determined prices. If the number of licences

⁶ Demsetz, H., Barriers to Entry, 72 American Economic Review 47-48.

is fewer than the number of taxis that would operate in a competitive market, then it seems reasonable to classify the licensing requirement as a barrier to entry. However, if the firms are left with zero profits after paying for a licence as well as covering their other costs, then the Bain's definition would not necessarily identify this barrier. Stigler's definition would also fail to recognise the requirement as a barrier to entry as licences are required for both entrants and incumbents.

48. Some of the more recent definitions are variations on the earlier definitions and suffer from similar problems. The last definition listed (by McAfee, Mialon and Williams) is useful in highlighting the need to consider the timeliness of entry as a significant delay in entry can also create customer detriment even if entry eventually takes place.
49. Academic economists have various reasons for identifying entry barriers and this is reflected in the variety of definitions proposed. However, regulators are generally interested in identifying entry barriers as part of the process of determining whether intervention in the market might be desirable. For example, where a harmful barrier to entry is identified, a regulator may then examine whether there is anything it can do to remove that barrier or, if not, whether price or other forms of regulations are justified to reduce the extent of customer detriment arising from that barrier.
50. In assessing the case for regulatory intervention, the aim should be to identify whether there are features of the market that are leading to significant customer detriment that could be remedied either by altering those features or by preventing the customer detriment such that social welfare is higher over time. This requires a market specific analysis (based in sound economics) of how particular barriers to entry are leading to particular detrimental market outcomes.
51. This view is similar to the conclusion reached by the OECD in relation to assessing barriers to entry for the purposes of competition law:

In recent years, several competition scholars have concluded that the debate about entry barriers should be considered irrelevant to competition policy. They argue that abstract, theoretical pondering on the definition of barriers to entry is unlikely to be very helpful in investigations and policy decisions. What matters in actual cases is not whether an impediment satisfies this or that definition of an entry barrier, but rather the more practical questions of whether, when, and to what extent entry is likely to occur given the facts in each case.⁷

52. Before considering barriers to entry more specifically in relation to the NEM, we believe that it also useful to note that in some circumstances a market may draw in *too much* entry. That is, if incumbents always accommodate new entrants (ceding some part of the market to them) then it may lead to too much entry (i.e. more than is efficient given demand).

⁷ Competition and Barriers to Entry (Policy Brief) - OECD

53. In the context of the NEM this could lead to inefficient outcomes if co-ordination between incumbents led to higher prices which drew in new entrants who, once incumbents, also co-ordinated. The end result of this could be more than optimal investment in capacity (or too much investment in inefficiently small capacity). Higher prices would be needed to fund this inefficiently high investment but instead of manifesting as high profits for incumbents it would manifest as high costs for incumbents.
54. Mankiw and Whinston (1986)⁸ modelled this scenario and described the effect of 'over entry' as a 'business stealing' effect. In this model there are fixed costs of capacity which Mankiw and Whinston call 'set up costs' but which would include the fixed costs of new generation plant. The authors show that if there is free entry into an industry then, under plausibly common conditions, imperfect competition among incumbents engenders a socially inefficiently high level of entry. The condition required for this result is simply that the incumbents tend to 'accommodate' the entrants by reducing output post entry. That is, the entrant's sales are partly 'new sales' and partly 'business stealing' of incumbents sales.

Intuitively, business stealing by a marginal entrant drives a wedge between the entrant's evaluation of the desirability of his entry and the planner's: the marginal entrant's contribution to social surplus is (except for second-order effects) equal to his profits less the social value of the output lost owing to the output restriction he engenders in other firms. The business-stealing effect therefore makes entry more attractive than is socially warranted. We show by example that the resulting bias can, in fact, be dramatic: the equilibrium number of firms can exceed the socially optimal number by a very large margin.

55. In this model, imperfect competition among incumbents attracts entry until prices are driven down to cost such that incumbents earn zero profit. However, the process of entry not only drives prices down, but also raises industry costs above the efficient level because entry, and the associated incursion of fixed 'set up' costs, is greater than necessary to meet demand. While examination of this effect is outside the scope of this study, we believe that it is relevant to bear in mind when considering potential competition problems in the NEM.

2.1. Applying the framework to the NEM

56. In the current context, the definition of a barrier to entry can be usefully linked to the definition of SMP in the AEMC Directions Paper:

Substantial market power in the context of the NEM is the ability of a generator to increase annual average wholesale prices to a level that exceeds long run marginal cost (LRMC), and sustain prices at that level due to the presence of significant barriers to entry.

57. This statement suggests the following definition of a barrier to entry:

Barrier to entry in the context of the NEM is a set of conditions that confers on a generator the ability to increase annual average wholesale prices to a level that exceeds long run marginal cost (LRMC), and sustain prices at that level.

58. By using the phrase “due to the presence of significant barriers to entry” in the definition of SMP, the AEMC is capturing in the definition of “significant barriers to entry” all of the factors that together give rise to “the ability of a generator to increase annual average wholesale prices to a level that exceeds long run marginal cost (LRMC)...”.
59. This is a very broad definition of barriers to entry. It is not tied to any particular theory of the source of SMP but rather simply describes the conditions (plural) that give rise to this as constituting barriers to entry. Put plainly, the definition above implies that where SMP is being exercised there must be barriers to entry.
60. In our view this is entirely appropriate. Artificially narrowing the field of research on the basis of a semantic definition has the potential to mislead and confuse the research. Again, this can be related to the developing practice in relation to competition law. For example, Cabral in his description of barriers to entry in the New Palgrave Dictionary of Economics Online states:

If we take these considerations into account, and bear in mind the practical antitrust use of the concept of barriers to entry, a reasonable definition seems to be: the set of structural, institutional and behavioural conditions that allow incumbent firms to earn economic profits for a significant length of time. Admittedly, this is a fairly general definition, but necessarily so: the problem with other definitions is that, in attempting to be more specific, they become incomplete and potentially misleading. To some extent, it may be appropriate to shy away from the phrase ‘barriers to entry’ and instead adopt a more explicit description of the conditions that would trigger some sort of policy response. Specifically, instead of attempting to identify ‘barriers to entry’, it is likely to be more useful to simply attempt to identify:

Any set of structural, institutional and behavioural conditions that allow incumbent firms to earn economic profits for a significant length of time.

61. In line with the reasoning of Professor Cabral, we believe that the AEMC’s purpose is likely to best served by examining the broader set of conditions allowing incumbent firms to earn economic profits for a significant length of time. To apply a more narrow definition focused on a specific definition of a barrier to entry risks finding SMP when it is not present or not finding SMP when it is present because of the effect of another factor not captured in the narrow definition.
62. An important consequence of considering more generally the conditions that may give rise to SMP is that it enables the degree of competition among incumbent firms within a market to also be examined. In particular, SMP may not exist within a market if

competition among the incumbents is strong even if there are significant barriers to new entry. For example, if firms within a market need to be licensed and there are sufficient firms already licensed to hold prices in line with efficient costs then there would not be SMP even if no new licences were to be issued. Thus, it is important for the AEMC's purpose to also examine the nature of competition among incumbent firms. In competition law, a range of evidence is examined to assess the likely intensity of competition among players in the market including the level of concentration, whether there are barriers to expansion of the existing firms, relationships with customers and other specific market characteristics. In addition, in some markets, it is sometimes possible to test for the existence of SMP directly by examining evidence on pricing, costs and profitability. However, there are often problems in accurately measuring prices, costs and profits and hence indirect indicators of the risk of SMP may need to be relied upon in place of or in addition to trying to determine the existence of SMP more directly.

63. One factor in assessing price evidence in the NEM is the presence of significant price regulation. In particular, to help ensure sufficiently reliable electricity supplies while managing the financial risks of market participants, a market price cap and a market floor price are imposed. In addition, if the sum of the half-hourly wholesale market spot prices over a rolling seven day period exceed a cumulative price threshold, an administrative price cap is imposed.
64. As reflected in the regulatory framework, overall efficient operation actually requires generators to bid above their short run marginal costs at least some of the time in order to cover LRMC and thereby maintain incentives for efficient entry. While such conduct does involve the exercise of transitory market power, it is not, on its own, evidence of market power that is harmful to efficiency nor in need of regulatory intervention given the way the NEM pricing arrangements are structured. The AEMC's definition of SMP, which is of regulatory concern, is appropriately based on prices being sustained above LRMC.

2.2. Defining long run marginal cost

65. Long run marginal cost is the present value of future prices that is just sufficient to induce the efficient level of entry required to serve demand growth. The use of the term "efficient level of entry" in the above calculation of LRMC is deliberately intended to exclude costs that are unnecessary or not justified on socially efficient grounds. As discussed below, these may be costs that are actually incurred by generators at the moment and that need to be recovered – forcing prices above efficient LRMC.
66. The adoption of "efficient LRMC" as the benchmark rather than just LRMC allows for the definition of a barrier to entry to include artificial cost imposts on generators, that is, costs that, while real to the generator, are not necessary or socially desirable (in particular, the costs imposed on the generator are not offset by some benefit elsewhere). Consequently, certain types of regulation may be identified as a barrier to entry if the costs that they impose on generators are not justified. By contrast, costs that are high but simply reflect economic reality (e.g. high cost of materials for construction) will not be identified as a barrier to entry.



67. The definition of LRMC makes no distinction between costs incurred in meeting demand growth by independent new entrants (i.e. who are not incumbents) versus the expansion of capacity by incumbents. In this context, we are interested in factors that lead to prices being in excess of efficient costs to meet new demand. This includes factors that prevent expansion by incumbents where such expansion would otherwise be efficient.

2.3. Full definition of conditions giving rise to SMP

68. This allows us to complete the definition of conditions giving rise to SMP.

Substantial market power arises from any set of conditions that give rise to the ability of incumbent generators to set market prices above the level required to compensate for the efficient costs of new capacity required to meet demand growth in the NEM (or in a NEM region).

69. For the avoidance of doubt, SMP can arise from incumbent generators acting unilaterally or in a coordinated way with the consequence that prices are raised above long run marginal cost.

3. Potential barriers to entry in the NEM

70. SMP requires both that competition among the firms already in the market be ineffective at constraining prices to LRMC as well as significant barriers to new entry. Accordingly, before investigating evidence on barriers to entry, we believe that the level of competition arising from firms within the market should first be investigated. Next, we examine specific barriers to entry. We discuss why some market features that are sometimes put forward as barriers to entry do not meet our definition of conditions giving rise to SMP. In the case of the NEM, we believe that three particular categories do comprise barriers to entry. These are:
- i. Barriers to entry arising from socially inefficient imposts on generation in general and new entry in particular;
 - ii. Other structural features of the market that prevent entry from eliminating SMP; and
 - iii. Strategic barriers to entry that result from the behaviour of the incumbent generators.
71. In the following, we expand on this discussion and then in the next two sections we consider the evidence in relation to the effectiveness of competition among the existing firms in the NEM as well as the significance of entry barriers.

3.1. Ineffective competition among incumbent firms

72. It is relevant to consider the significance of barriers to entry only where competition among the firms already in the market is ineffective at preventing SMP. In particular, it is possible that the presence of even a handful of generators may be sufficient to constrain prices to LRMC even if new entry is not possible. Thus, before examining whether there are barriers to entry that are enabling SMP, we first consider the intensity of competition among the existing generators.
73. The degree to which firms within a market compete depends on a range of factors. A general observation is that more concentrated markets tend to have weaker competition than less concentrated markets, albeit that other factors will also be influential. Under one standard economic model of competition (Cournot competition where competition focuses on quantities), the presence of only a few firms in a market can lead to prices significantly above marginal costs even without a coordinated outcome.
74. A market in which one firm accounts for a substantial share of overall market output may enable that firm to price above LRMC, particularly by withholding capacity from the market so as to push market prices up. Other firms may not be able to increase their supply sufficiently to replace that firm's withdrawn capacity (e.g. if they are capacity constrained). Alternatively, other firms may judge that they would be better off by limiting any expansion in their supply so as to also take advantage of higher prices. It should be noted that this need not require any actual agreement between

firms. Rather, each firm may independently determine its best output decision but that the consequence of all firms' decisions is that market output is lower than competitive levels and prices are above LRMC. Such a market outcome is referred to as coordination or tacit collusion.

75. Coordination can arise in markets even where there is no single dominant firm. For example, a few players with similar market shares may individually determine that they can each maximise profits by limiting output with the consequence that market prices rise above LRMC. Economic theory, accepted by competition law, shows that coordination requires:
- a. Firms must be able to reach a coordinated position;
 - b. The coordinating firms must be able to monitor each other's adherence to the coordinated position;
 - c. The coordination must be sustainable in the sense that firms do not perceive that they could gain from deviating given the risk of being detected; and
 - d. The reactions of other firms and customers must not be able to undermine the coordination.
76. Whether these conditions characterises the NEM markets is examined in section 4. We next turn to examining what does and does not constitute a barrier to entry.

3.2. What does not constitute a barrier to entry

77. Some market features that raise the costs of new entrants do not necessarily create a barrier to entry that would warrant regulatory intervention. If there are high costs of new entrants but these reflect high social costs of that entry (e.g. resource costs) then these costs are simply costs of entry – not inefficient barriers to entry.
78. As discussed in section 2, there are factors that make entry into generation particularly risky for investors relative to entry into other industries. These include high sunk costs, large scale relative to the size of the market, long lead times, regulatory uncertainty and market uncertainty (including that arising from uncertain future regulatory actions), long lived assets and difficulties in reliably contracting prior to entry for a material portion of the asset's life.
79. All of these factors make investment in generation risky and many will tend to raise the required return that investors demand to fund new generation (or the price level in the market before investments will be made). However, it is not obvious that all or even any of these factors alone should be classified as a barrier to entry.
80. Historically, the competitive generation market was developed in which individual investors would bear the responsibility for risks of entry in order to encourage more efficient investment decisions. That is, many of these factors were recognised as 'real' and 'structural' factors that a market could and should take into account in order to generate efficient investment outcomes. It would be a mistake to conclude that just



because these factors raise costs and/or uncertainty that they constitute a barrier to entry relevant to considering regulatory intervention.

81. A simple rule of thumb is that if a cost/factor has been included in the estimate of efficient competitive level prices (i.e. LRMC) it should not, of itself, be identified as a barrier to entry. It would be inappropriate to identify a cost as a barrier to entry if it was also included in the benchmark used to determine a competitive level/path for prices. For example, high costs of gaining access to gas delivered to a suitable location in order to fuel a generator will not, as a rule, represent a barrier to entry. Only if that cost is artificially/inefficiently high would it be considered a barrier to entry.
82. That said, some of these factors may, in certain circumstances and in combination with other factors, play a role in creating a barrier to entry. For example, it is difficult to conceive of any scenario where barriers to entry would exist if it was not the case that entry resulted in large sunk/irreversible costs. Similarly, while some regulatory uncertainty may be unavoidable/desirable due to the need for the regime to remain flexible, it is possible that the level of regulatory uncertainty that currently exists is inefficiently high and, consequently, creates a barrier to new entry.

3.3. Barriers to entry arising from inefficient imposts on new entrants

83. Certain features of the structure of markets can prevent entry (or the threat of entry) from constraining prices to the efficient LRMC levels. Such features include inefficient imposts placed on independent entry and/or expansions of capacity by incumbents. Such imposts are socially wasteful in the sense that their benefits do not exceed their costs (e.g. overly zealous planning restrictions fall into this category). Alternatively, imposts may take the form of incomplete regulation or incomplete property rights (e.g. incomplete rights to transmission capacity). The relevance of such imposts to the NEM is discussed in section 5.

3.4. Other structural barriers to entry

84. Market prices can be held permanently above LRMC if it is the case that the potential new entrants expect that were they to enter they would not be able to earn a sufficient return to recover their costs including their costs of entry.
85. Potential entrants will evaluate whether to enter on the basis of the level of market prices that they expect following their entry. This may be a price level significantly below prevailing market prices if their entry is expected to disrupt the existing competitive dynamics in the market. For example, if there is a coordinated outcome currently in the market with prices significantly above LRMC, entry may cause that coordination to breakdown. However, it might be that the expected post-entry prices would then be expected to be too low to enable the entrant to recover its costs including its costs of entering. In such a situation, entry would be unlikely to occur even though the incumbents are then able to maintain prices above LRMC indefinitely.



3.5. Strategic barriers to entry

86. Separate to features that arise from the structure of the market and competition within that market, there may be actions taken by incumbent firms with the specific purpose of deterring entry. These are known as strategic barriers to entry.
87. There are potentially a wide range of actions that incumbent firms could undertake to deter entry. For example, incumbents could over-invest in capacity but withhold some of their capacity from the market so as to keep prices above LRMC. A potential entrant may be deterred from entering if they believe that the incumbent would expand its output should entry occur as the combination of the incumbent's full capacity as well as the entrant's capacity may lead to prices that are too low for the entrant to recover its costs. We examine strategic barriers to entry more fully in section 5.



4. Assessing effectiveness of competition among incumbents

88. As discussed in the previous section, before examining the significance of barriers to entry in particular it is useful to first investigate whether competition among the incumbent generation firms would itself be sufficient to prevent SMP. In this section, we examine the evidence on the effectiveness of competition among the incumbent generation firms in the NEM.

4.1.1. Relationship between existing competition and barriers to entry

89. If a regulator wishes to understand the likelihood of pricing above LRMC, then it is necessary to consider both the effectiveness of competition among existing players within the market as well as the significance of barriers to new entry. Only if both existing competition is ineffective and barriers to entry significant would firms be able to price above LRMC for a significant period of time.
90. Assessing existing competition is also important because entry will not necessarily overcome excessive pricing arising from ineffective competition among incumbent firms. First, as we discuss in section 5.3, coordination may be sustainable without attracting entry because potential entrants fear that if they were to enter the incumbents would respond by competing and drive down prices below the level necessary to recover the costs of entry.
91. Second, if the lowest cost (and most efficient) way to meet demand is by the incumbents expanding their capacity then entry by higher cost, independent generators will not be sufficient to ensure prices are constrained to efficient costs. In this case, ineffective competition among incumbent firms may lead to prices well above efficient costs (albeit just below the cost of new entry). Incumbents could represent the lowest cost means of expanding capacity if, say, the construction of co-located generation plant is able to take advantage of existing hard and soft infrastructure.⁹
92. Consider an extreme example where a small number of incumbents can all expand without limit at a cost of \$40/MWh in energy delivered by the expansion but where the equivalent for other generators, including independent new entrant generators, is \$60/MWh. In this scenario, the efficient LRMC is \$40/MWh. However, if the group of generators with the lowest cost expansion options can avoid competing with each other for the next expansions then they will be able to permanently sustain prices at a level of more than LRMC but less than \$60/MWh without ever facing new independent entry.

⁹ Examples of hard infrastructure include gas pipeline spurs and electricity transmission investments already serving the incumbents sites. Examples of soft infrastructure includes relationships with suppliers and existing workforce, contracts with retailers etc.



93. This scenario assumes that unilateral SMP and/or coordination by incumbents is sufficient to sustain spot prices above \$40/MWh on average in the short run. It also assumes that incumbents are able to coordinate on a 'fair sharing' of capacity expansions between each other. Otherwise generators would have a strong incentive to build new generation early in order to benefit from market prices being above the cost of those expansions.
94. There are a number of significant real world obstacles to such coordination. However, the long lead times involved in generation development and the fact that these would have to be signalled significantly in advance, including in the AEMO Statement of Opportunities, has the potential to facilitate such conduct.
95. There are two types of factors that could lead to incumbents' costs being below the costs of new entrants.
 - Higher costs reflecting unavoidable economic resource costs. For example, incumbents may have land available to them at existing sites that are less expensive to use for generation (e.g. because access to the transmission network already exists and/or because planning approval is likely to be easier given a generator already operates there). In addition, there may be economies of scale in other parts of the operation such as in maintenance and trading activities; and
 - Higher costs for independent new entrants caused by strategic behaviour of incumbents (this is discussed in section 5.2).
96. Even if new entry is not a credible threat except at high prices, if there is effective competition among incumbents then there is no need to rely on new entry to constrain prices to efficient costs. Consequently, the lack of competition among existing players can be a necessary condition for other constraints on competition to give rise to prices above efficient costs.

4.1.2. Approach to assessing competition among existing firms

97. Competition among incumbent firms may be ineffective if either one firm has a market position that enables it to unilaterally keep market prices above LRMC or if a group of incumbent firms have the ability and incentive to reach a coordinated position in which prices are above LRMC.
98. Competition authorities normally consider a range of evidence to assess whether unilateral or collective SMP is present.
99. A key type of evidence is the degree of concentration in the market. A high market share for one firm can give rise to a presumption of SMP. A high market share together with the inability of other firms to readily expand their supply is likely to indicate that the firm could profitably withhold capacity and raise its prices above LRMC as the other smaller firms would have difficulty taking sales from that firm.

100. The degree of concentration is also relevant to considering the potential for coordination. Where a market is dominated by only a few firms then coordination is likely to be easier to reach and maintain than where there are many firms. This has been supported by empirical analysis, e.g., see Koller et al. (1989).¹⁰ We consider the evidence of concentration in the NEM in the next section.
101. Other factors that can give rise to unilateral SMP include whether other firms are unable to match the costs of the dominant firm or are unable to expand their supply. These can arise from conditions that affect entrants as well as smaller, existing firms in the market. While we consider these in section 5 in our discussion of barriers to entry, we note that much of the analysis can also apply to existing smaller competitors.
102. In relation to other factors that can support reaching and maintaining coordination between the incumbent firms, a number of features of the market are relevant. Reaching a coordinated position in the NEM is made easier by electricity being a homogeneous product, the use of uniform price auctions (where a single price is set for all sellers)¹¹ and market players having significant information on each other's costs and capacities. However, there are also features that tend to make coordination more difficult including significant asymmetries between the players in each state market particularly in terms of their market shares (see the next section) and having different technologies and cost structures. In such cases, incumbent generation firms may have different ideas on where market prices should be and what share of market output is reasonable for them to obtain. In addition, significant bilateral contracting is likely to make coordination more difficult as rivals will not know the content of the contracts until their effect is evident in the market by which time it may be too late for the rival to respond.
103. The sustainability of coordination is likely to be supported by market transparency and the repeated interaction between the firms. This suggests that if one firm sought to deviate from the coordinated position, it would quickly lead to other firms also reducing prices. As a consequence, there would be little incentive to deviate as the firm doing so would face lower prices without gaining a higher market share for any significant period. In summary, we believe that if coordination can be achieved, it could be sustained for a significant period of time. However, whether coordination is achievable will depend significantly on the structure of each state market in the NEM. We address that in the next section.
104. A final type of evidence that is useful in assessing the effectiveness of competition among incumbents is actual evidence on pricing, investment and capacity utilisation. This evidence is also relevant to assessing the significance of barriers to entry and we address that in section 5.

¹⁰ Koller, R.; and Weiss, L. (1989). "Price levels and seller concentration: the case of Portland cement", *Concentration and Price*, Cambridge: The MIT Press.

¹¹ Fabra, N. (2003). "Tacit collusion in repeated auctions: uniform versus discriminatory", *The Journal of Industrial Economics*, vol. 51 (3), pp. 271-293

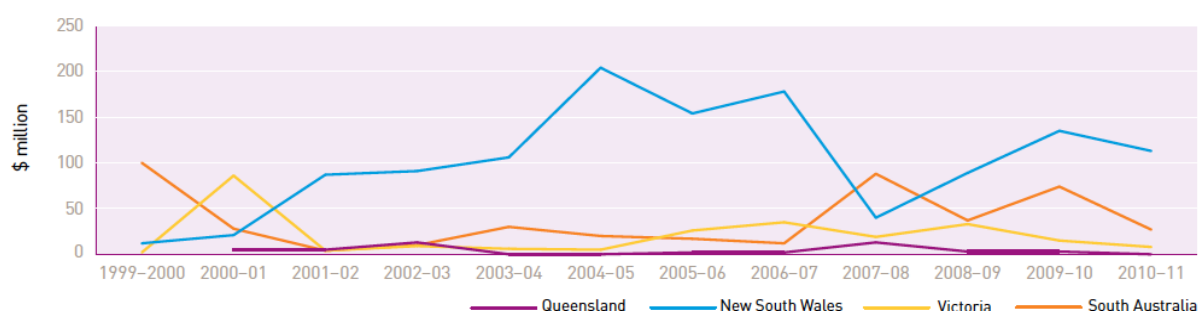
4.1.3. Concentration in generation

105. In this section, we examine the degree of concentration in generation in the NEM to help in the assessment of whether any one generation firm or group of firms is likely to have SMP.

State-based markets

106. We examine concentration in relation to each of the regions of the NEM separately. This is consistent with the conclusion of the NERA report that there are separate generation markets in each State. We note that while the States and the Territory of the NEM are interconnected, the level of trade between the regions is limited by losses in energy as electricity is transported large distances and the capacity of the interconnectors. When this capacity becomes congested, significant differences in prices can arise between regions. Prices were aligned in the NEM 61 per cent of the time in 2010-11.¹² Of course, this alone does not indicate inefficient capacity on interconnectors as it will often be more efficient to have some level of congestion than to incur the costs necessary to eliminate congestion (moreover, some price separation can be due to events such as planned or unplanned outages). The AER also notes that the volume of settlement residues, which arise from the difference between the price paid in the importing region and the price received in the generating region, provide an indication of the extent of interregional congestion. Figure 1 shows settlement residues over the last decade. Settlement residues have been most significant for New South Wales and South Australia reflecting their position as net importers.

Figure 1 – Settlement residues by region



Source: AER, *State of the Energy Market 2011*, Figure 2.8.

Market shares

107. Generation is relatively concentrated in the NEM. As the following table shows, the four largest players in each state account in aggregate for between 66 per cent and

¹² AER, *State of the Energy Market 2011*, p.34.



100 per cent of total capacity.¹³ Nonetheless, apart from Tasmania, in no state does one player hold more than 40% market share (at least when measured in terms of registered capacity) – this is a threshold used in European competition law as to whether there is a heightened risk of a firm having significant market power. This would suggest that unilateral SMP is less likely to be a problem outside of Tasmania unless there are other factors indicating SMP. However, it must be recognised that because of the difficulty of storing electricity, it is possible for even a small generator strategically placed on the industry cost curve to frequently have SMP (as discussed in Appendix A). AGL's position in South Australia is relatively large and hence that position does warrant further consideration.

¹³ In calculating the market shares in the table we have applied the approach of assuming state-based markets consistent with the NERA report. As the table does not include supply from interconnectors, the market shares can be considered to overstate the actual market position of the generators in each state. However, it should be noted that concerns about market power are likely to arise particularly when the interconnectors are congested. Further, as a number of generation firms are present in multiple states, it would be difficult to assess the precise market position of each firm without detailed modelling.

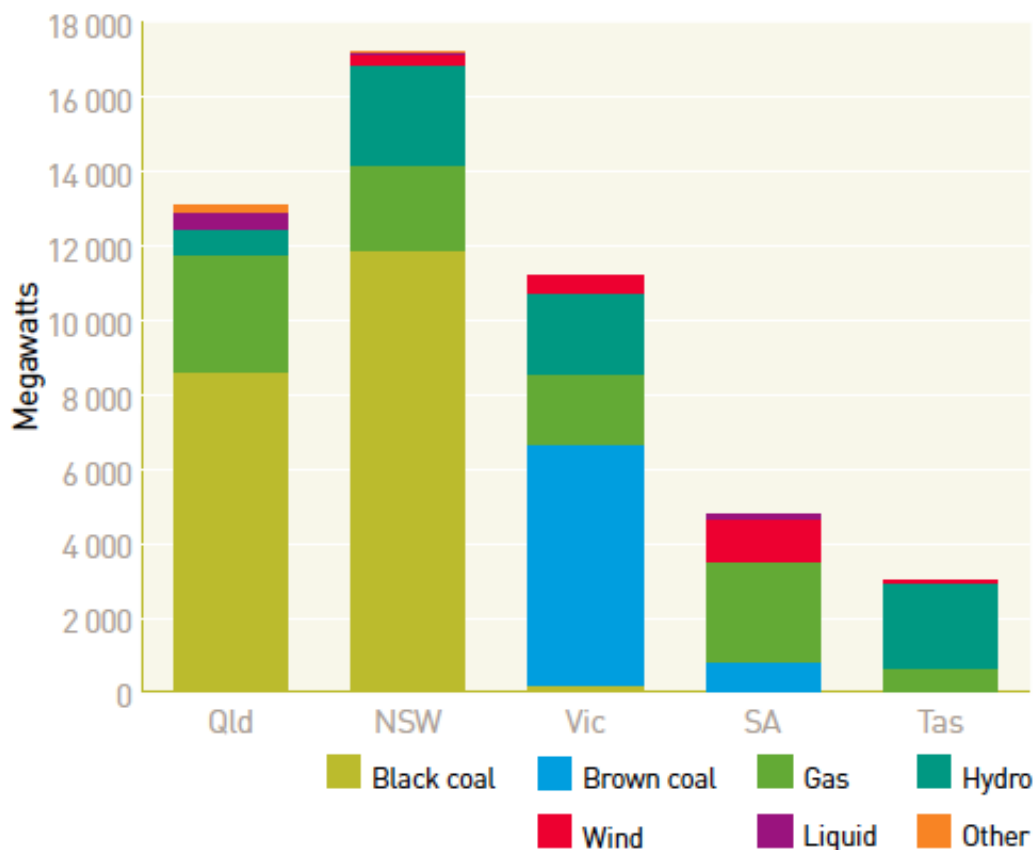
Table 1: Market share based on registered capacity (top 4)

State	Firm	Market share
NSW*	Macquarie	33%
	Origin	25%
	TRUenergy	20%
	Delta	19%
	Others	3%
QLD	Stanwell	33%
	CS Energy	19%
	Origin	9%
	InterGen	7%
	Others	32%
SA	AGL	37%
	International Power	20%
	Alinta	18%
	Origin	9%
	Others	17%
TAS	Hydro Tasmania	84%
	AETV	16%
	Others	0%
VIC*	International Power	23%
	AGL	17%
	TRUenergy	16%
	IFM	10%
	Others	34%

Source: CEG calculations based on information from AEMO Electricity Statement of Opportunities 2011, AEMO Energy Market Registration Lists and CEG research. Supply from interconnectors is not included.
 *Excludes Snowy Hydro's Snowy Mountain Scheme power plants situated between New South Wales and Victoria and which prior to 2008 had its own NEM Region. If allocated to each NEM region the Snowy Hydro would have around 18%/13% capacity share in Victoria/New South Wales.

108. Also evident in the above table is the significant differences in market shares between the leading players in each state. This is likely to make coordination more difficult as, for instance, individual players in particular states may believe they should be allowed a higher share than they are currently achieving. Coordination is also made less likely by the presence of different technologies and cost structures. The following figure shows the variety of different fuel technologies used across the NEM states.

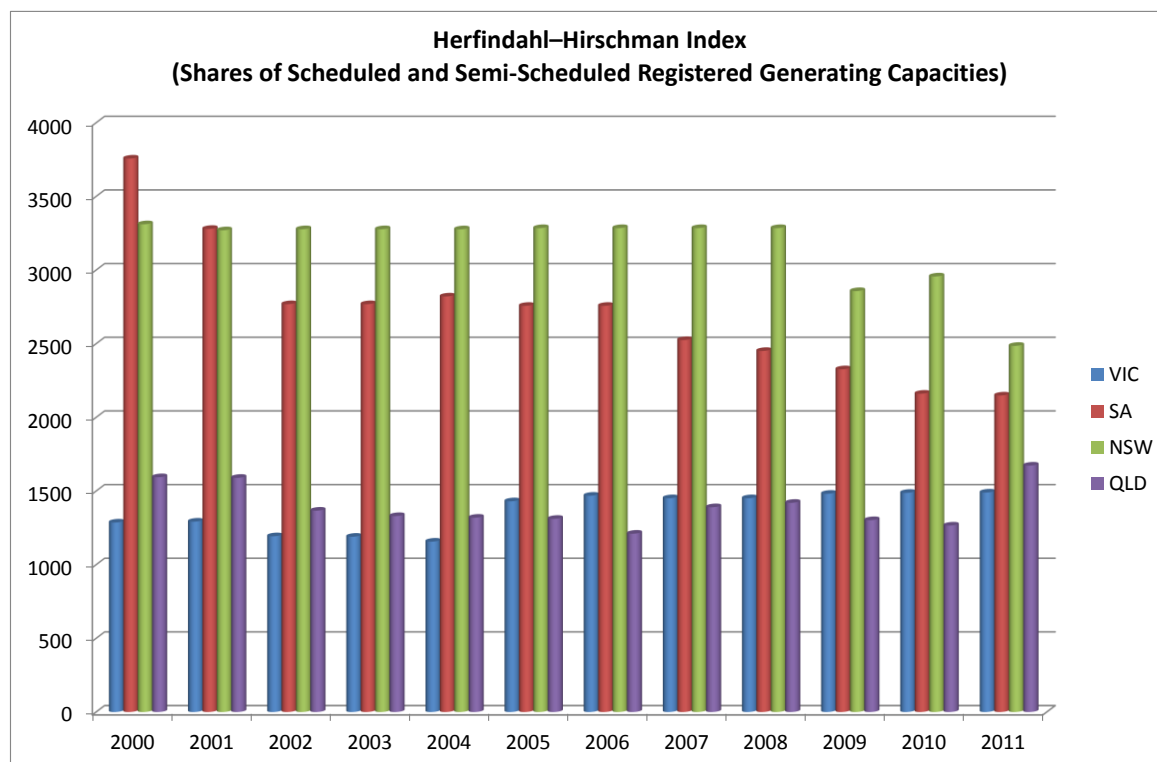
Figure 2 – Registered capacity by fuel source



Source: AER, *State of the Energy Market 2011*, Figure 1.4.

109. A more comprehensive measure of concentration that is also used by competition authorities is the Herfindahl-Hirschman Index (HHI) which is calculated by adding the sum of the squares of the market shares of each firm within the market. Markets with higher HHIs are considered to be more likely to suffer from weaker competition, although whether this is the case will depend on a wide range of other factors impacting competition. The ACCC's Merger Guidelines state that the ACCC will be less likely to identify competition concerns when the HHI is less than 2000.
110. The following figure provides a time series for the HHI in each NEM region other than Tasmania. We have excluded Tasmania because of the near monopoly status of Hydro Tasmania and the ongoing review into restructuring in that state.

Figure 3 – Time series for HHI in NEM



Source: CEG calculations based on information from AEMO Electricity Statement of Opportunities 2011, AEMO Energy Market Registration Lists and CEG research.

*Excludes Snowy Hydro's Snowy Mountain Scheme power plants situated between New South Wales and Victoria and which prior to 2008 had its own NEM Region.

111. In Victoria the most significant changes to the HHI occurred first, in 2002, when three new generating facilities (Bairnsdale, Somerton and Valley Power Peaking Facility) were added, and the HHI fell as the new players came into the market, and second, in 2005, when International Power acquired substantial interest in Loy Yang B and Valley Power with the effect that the HHI rose above its pre 2002 level.
112. In Queensland, HHI noticeably dropped in 2002 mainly due to: (a) the Millmerran power station being commissioned by InterGen and several new parties; (b) in 2006 when Braemar power station was launched by Babcock & Brown Power, a new party to the Queensland market at the time; and (c) in 2010, when Origin Energy commissioned Darling Downs and increased the capacity of Mt Stuart station, thus driving the shares of major incumbents down. Queensland HHI noticeably increased in 2007 due to CS Energy, a major player by then, increasing its market share further by commissioning Kogan Creek facility, and NRG selling its share in Gladstone facility to Transfield and thus increasing Transfield's market share. Concentration increased again in 2011, when Tarong Energy became a subsidiary of Stanwell Corporation, and Stanwell also obtained Swanbank B and E from CS Energy.
113. There have been substantial declines in HHI for New South Wales and South Australia. In New South Wales, prior to the recent GenTrader agreements, nearly 90%



of the scheduled generating capacity was controlled by three state-owned companies (Delta Electricity, Macquarie Generation, and Eraring Energy). Since GenTrader, the four largest incumbent companies (where 'ownership' is broadly defined as ownership over the output in a sense of GenTrader agreement) are: Macquarie Generation, Origin, TRUenergy, and Delta Electricity. Thus, the 2011 drop in HHI can be attributed to GenTrader agreements, while the earlier drop in 2009 was due to commissioning of two new facilities by private companies: Tallawarra by TRUenergy and Uranquinty by Origin Energy.

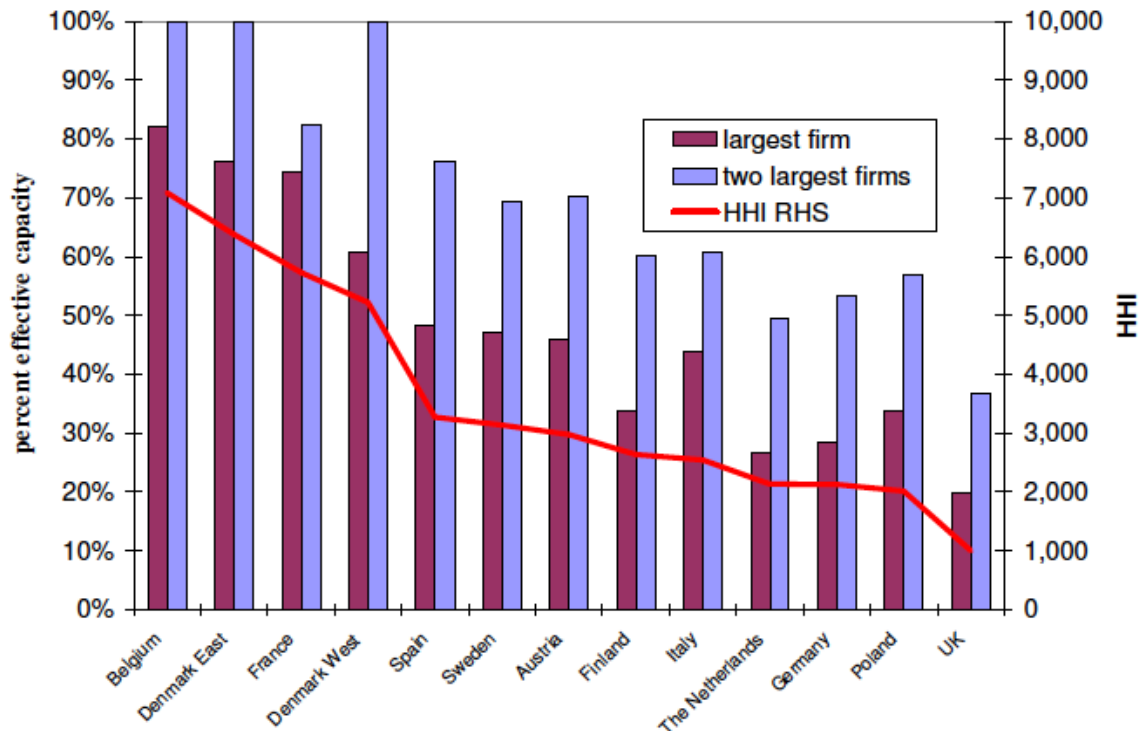
114. In South Australia, the initial fall in the HHI in 2001 and 2002 was due to new generating capacities being commissioned by new parties and parties with smaller market shares (Quarantine by Origin Energy, Hallett GT by AGL Energy, and Pelican Point by International Power). The fall in HHI in 2008-2011 has reflected both rearrangements of assets via asset sales and relatively modest expansions in capacity (mostly) by existing players.
115. The significant falls in HHIs in New South Wales and South Australia in itself is indicative of significant competition among incumbents and/or entry by independent generators. In either case, this suggests that even if SMP were present in those States, it is weakening over time.
116. It should also be noted that concentration in the NEM markets (apart from Tasmania) is generally towards the lower end of the range compared with international generation markets. In the US states, around two third of states have HHIs based on total generation capacity that are higher than 2,500.¹⁴
117. Generation capacity has also been highly concentrated in a number of European markets. Generation assets in 2004 remained largely in the hands of a few players (see Figure 4¹⁵). The European Commission also noted in 2007 that there had been relatively little investment by independent new entrants although some gas and renewable energy plants were being developed.¹⁶

¹⁴ Based on data for 32 states presented in US EPA, Electricity Generation Ownership, Market Concentration and Auction Size, July 2010.

¹⁵ Note that the HHIs are based on Effective Capacity which is defined as dependable generating capacity calculated from probability generation would be available when needed. This is a somewhat different measure to that used by us.

¹⁶ European Commission, Energy Sector Inquiry – First Phase, 2007, §407.

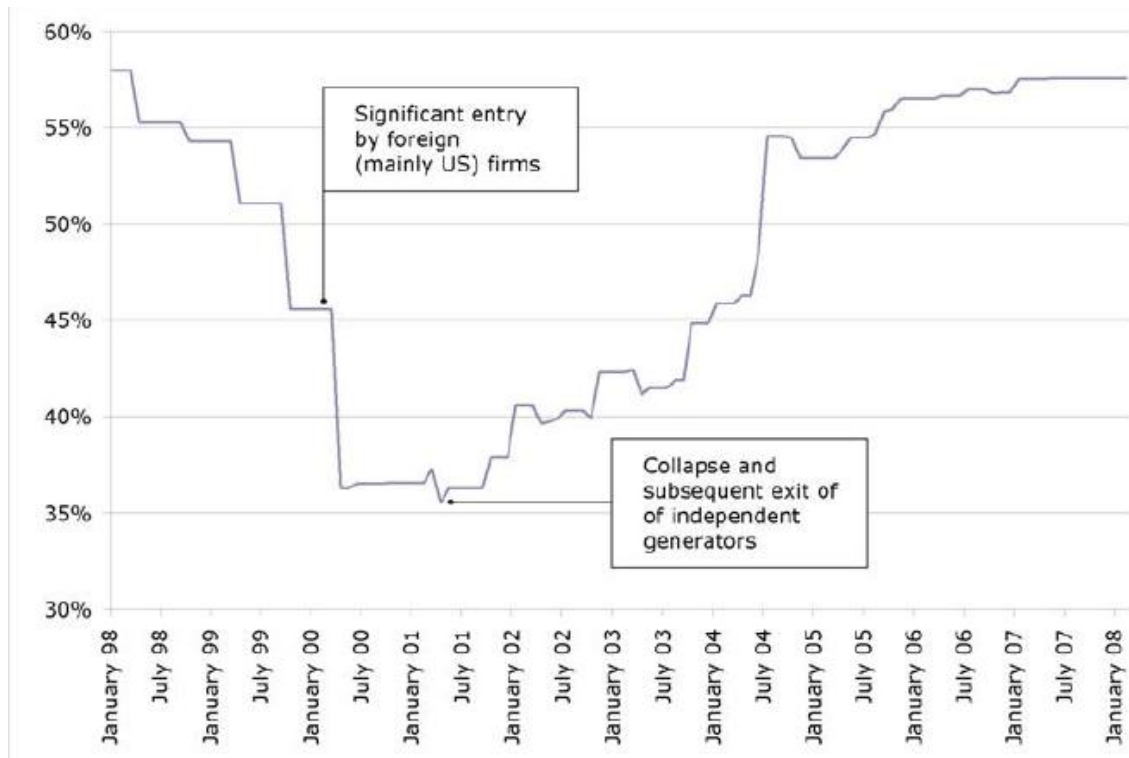
Figure 4 – Concentration in EU electricity (2004)



Source: Gilbert, *Market Power in US and EU electricity generation*, January 2009, Figure 2.

118. The UK market has been one of the least concentrated in Europe, although there has been significant consolidation in this market recently. There were a large number of independent UK electricity generation companies but the market has now consolidated with six large vertically integrated companies accounting for over 55% of generation capacity.

Figure 5 – Generation capacity shares of the largest UK suppliers



Source: Ofgem, *Electricity Supply Probe – Initial Findings Report*, 2008, Figure 2.3.

4.1.4. Conclusion

119. In summary, evidence on concentration suggests that unilateral SMP is unlikely in the NEM States with the exception of Tasmania. Outside of Tasmania, AGL's position in South Australia is more borderline on the basis of the market share evidence alone. HHIs are higher than the ACCC's threshold for the likelihood of competition concerns in New South Wales, South Australia and Tasmania. Nonetheless, HHIs have been falling in New South Wales and South Australia and are not substantially above the ACCC's threshold. In addition, there are significant differences in the market shares of the major players in each of the States. The evidence of concentration alone thus suggests that SMP concerns are less likely in most States except for Tasmania. Apart from Tasmania, the concentration evidence is less conclusive with respect to South Australia and New South Wales.
120. This overview of indicators of competition among incumbents has two key implications for the assessment of barriers to entry. First, it suggests that in NSW, Queensland and Victoria, it will be difficult to obtain an overall assessment of the significance of barriers to entry. In particular, if market outcomes are competitive then this could reflect the competition among the incumbents or the threat of new entry (in the case where prices are in line with LPMC, the significance of barriers to entry is also of less regulatory importance). In Tasmania and, to a lesser extent, South Australia, there is the greater potential for less competitive outcomes and thus these markets can



potentially provide clearer evidence on whether barriers to entry are allowing less competitive outcomes to be sustained.

5. Evidence on barriers to entry in the NEM

121. In this section, we examine the available evidence of the significance of barriers to entry in the markets of the NEM. We first examine the evidence in relation to the three specific types of conditions identified in section 3. We then consider evidence on overall market outcomes as to the significance of overall barriers to entry. Finally, we make some concluding comments and suggestions for next steps.
122. We now examine the specific evidence on the three types of barriers to entry that we consider are relevant to generation competition in the NEM. In particular, this evidence helps address the question: if competition among incumbent firms is ineffective, would entry (or the threat of entry) ensure that prices are constrained to LRMC. The first type of barrier to entry we consider relates to imposts arising from policies or regulation that prevent entry from effectively constraining prices.

5.1. The significance of inefficient imposts on new entrants

123. As discussed in section 2.2, investment in generation involves significant sunk costs such that it is highly sensitive to uncertainty in relation to future revenues and costs. Some uncertainty reflects real world factors and investors should efficiently bear that uncertainty as part of weighing up whether to invest. This includes uncertainty around future fuel costs and generation technology. Other sources of uncertainty may be in the control of Government or regulators.

5.1.1. Regulations relating to the environment and clean energy

124. It is possible that uncertainty around the future path of 'green energy' regulation may create uncertainty in relation to both future wholesale market prices and fuel costs. For example, current and prospective Government regulations that have the potential to encourage/discourage renewable generation investment will affect the average market price. An investor in new thermal energy generation will have to factor this uncertainty into its best estimate of future market prices before deciding on whether to invest. Similarly, uncertainty around the future price of carbon dioxide emissions will also have to be factored into the expected costs of thermal generation entry and the expected wholesale prices for all generation entrants (be they thermal or not). To the extent that this uncertainty about future Government policy is unnecessarily high then it could be causing investors to demand higher market prices prior to entry – pushing prices above the efficient LRMC.
125. It is also possible that policy uncertainty could distort the nature of technologies chosen. For example, policy uncertainty is likely to raise the required return on technologies with a relatively high proportion of fixed costs (such as base load generation plant) compared to peaking plants with lower fixed costs and higher marginal costs. The Investment Reference Group made these points in its April 2011 report for Report to the Commonwealth Minister for Resources and Energy.

Prices – Policy uncertainty will lead to higher prices for customers if there is inefficient investment from a longer term perspective, such as a focus on peaking gas plant rather than baseload plant when that is required. Customers may also pay higher prices as a result of policy uncertainty if it leads to investors seeking higher returns because of the higher risks they face. (Page 9)

126. Moreover, some regulations may, even if there is no uncertainty attached to them, simply be socially inefficient. Socially inefficient regulations arise if governments place constraints or additional costs upon the actions of generators that are not justified by the benefits derived from those regulations (or if the costs of the regulation for generators could be reduced by amending the regulation in some fashion without imposing high costs on other parties).
127. Inevitably, whether particular regulations fall into the category of being socially inefficient will require regulatory judgement. This may be the case with some planning regulations. By way of example, the Victorian Government has amended all planning schemes in the state to place strict limits upon the ability of firms to build wind turbines.¹⁷
128. The aggregate effect of these changes is that in most parts of Victoria (including locations close to population centres) the obstacles to developing wind farms are very high. According to media reports, no new wind farms have been proposed since the introduction of this amendment and the status of existing projects is in doubt.¹⁸ This may or may not be an example of a socially inefficient regulation depending on the level of benefits derived in the community from the savings in noise and visual pollution.
129. More generally, the Productivity Commission (PC) has evaluated a range of emissions reduction measures applied in the Australian generation sector including components of the Renewable Energy Target (RET), solar Photovoltaic (PV) feed-in Tariffs, the New South Wales and Australian Capital Territory Greenhouse Gas Reduction Scheme and the Queensland Gas Scheme. The PC found evidence indicating that

¹⁷ The amendment prohibits wind energy facilities in the following circumstances:

- Turbines within two kilometres of an existing dwelling except where the planning permit application includes evidence of written consent from the owner of the dwelling to the location of the turbine.
- Areas of high conservation and landscape values including National and State Parks described in a schedule to the National Parks Act 1975 and Ramsar wetlands as defined under section 17 of the Environment Protection and Biodiversity Act 1999.
- Locations that feature a high degree of amenity, environmental value, or significant tourist destinations including the Yarra Valley and Dandenong Ranges, Mornington Peninsula, Bellarine Peninsula, Macedon and McHarg Ranges, Bass Coast and the Great Ocean Road region.
- Locations identified for future urban growth including land in the Urban Growth Zone and designated regional population corridors specified in the Regional Victoria Settlement Framework Plan in the State Planning Policy Framework.

See <http://www.dpcd.vic.gov.au/planning/planningapplications/moreinformation/windenergy>

¹⁸ <http://www.abc.net.au/worldtoday/content/2012/s3433069.htm>

certain measures were raising costs in a socially inefficient way. For example, the PC found that the solar PV tariffs, in combination with the RET, “...*did not lead to any additional abatement, and only added to the total financial costs of meeting the target*”.¹⁹ The PC also found that subsidies for large scale renewables was high relative to more cost effective policies.²⁰

130. The Grattan Institute similarly found that grant tendering schemes and rebate schemes are generally highly inefficient in terms of their costs relative to the level of abatement achieved. For instance, the Grattan Institute found that while Federal and State Governments have announced around \$7.1 billion of grants to projects to reduce emissions, these were forecast to result in just 4.2 million tonnes of emissions reduction in 2010 and 7.2 million tonnes in 2020.²¹ In contrast, reducing Australia’s emissions to 5% below 2000 level by 2020 will require a reduction of 160 million tonnes of carbon dioxide a year. Rebates schemes (such as for purchases of solar hot water systems) were found to have cost Federal and State Governments more than \$5 billion and yet have reduced emissions by less than 2 million tonnes per year.²²
131. These factors tend to raise the level of industry costs above the efficient LRMC (for any given level of abatement). However, because these schemes involve subsidies for generation investment they do not necessarily raise the industry costs net of subsidies. Indeed, the level of subsidies may be sufficient that that it promotes an above optimal level of investment in generation overall (i.e., more than fully crowds out other generation investment) such that market prices may be pushed down below LRMC.
132. A carbon tax and emissions trading scheme can represent more efficient means of achieving emissions objective. However, the efficiency of these approaches depend on the level of the tax or the amount of emissions permit allowed. Further, uncertainty over the future of these schemes can itself deter efficient investment. Deloitte found in April 2011 that policy uncertainty in relation to carbon pricing was cited as the most significant uncertainty for future baseload investment.²³ While the passage of the Clean Energy Future legislation would have reduced uncertainty to an extent, significant uncertainty remains in the longer term as a change in Government would be likely to result in a change in carbon pricing policy. Further, even under the Clean Energy Future legislation, the transition to a floating market-determined price would still lead to uncertainty.
133. In summary, the extent to which emissions reduction measures lead to electricity demand being met by inefficient technologies, they reduce the demand that could potentially be met by efficient entrants. As such, inefficient reduction measures

¹⁹ Productivity Commission, Carbon Emissions Policies in Key Economics, May 2011, p.83.

²⁰ Productivity Commission, Carbon Emissions Policies in Key Economics, May 2011, p.84.

²¹ Grattan Institute, 2011, p.21.

²² Grattan Institute, 2011, p.21.

²³ Deloitte, Electricity Generation Investment Analysis, April 2011.



(particularly grant tendering schemes, rebates and PV feed-in tariffs) as well as policy uncertainty should be treated as barriers to entry. On the other hand, efficient and stable schemes may ease the entry of some efficient new entrants.

5.1.2. Access to transmission

134. An additional potential source of regulatory inefficiency relates to the terms and conditions of access to the transmission system that are able to be obtained by individual generation firms.
135. The level and type of investment by transmission businesses can have different effects on generators in different locations – by relieving congestion in some parts of the network and/or raising it in others. For example, interconnections between NEM regions allow energy to (generally) flow from high price regions to low price regions. As a result, interconnection capacity operates as a generator in the high priced region and demand in the low priced region. Interconnection provides both a substitute for generation and price signal to generation (if built, interconnection will encourage greater/less generation investment in the low/high price region).
136. A new entrant to the NEM must negotiate with a transmission network services provider (TNSP) in order to connect to the transmission network – including negotiating to pay the costs of these connections. The difficulty with which these connections can be negotiated and the level of costs that generators must bear have the potential to give rise to barriers to entry.
137. Moreover, once connected to the transmission network generators require access to that network in order to sell their energy. If the network becomes congested a generator may not be able to sell all of the energy that they would like to. Within the NEM it is not possible for generators to buy firm transmission rights (rights to be able to generate at a given capacity or to be compensated financially in the event of congestion).
138. A report by SFS Economics noted that “a number of sections of the existing transmission network in South Australia are strained, certainly during high demand conditions” and that as a consequence of increased wind turbines, thermal power stations will increasingly be constrained off and congestion of interregional interconnectors is expected to increase.²⁴
139. If a new entrant cannot reliably plan on having uncongested access to the transmission network over the life of their investment then this will lower the expected revenues from an investment and will raise the uncertainty associated with the investment.

²⁴ SFS Economics, Barriers to entry in the South Australian region of the NEM, 2010, p.27.

140. The AEMC is currently considering these issues in the context of its Transmission Frameworks Review. As acknowledged in the AEMC First Interim Report, the current NEM open access regime gives generators insecure property rights to the transmission network. At the other extreme to the current regime is a regime with 'perfect' or 'fully allocated' property rights. In this regime, all generators would have secure rights to the transmission network (and would have to pay for the creation of any new rights). At least in theory this would allow generation decisions and transmission planning decisions to be coordinated in a market process.
141. It may be that the costs associated with transitioning to such a regime, and the costs associated with managing a more administratively complex regime would exceed the benefits. The AEMC also nominates other alternatives to the current regime that may send better signals to generators about the cost/value of transmission usage.²⁵ It is plausible that at least one of these options is significantly superior to the current regime and which, if implemented, would materially lower the industry LPMC. If so, then the failure to adopt such a reform would be an example of a barrier to entry (as defined in this report).
142. Large scale transmission investments, including interconnection, are subject to a regulatory regime within the NEM that requires TNSPs to undertake a cost benefit analysis before proceeding with the investment. The level of investment is, consequently, partly dependent upon the structure of the regulations that govern that cost benefit test. Too little or too much investment relative to the optimal level will result in a higher actual LPMC than the efficient LPMC. Consequently, to the extent that the regulatory regime associated with transmission investment is sub-optimal this could be a source of a barrier to entry as defined in this report. Potential enhancements to planning arrangements are being considered as part of the AEMC's Transmissions Framework Review.

5.1.3. Retail regulation

143. Retail price regulation will undermine contestable supply where regulation sets prices below competitive levels. In this scenario, customers already on regulated tariffs will not be contestable (at least not on the basis of price) and customers on competitively supplied contracts will, to the extent that jurisdictional arrangements allow it, have an incentive to switch back to a regulated tariff.
144. The potential for this outcome to occur creates an additional source of risk for competitive retailers that their margins will be compressed and/or that their volumes will not be sustained. This in turn may cause retailers to be reticent to enter into long term contracts with generators. That is, the risk of future regulatory error in setting the regulated retail price creates an additional uncertainty in retailers' ability to plan for sustained demand for their product. This, in turn, increases the risks associated with entering into long term contracts with generators.

²⁵ Ibid, pg iii.



145. TRUenergy has made submissions along these lines to the QCA recently in the context of the QCA adopting an approach to retail regulation that could see the allowance for the cost of wholesale energy fall below the QCA's estimate of LRMC.

Given the uncertainty already in the market regarding carbon costs, setting an energy cost allowance below LRMC will make retailers unwilling to enter long-term forward contracts at LRMC. This in turn will diminish the willingness of private capital to invest in the new generation capacity that Queensland clearly requires. Higher and more volatile wholesale electricity prices are likely to result and the risk of blackouts will increase. It is hard to see how adopting an electricity pricing approach that is likely to hinder investment is in the long term interests of electricity customers. As a potential investor in new generation, we urge you to reconsider creating further investment uncertainty by not utilising LRMC as a floor price.²⁶

146. We are sympathetic to the sentiments expressed by TRUenergy in the above quote. However, this is not because we consider that it necessarily follows that setting regulated retail prices on the basis of forecast spot prices below LRMC must lead to the results described by TRUenergy. However, such an approach does raise the potential for this to occur.
147. Ultimately, the question is whether retail price regulation results in prices below competitive retailers' truly expected costs. Setting prices below LRMC does not necessarily give rise to this result. If all market participants expect that spot prices over the next year or so will be below LRMC then we would expect that contract markets, even for long term contracts, will reflect this. Consequently, if the QCA accurately forecast expected contract prices to be below LRMC then retailers should still be willing and able to compete with the regulated tariff and therefore be willing to enter into contracts with generators to do so (the more so to the extent the QCA has allowed sufficient headroom in its total cost build up).
148. However, this benign view requires that the regulator's assessment of expected wholesale prices is accurate – accurate at the time the forecast is made and remains accurate over the period the regulation is in place. In this context, removing LRMC as a floor for the regulated wholesale energy cost must raise the potential that this allowance will inadequately reflect retailers' expected wholesale costs – giving rise to the disincentive to enter into long term contracts with wholesalers. Of course, if sufficient other headroom is allowed in the cost build up then this risk can be mitigated.
149. Ultimately, while retail price regulation is in place the risk of a future error exists – even if current practice is error free. The risk of future error will tend to raise the risks to retailers in entering into long term contracts with generators – although the materiality of this effect is open to debate. A more limited supply of retailers seeking long term

²⁶

<http://www.qca.org.au/files/ER-TRUenergy-Submission-RevRegRetailElecTariffsPrices-0811.pdf>

contracts has the potential to raise the risks and costs of generator entry which must rely on such contracts to underwrite that entry.

150. Evidence from a number of studies suggests that inefficient imposts are likely to be creating barriers to entry in the NEM markets. In particular, there are a range of Government emissions reduction schemes that have been found to be highly inefficient and these can be expected to be limiting the demand available for efficient new entry (albeit that the aggregate impact of these schemes on costs should not be overstated given that part of the reason for their inefficiency is the relatively small scale of many schemes). Inefficiently congested transmission network capacity or a lack of property rights to scarce transmission capacity could also represent a barrier to entry. The AEMC's Transmission Frameworks Review should help lead to efficient investment decisions going forward. Finally, the potential for overly aggressive retail regulation also has the potential to limit demand for generation contracts that new entrants rely on to fund investment. This is true even if current retail price regulation is not aggressive.

5.2. Other structural barriers to entry

151. In the presence of sunk and irreversible costs associated with entry/expansion (as is the case for electricity generation in the NEM), market prices can potentially be held permanently above the costs of efficient new capacity without attracting competitive new entry. In particular, this could be the case if the post-entry competitive dynamic (e.g. level of coordination) differs to the pre-entry competitive dynamic that gave rise to the pre-entry price level.
152. Incumbents earning high prices may reflect the results of unilateral/collective conduct by the incumbent(s). Entry may be expected to cause a breakdown in the ability to maintain that conduct. As a result, a rational potential new entrant may not enter even if they expect that, absent their entry, prices will be permanently above their costs. That is, for the new entrant it is the expected price post entry that determines entry decisions not the pre-entry prices.
153. A specific example of where this may be the case is where capacity expansions require lumpy investments²⁷ relative to the size of the market and there is relatively low (or even negative) demand growth relative to incumbent capacity. In this scenario the efficient outcome may be that there is no need for any new capacity for the foreseeable future and entry would create material overcapacity. In this scenario, even if the incumbents were to coordinate to maintain prices above LRMC this need not be expected to result in independent new entry if the resulting excess capacity would lower the expected path of prices below LRMC.

²⁷ "Lumpy investment" creates an 'integer problem' associated with a minimum efficient scale of investment. That is, incremental entry that is small relative to the size of the market is not feasible. The existence of lumpy investment relative to the size of the market is important because the need for entry to occur on a non-trivial scale means that the new entrant cannot expect to receive the same prices post entry as they observe pre-entry.

154. With lumpy investment, new entry may be so disruptive to incumbent coordinated conduct that it becomes a non-credible threat to that conduct. That is, the potential new entrant knows that entry will destroy the conditions giving rise to coordination and high prices. Consequently, high prices do not attract the new entrant because the act of entry will make them disappear. Knowing this, incumbents feel free to coordinate to raise prices above long run marginal cost.
155. Potentially, this situation could apply currently in SA at least with respect to new large scale entry by, for example, a CCGT plant. Demand in South Australia is not growing at a strong rate and the AEMO is not predicting the need for material new capacity. In these conditions it is conceivable that incumbents would be able to raise average market prices above the level that would make a new CCGT plant profitable without inducing entry by that plant. However, we note that recent prices in South Australia have fallen relative to levels in 2008 to 2010 and that NERA has estimated that these prices have been consistent with LRMC (see discussion of NERA report above).
156. One issue in investigating the presence of such barriers is the distinction between contracted prices and spot prices at a particular point in time. An incumbent generator that has committed most of its potential output under fixed price wholesale or retail contracts may be able to maintain high contracted prices even while it subsequently lets spot prices fall to relatively low levels. The low spot prices in turn may discourage entry. Thus, the presence of low spot prices at a particular point in time should not be taken as implying that incumbent firms are not earning overall revenues above LRMC. We discuss this issue further in the next section in relation to leverage of market power into retail.
157. In summary, these other structural barriers to entry would be significant only to the extent to which prices were found to be above LRMC for significant periods of time. We consider the pricing evidence for the mainland States of the NEM in Section 5.4. This suggests that these types of barrier to entry do not raise concerns in these markets. We do not have sufficient evidence to make a conclusion in relation to Tasmania.

5.3. Strategic barriers to entry

158. Strategic barriers to entry exist where the actions of an incumbent create or strengthen the barriers to entry discussed in the previous section. In this section, we examine the relevance of strategic barriers to entry to competition in the NEM markets.

5.3.1. Installing or signalling the imminent installation of new capacity

159. In the previous section we discussed the potential for a barrier to entry to exist if a minimum efficient scale entrant expects their entry to materially alter the nature of the pricing strategies of the incumbents.
160. This expectation may arise purely due to the natural structure of the market (ie, a small market relative to minimum efficient scale with slowly growing demand). Alternatively,

incumbents could act in ways to deliberately promote such an expectation. Dixit (1980) develops a model where incumbent firms have an incentive to install excess capacity in order to commit irreversibly to that capacity – deliberately creating the conditions necessary for an independent new entrant to expect low prices.²⁸ That is, incumbents make costly capacity expansions themselves in order to deter *independent* entry – with the effect that they can unilaterally or in concert continue to price above efficient costs.

161. A necessary condition to establish pre-emption of entry due to incumbent capacity expansions is to establish that incumbents have been/are expanding capacity. The following facts could be consistent with a theory of pre-emption:

- Since acquiring Torrens Island A and B in 2007, AGL has been the largest incumbent generator in South Australia and has invested in 351MW of new scheduled or semi scheduled capacity out of a total of 927MW. All of AGL's investment has been in wind farms;
- New entry/expansion outside the four largest generators has accounted for just under 50% of investment in total scheduled or semi-scheduled capacity – all of which is wind based. The share of the four largest generators in thermal capacity has increased over the same period with Origin Energy and International Power adding 128 MW and 22 MW in capacity from 2008 to 2011 while Infratil's Angaston power station's registered capacity dropped from 51 MW in 2010 to zero in 2011²⁹; and
- All of the announced plans for scheduled generation in South Australia (where at least one of land, finance, equipment or planning approval have been obtained for the project) are by large incumbent generators/retailers (AGL (500-750MW), Origin (650MW), International Power (320MW)).

162. However, these facts are also consistent with numerous other theories/views, including that:

- Incumbents have the lowest cost expansion opportunities;
- Investments made by AGL (but not Origin) since 2007 have been in wind farms and this has been driven by AGL's need for RET certificates given its position as a large retailer; and
- The announced plans of the incumbents are less than fully credible threats to potential new entrants – in order to be fully credible investment/construction may actually need to have begun. For example, the planned major expansion of its Torrens Island Power Station was announced in November 2009 with AGL hoping "to begin construction in about two years".³⁰ The AEMO noted in June 2011 that

²⁸ Avinash Dixit, 'The Role of Investment in Entry-Deterrence', 90 Economic Journal 95 (1980).

²⁹ Noting that Angaston was, in any event, subject to an offtake contract, potentially with AGL Energy, in 2011. See, <http://www.infratil.com/content/view/1894/1/> and <http://www.aemc.gov.au/Media/docs/ESIPC-fbb4ac2f-b32f-4b3a-83bd-78a850b10f8c-0.PDF>.

³⁰ Press release of the South Australian Premier, 6 November 2009.

the expansion is subject to market demand and is “expected within the next 2-3 years”.³¹ While market factors may have led to the delay, it is also possible that the intention of announcing the planned expansion well before any actual construction may have been directed at discouraging other players from making large investments in South Australia.

163. In other states incumbents have played a varying role in past capacity expansions and have varying importance in terms of planned investments. We discuss the evidence on investment in Section 5.4.2.
164. In addition, the past investment would not constitute pre-emption if it was undertaken at a time where it was clearly justified by market conditions. The Major Energy Users have argued that capacity in South Australia has been such that no new investment is needed and therefore prices should not have been as high in South Australia as they were in 2008 to 2010. If correct, continued investment by incumbents could be construed as evidence in support of pre-emption theory:

[...] the AEMO Electricity Statement of Opportunities (ESoO) issued in 2009 highlights that new generation investment was not required in the SAVic region for another 4 years at the earliest and considers, in its alternative regional summer outlook, that the additional capacity could well be needed even later. This deferred need is reinforced in the 2011 ESoO which indicates that no new capacity is required in SA region until 2014/15 at the earliest despite there being no new dispatchable generation being provided in the interim. This means there is little doubt that the market signals in SA in 2008, 2009 and 2010 do not signal the need for more generation but result from other causes.

*Such practical analysis indicates that the market price signals are totally at odds with quantitative assessments of need. This means that there is a need to examine the market for other reasons why there are these spurious price signals. Both the MEU and AER have stated a view that the high prices in 2008, 2009 and 2010 in the SA region were from the exercise of market power, and this has resulted in regional prices well in excess of those market signals indicating the need for additional generation that the SA region saw in 1999/00 and 2000/01.*³²

165. On the other hand, in assessing AGL’s investment in South Australia, SFS Economics have noted that:

it is difficult to tell whether AGL’s investment would be economic in its own right, or whether it represents a loss-making strategy aimed at pre-empting investment by other parties. This depends, among other things, on future load growth and therefore what proportion of the new capacity would be required, and on the

³¹ AEMO, South Australia Supply and Demand Outlook, 2011, p.38.

³² Major Energy Users, Comments on the AEMC Technical Paper provided by NERA, pg 6.



*effect on spot market prices of the investment, taking account AGL's future bidding behaviour.*³³

166. As such, we note that pre-emption is potentially a problem in South Australia. In this respect, ongoing monitoring of the South Australian market would be warranted.

5.3.2. Leverage of substantial market power in retail

167. Another potential form of pre-emption can arise from vertical integration between generators and retailers (either through common ownership or long term contracts). This would be considered a form of pre-emption to the extent that the aim of this conduct, at least in part, was to raise the costs of hedging for independent new entrants. Vertical integration between generators and retailers has been a source of concern in the past for the ACCC.³⁴ On the other hand, vertical integration can often be efficient such as in terms of reducing transaction costs or facilitating better risk management. Accordingly, regulators should be cautious in drawing implications from the extent of vertical integration.

168. In recent years, there has been an increasing trend towards more vertical integration. For example, between 2007 and 2011, AGL, Origin Energy, TRUenergy, made a number of acquisitions in the retail and generator sectors. One of the largest acquisitions was AGL Energy's acquisition in 2007 of the Torrens Island power station (40 per cent of South Australian capacity) from TRUenergy in exchange for the 150 MW Hallett power station and a cash sum. AGL also has a large share of the retail market in South Australia. More generally, the AER has noted that since 2007 there has been negligible investment in generation by firms that are not also present at the retail level.

*Around 58 per cent of new generation capacity commissioned or committed since 2007 is controlled by these three entities. Generation investment since 2007 by entities that do not also retail energy has been negligible. In addition, many new entrant retailers in this time are vertically integrated with entities that were previously stand-alone generators — for example, International Power (trading as Simply Energy in retail markets) and Infratil (Lumo Energy).*³⁵

169. Figure 1 shows the extent of vertical integration with many of the significant players in generation in New South Wales, Queensland, South Australia and Victoria also being

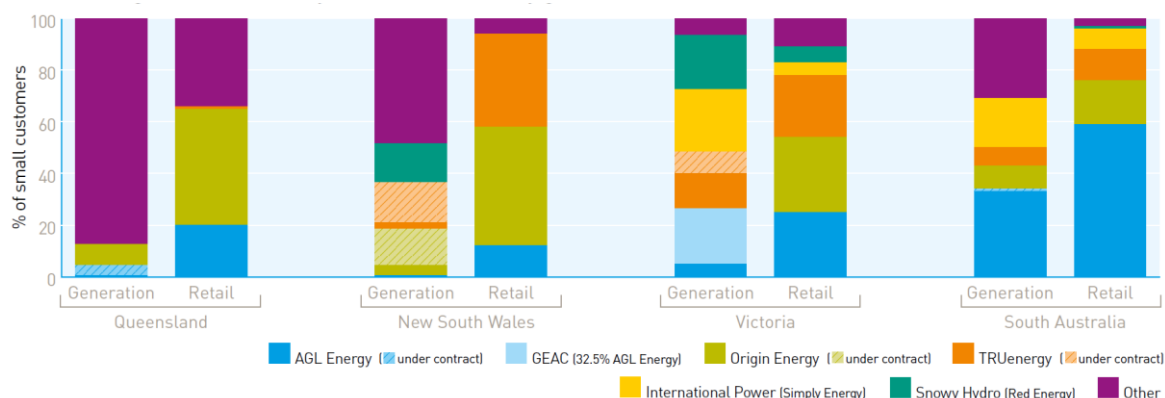
³³ SFS Economics, Barriers to entry in the South Australian region of the NEM, 2010, p.32.

³⁴ In 2003, the ACCC attempted to prevent the part acquisition of Loy Yang A power station in Victoria largely based on a view that vertical integration of AGL's retail operations with generation activity would lessen the efficiency of the contract market.

³⁵ Source: AER, State of the Energy Market 2011, p.106.

present at the retail level. In South Australia AGL has a retail market share of about 55%³⁶ and a generation market share of about 35%.³⁷

Figure 6 – Vertical integration in electricity retail and generation 2011



Source: AER, *State of the Energy Market 2011*, p.13.

170. Vertical integration has been identified as contributing to a reduction in liquidity in the market for hedging contracts used by generators to reduce the risks of spot market exposure. For example, D-cyphaTrade has noted that futures market liquidity is particularly poor in South Australia and has deteriorated in New South Wales.³⁸
171. Illiquidity in the market for hedging contracts could act as a significant deterrent to entry. The expectation of obtaining, on reasonable terms, a five to ten year contract for a material part of their capacity may be a prerequisite for a potential new entrant to be able to arrange for finance (again, on reasonable term) for the up-front costs of project development. If a potential new entrant cannot expect to obtain such a hedging contract then their cost of financing (both equity and debt) may be materially increased. A material increase in their cost of financing may make entry uneconomic even in circumstances where prices would justify entry conditional on hedging contracts being available.
172. In order to illustrate the potential problems with vertical integration, consider a scenario where there is a single supplier of both retail and generation services in a market. Let demand be growing such that new generation capacity is required. The incumbent generator has a natural hedge for building that capacity due to their vertical integration into retail – such that retail demand will grow with market demand. By contrast, an independent generator must, if they are to obtain hedging, contract with the incumbent retailer who is the only party with a natural demand for a contract with the generator.

³⁶ ESCOSA, Annual performance report: South Australia Energy Supply Industry, November 2011, Figures 2.8 and 2.10. Residential and small business customers.

³⁷ Based on scheduled capacity. CEG analysis based on AEMO, Electricity Statement of Opportunities, update as at 2 March 2012.

³⁸ d-cyphaTrade, Strategic priorities for energy market development, Submission to AEMC, 2011.

173. However, in this circumstance the incumbent retailer may prefer to deny the new entrant such a contract in order to raise the new entrant's costs and preserve SMP in generation. This may occur even if the new entrant offers a contract price that is lower than the incumbent's estimated cost of their own expansion. This is because the incumbent will rationally estimate the cost of accepting such a contract as the contract price plus the loss in any future profits due to a loss in SMP in generation.
174. However, it must be noted that, in pursuing such a strategy, the incumbent risks inducing entry by another vertically integrated retailer/generator. That is, a generator attracted by high wholesale prices but denied hedging contracts may embark on a strategy of entering into the retail market, including serving large industrial customers, in an attempt to obtain a natural hedge. Promoting such a strategy by denying hedging contracts risks undermining the incumbent's SMP in both generation and retail.
175. Of course, there can be obstacles to independent new entrants finding foundation customers in such situations especially where there are significant economies of scale. As noted by Rasmusen et al (1991).

Ordinarily, a monopoly cannot increase its profits by asking customers to sign agreements not to deal with potential competitors. If, however, there are 100 customers and the minimum efficient scale requires serving 15, the monopoly need only lock up 86 customers to forestall entry. If each customer believes that the others will sign, each also believes that no rival seller will enter. Hence, an individual customer loses nothing by signing the exclusionary agreement and will indeed sign. Thus, naked exclusion can be profitable.³⁹

176. Potential independent new entrants have complained about the difficulties of acquiring foundation contracts on reasonable terms from vertically integrated retailers in South Australia and in the NEM more generally. One such complaint aired publicly was made by Pacific Hydro, who noted that:

The Australian retail energy market is dominated by a few very large vertically integrated entities, who are not only our potential customers but also competing for funding under the solar flagships program.

It is not unreasonable to expect that this conflict will continue to occur in the future which requires independent power producers like ourselves to continually evolve and adapt.

Pacific Hydro has been working on our retail market strategy for some time and we are very confident that it will be a success with projects like the Moree Solar

³⁹ Rasmusen, Ramseyer, Wiley, Naked Exclusion, *The American Economic Review*, Volume 81 December 1991.



*farm part of a future diversified renewable energy portfolio that will include wind and possibly into the future geothermal.*⁴⁰

177. Of course, the fact that businesses are unable to negotiate hedging contracts on terms that they regard as reasonable may simply reflect that they are underestimating the fair market price for hedging.

178. Also relevant is the claim by the AER, referred to above, that:

Generation investment since 2007 by entities that do not also retail energy has been negligible. In addition, many new entrant retailers in this time are vertically integrated with entities that were previously stand-alone generators — for example, International Power (trading as Simply Energy in retail markets), Infratil (Lumo Energy) and Alinta Energy.

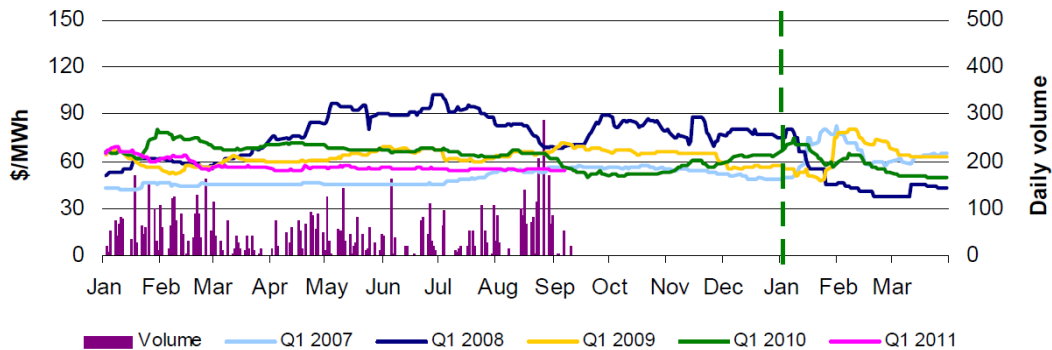
179. One explanation for the above facts is that vertically integrated retailers are unwilling to deal with independent entrants on reasonable terms. Another is that vertically integrated generators had the least cost expansions and would have had them even if they were not vertically integrated. A still further explanation is that there are synergies of vertical integration that cause vertically integrated firms to have lower costs. That is, vertical integration may be a dominant strategy not because it raises other firm's costs but because it lowers total costs for vertically integrated firms.

180. Nonetheless, there is evidence to the effect that high levels of vertical integration would raise the costs of hedging for an independent generator. First, the ability to hedge using exchange traded derivatives⁴¹ is clearly worse in South Australia than, for example, Victoria. This is demonstrated in the following figures which show a materially lower liquidity for South Australian exchange traded contracts than for exchange traded contracts in other NEM states. These figures compare for each region the closing daily base contract prices for the first quarter of 2007, 2008, 2009, 2010 and 2011 against the fifteen months to the end of that quarter. The vertical dashed line signifies the start of the Q1 period for which contracts are being purchased. The daily volume of Q1 2011 base contracts traded are also shown.

⁴⁰ <http://www.pacifichydro.com.au/2012/02/27/moree-solar-farm-partners-submit-new-bid-announce-new-lead-contractor/?language=en>

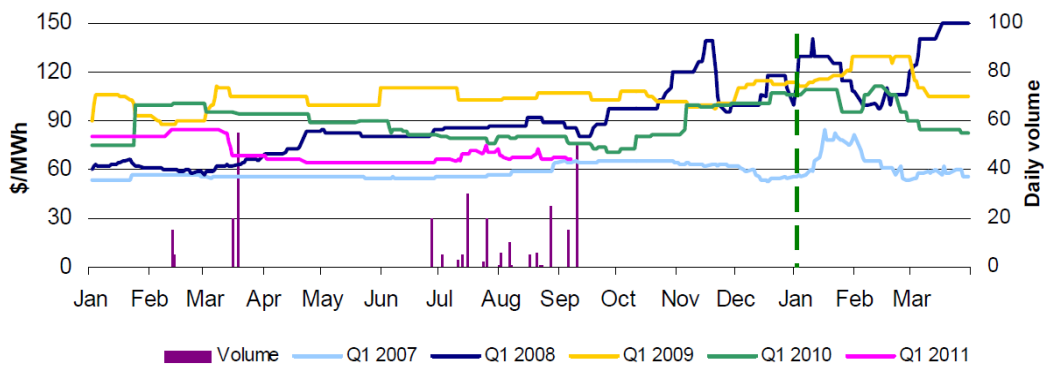
⁴¹ Futures contract prices traded on the Sydney Futures Exchange (SFE).

Figure 7 – Victorian derivative liquidity



AER, Weekly Electricity Market Analysis, 5-11 September 2011.

Figure 8 –South Australian derivative liquidity



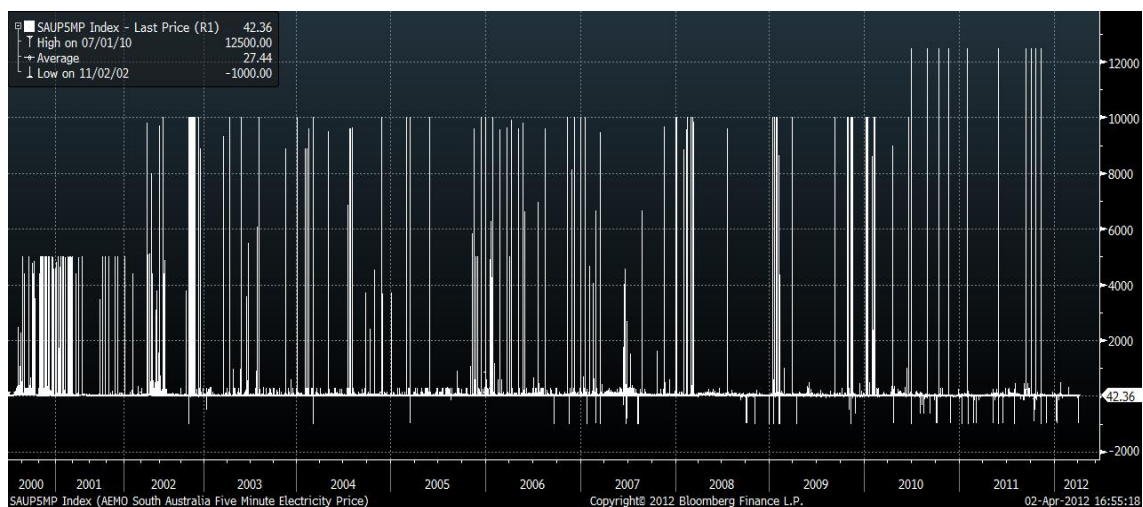
AER, Weekly Electricity Market Analysis, 5-11 September 2011.

181. The comparison between these charts demonstrates the lack of liquidity in South Australia relative to Victoria (of course, this does not provide any direct evidence of the difficulty of hedging using bilateral 'over the counter' (OTC) contracts).
182. It is also important to note that vertical integration can give a generator with SMP the incentive to reduce prices as well as increase prices. This will be the case where the vertically integrated firm is long on retail (i.e. is buying more electricity than it is selling).⁴² In which case, the firm may have an incentive to act in a manner that lowers wholesale prices – especially where market conditions are such that prices can be dramatically reduced (e.g. to negative \$1000 per MWh). This assumes that low prices caused in this manner do not get reflected in competitive retail prices (i.e. are not expected to be a permanent strategy by other retail players).

⁴² Of course, it is only possible to know this if one knows the position that the generator has taken in contract/derivative markets. This information is not generally publicly known.

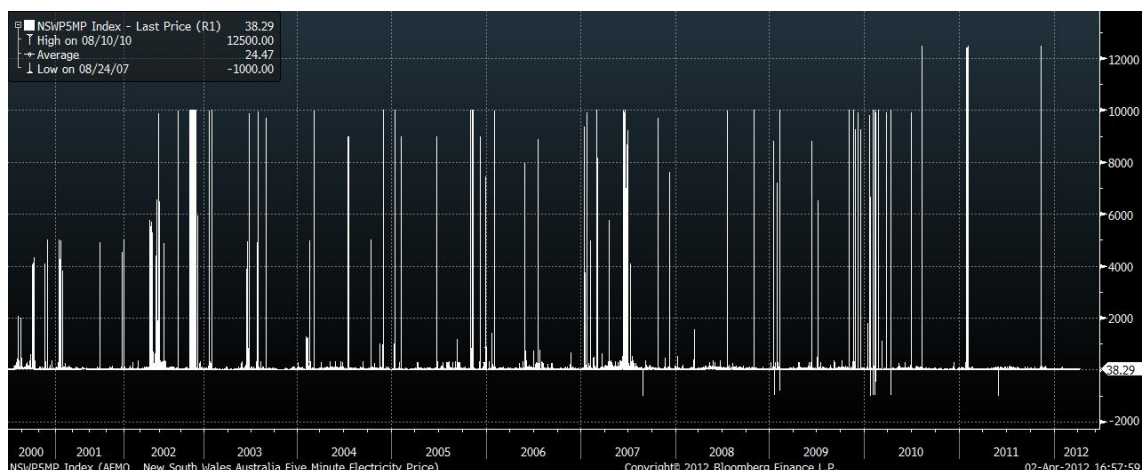
183. Even if a vertically integrated generator has a balanced net position, or is slightly long on generation, it may still have an incentive to drive prices down as part of an overall strategy to increase price instability. This can be the case if price instability has the effect of raising the costs (e.g. financing costs) of independent generators in a market where hedging instruments are illiquid.
184. The following charts suggest materially higher price volatility in South Australia than in other NEM regions on average.

Figure 9: Price volatility in South Australia (maximum and minimum price in a 5 min interval during a day)



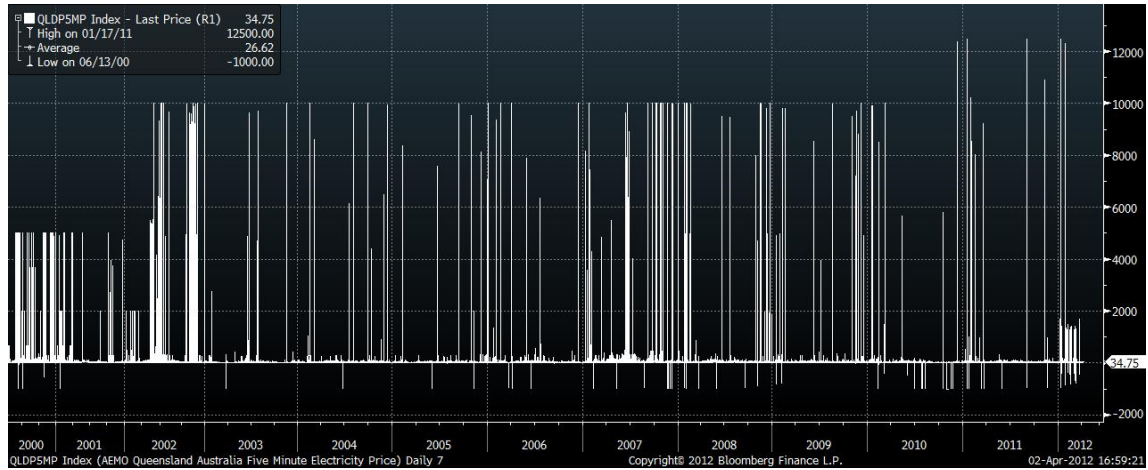
Source: Bloomberg

Figure 10: Price volatility in New South Wales (maximum and minimum price in a 5 min interval during a day)



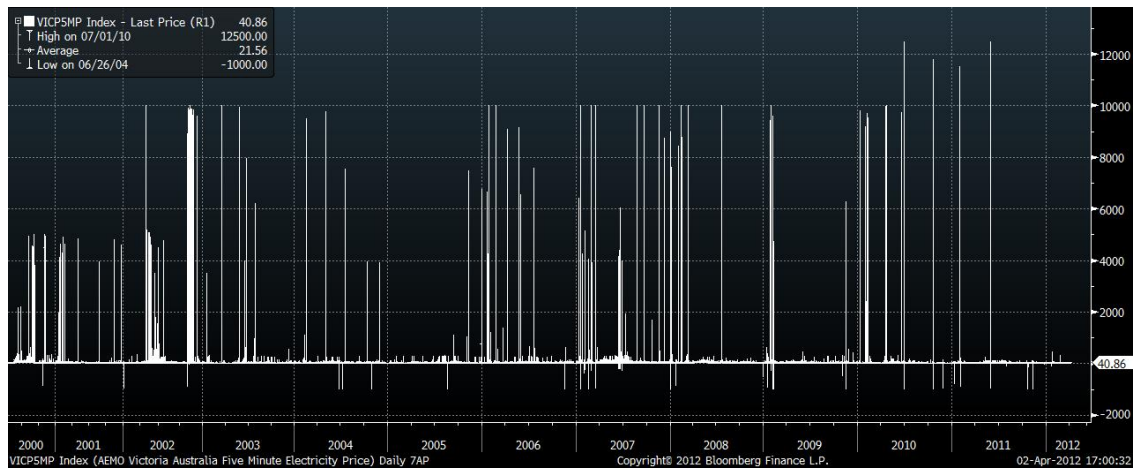
Source: Bloomberg

Figure 11: Price volatility in Queensland (maximum and minimum price in a 5 min interval during a day)



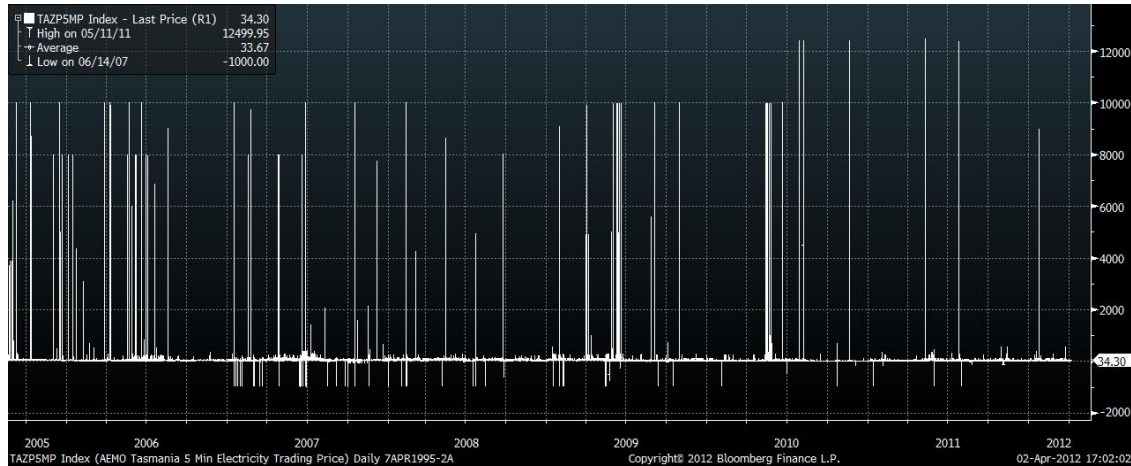
Source: Bloomberg

Figure 12: Price volatility in Victoria (maximum and minimum price in a 5 min interval during a day)



Source: Bloomberg

Figure 13: Price volatility in Tasmania (maximum and minimum price in a 5 min interval during a day)



Source: Bloomberg

185. This evidence is consistent with theory of pre-emption that involves incumbents in South Australia deliberately causing greater price volatility in order to ‘send a signal’ to potential independent new entrants. However, there are certainly alternative explanations. For example, the SFS Economics report noted that growing intermittent wind generation had increased spot price volatility and the extent of South Australia’s reliance on wind generation distinguishes South Australia from the other NEM States. However, the SFS Economics report also noted that “to the extent to which volatility is ‘created’ by incumbent generators through the exercise of market power, investment risks for entrants may also increase.”⁴³ It is beyond the scope of this report to attempt to determine the extent to which structural or strategic factors are causing this volatility (including frequent negative prices of \$1,000 MWh).

5.4. Evidence from market outcomes

186. Ultimately, whether a barrier to entry is significant from a regulatory perspective will depend on whether it leads to market outcomes that depart significantly from competitive outcomes. In the remainder of this section, we examine the evidence on market outcomes. In reviewing the evidence, it should be borne in mind that market outcomes will also be affected by other factors in particular States such as the strength of competition among incumbents and whether there are other features that are constraining behavior (e.g. legal restrictions or government ownership). In this regard, we have already found that measures of market concentration create a presumption of effective competition between incumbents except in Tasmania and to a lesser extent South Australia. Government ownership of generation assets has been substantial over the period under consideration in Tasmania, NSW and Queensland.

⁴³ SFS Economics, Barriers to entry in the South Australian region of the NEM, 2010, p.30.



5.4.1. Evidence on pricing

187. NERA and Oakley Greenwood have prepared a report for the AEMC examining to what extent prices have been aligned with costs in the NEM markets.⁴⁴ The report compares annual average observed prices with an estimated range of Long Run Marginal Cost in the four NEM state markets excluding Tasmania (where LRMC benchmark estimates were difficult to obtain and because of the unique features of that market). The report found that for the period 2007-08 to 2010-11 weighted average spot prices were generally within or below its estimated range for LRMC for the NEM as a whole and for Queensland, New South Wales and Victoria.
188. In 2006-07, prices were above the estimated LRMC range in these States, although the report noted that this coincided with the impact of drought conditions on hydro and thermal plants. In South Australia, the pattern of prices was somewhat different. In particular, prices significantly exceeded the LRMC range in 2007-08. The report identified two contributing factors that may have led to these high prices: a prolonged heat wave; and the low available capacity of the interconnector to Victoria. Spot prices in South Australia have subsequently fallen relative to LRMC including below the low end of the report's range for LRMC in 2010-11. The report's estimates of contract prices were generally within the estimated LRMC range for each of the four mainland NEM States.
189. The conclusion of the report is thus that, at least in the recent past, barriers to entry and/or competition among incumbents (along with modest entry by independent generators) has been sufficient to constrain prices to be consistent with estimates of efficient costs.
190. The type of approach taken by NERA provides the most direct, practical way to determine whether there are any competition problems today. If recent prices are not materially above long run efficient industry costs then this provides significant evidence on the basis of which a regulator could treat barriers to entry as not significant and/or competition among incumbents as being effective. Nonetheless, there should not be relied on as the only evidence to reach a conclusion on the significance of barriers to entry.
191. NERA's analysis is based on recent historical prices. However, ideally the test for existence of SMP requires a comparison of the present value of the *expected* path of future prices over the life of new investment to the expected efficient costs of new investment required for meeting future demand growth. NERA understandably did not have a reliable estimate of expected market prices and, consequently, used recent historical prices as an implicit proxy for expected future prices. One issue with the use of historical prices is whether the weather conditions prevailing over those years will characterise weather going forward. For instance, it is noteworthy that in 2006-07 when the southern mainland States of the NEM were affected by relatively high temperatures and drought, NERA found prices at or above its upper bound for the

⁴⁴ NERA and Oakley Greenwood, Benchmarking NEM wholesale prices against estimates of Long Run Marginal Cost.

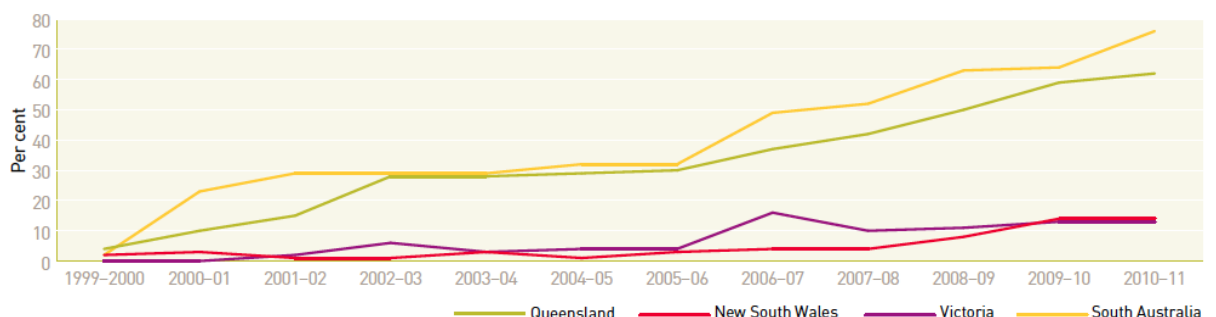
LRMC in these States. In 2010-11 when temperatures have been more moderate, NERA has found prices to be below its lower bound for LRMC. If future years become hotter and more drought-prone, then it is possible that prices above LRMC may be more common. Nonetheless, there has also been increases in capacity since 2006-07 (except in Victoria) so that it is unclear whether relatively high temperatures would lead to prices exceeding LRMC as they did in 2006-07.

192. The reliance of the NERA approach on recent past prices suggests that additional market evidence on barriers to entry could help in determining what weight should be placed on the conclusions from the NERA report. For example, we have already found that NERA's evidence on prices being close to LRMC is consistent with the evidence on concentration in the NEM States (with the exception of Tasmania). Ongoing monitoring of prices in relation to LRMC would also help identify if future weather conditions lead to prices rising relative to LRMC.

5.4.2. Evidence on investment

193. Other relevant market evidence is the extent of investment in the market. Evidence on overall investment and investment by new entrants can help demonstrate whether there are significant barriers to entry. If overall investment has failed to keep pace with demand, this may suggest that there are significant barriers to entry preventing investment by new entrants. On the hand, evidence of significant new entry itself would suggest that barriers to entry are not insurmountable.
194. From the start of the NEM at the end of 1998 to June 2011, new investment added 12,600 MW of new registered capacity in the NEM.⁴⁵ This represents around a quarter of the NEM's total registered capacity in 2011 of 49,110 MW. After a period of significant investment (predominantly in black coal and gas fired generation) in the early years of the NEM, investment levels fell away before rising again from 2005-06. Figure 14 shows that investment relative to existing capacity over the last decade has been greatest in Queensland and South Australia.

Figure 14 – Cumulative net changes in capacity



Source: AER's State of the Energy Market 2011, Figure 1.14.

⁴⁵ AER's State of the Energy Market 2011, p.25.



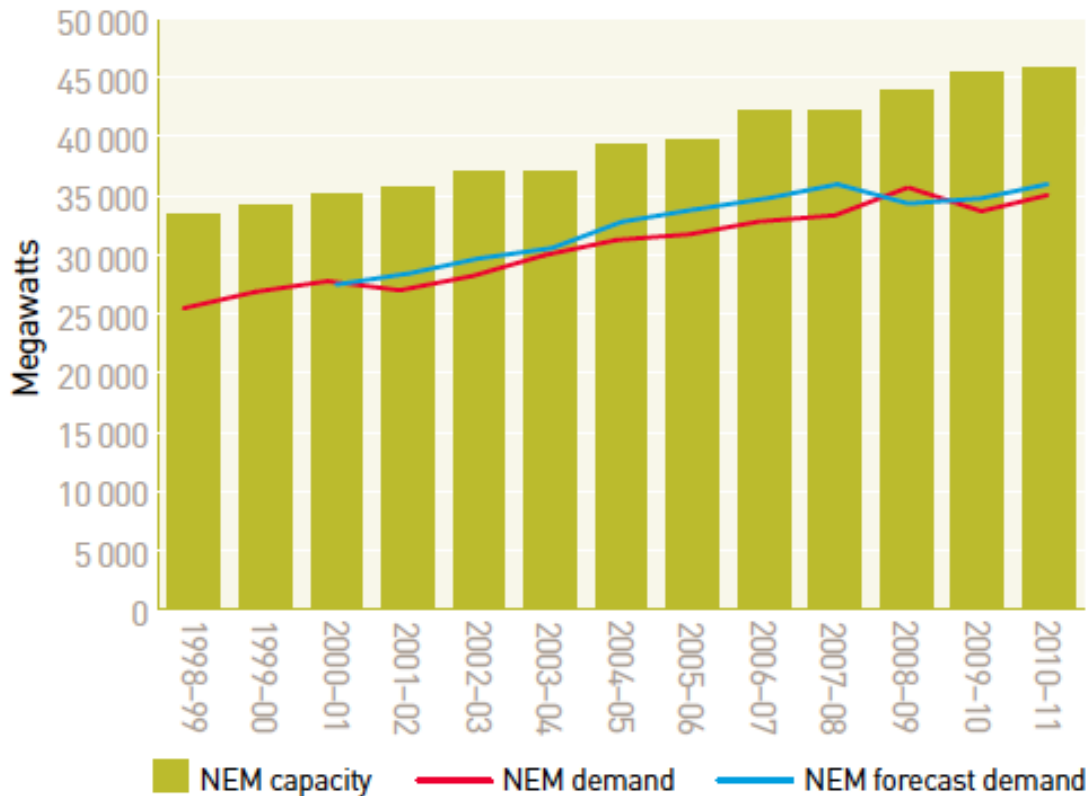
195. Over 4,700 MW of capacity was added in the three years to 30 June 2011 (mostly gas fired generation in New South Wales and Queensland). The AER has noted that around 58 per cent of new generation capacity commissioned or committed since 2007 is controlled by Origin Energy, AGL Energy and TRUenergy.⁴⁶
196. Over the history of the NEM, sufficient investment has taken place to ensure that capacity can meet peak demand, with only very rare exceptions (see Figure 15 below). On only three occasions from the start of the NEM to 30 June 2011 was generation capacity insufficient. The most recent occasion was in January 2009 during a heatwave in Victoria and South Australia and then the unserved energy on an annual basis was only 0.0032 per cent for South Australia and 0.004 per cent for Victoria.⁴⁷
197. In Tasmania, the review also found that *“Tasmania has substantially more electricity generation capability (both energy and capacity) than is currently needed to meet peak demand, and with normal hydrological inflows, no new capacity will be needed until well after 2020.”*⁴⁸

⁴⁶ AER's State of the Energy Market 2011, p.13.

⁴⁷ AEMC Reliability Panel, Reliability standard and reliability settings review, final report, 2010, p. 11.

⁴⁸ Final report of the Independent Review of Tasmanian Electricity Supply Industry, March 2012, p.156.

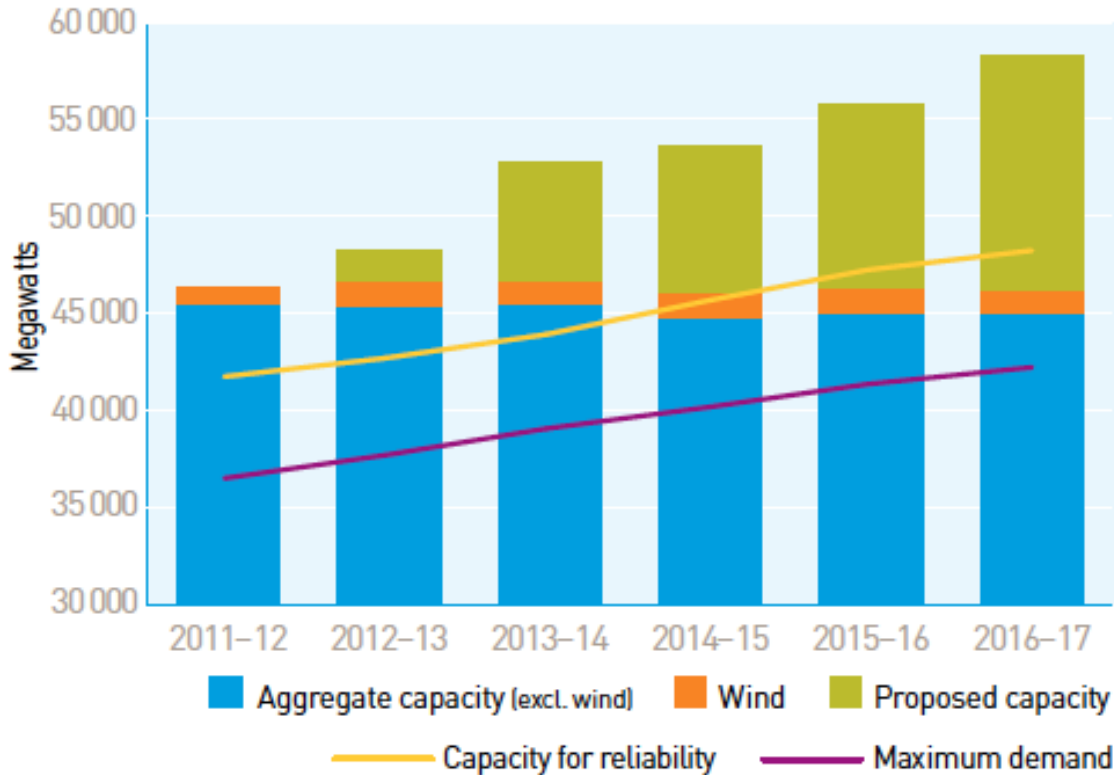
Figure 15 – Investment has kept pace with demand



Source: AER's *State of the Energy Market 2011*, Figure 1.16.

198. Looking forward, existing and new planned capacity is expected to remain sufficient to meet peak demand (see Figure 16). In particular, AEMO assessments have found that installed and committed capacity (excluding wind) across the NEM as a whole will be sufficient until 2013-14 to meet peak demand projections and reliability requirements. Queensland would have been first to have risked failing the AEMO's reliability standard, however, TRUenergy announced in October 2011 that it will invest in two gas fired generators. The evidence on overall investment thus does not suggest that there are significant barriers to entry. Nonetheless, this evidence should be treated with care as even a monopoly would find it profitable to expand supply over time in the face of growing demand (albeit that demand would not be as high as under a competitive market).

Figure 16 – Electricity supply and demand forecasts



Source: AER's *State of the Energy Market 2011*, Figure 6.

199. It is useful to also examine to the extent to which investment in the market has been undertaken by new entrants rather than incumbent generation firms. In NSW, capacity increased by around 15 per cent between 2000 and 2011, with two thirds of this new capacity being created by new entrants to the market since 2000.⁴⁹ In Victoria, there was also relatively little increase in capacity (i.e. by around 11 per cent between 2000 and 2011) with investment by entrants not already in the market in 2000 accounting for just under half of the capacity increase.
200. In Queensland where capacity has increased substantially more than in NSW over the period since 2000, new entrants have accounted for around 40 per cent of the increase. In South Australia, capacity increased by 39 per cent between 2000 and 2011), with new entrants accounting for around one third of the new capacity (albeit most of this represents additions to capacity by one firm, AGL, which entered in 2002).
201. The limited overall new investment in NSW and Victoria (relative to the size of the markets) makes it difficult to draw clear inferences for barriers to entry. As noted earlier in this section, capacity in these markets has been sufficient to meet demand.

⁴⁹ In this analysis, we have excluded changes in ownership of existing capacity. We have also made a number of assumptions where capacity has been jointly held.



On the other hand, the significant investment by new entrants in Queensland and, at least in the early years of the NEM, in South Australia suggests that barriers to entry have not been significant in those markets. We are somewhat cautious in relation to the South Australian evidence as much of the new investment has been by AGL.

5.4.3. Capacity utilisation

202. A further type of evidence relates to the extent to which incumbent firms are using the capacity that they have available or whether they believe that can withhold capacity from the market because entry has been limited in the past and they do not believe that they would induce new entry.
203. The Major Energy Users proposed rule change is motivated by a view that there is SMP being exercised by generators in South Australia. The Major Energy Users point to the following statement from the AER in support of this view:

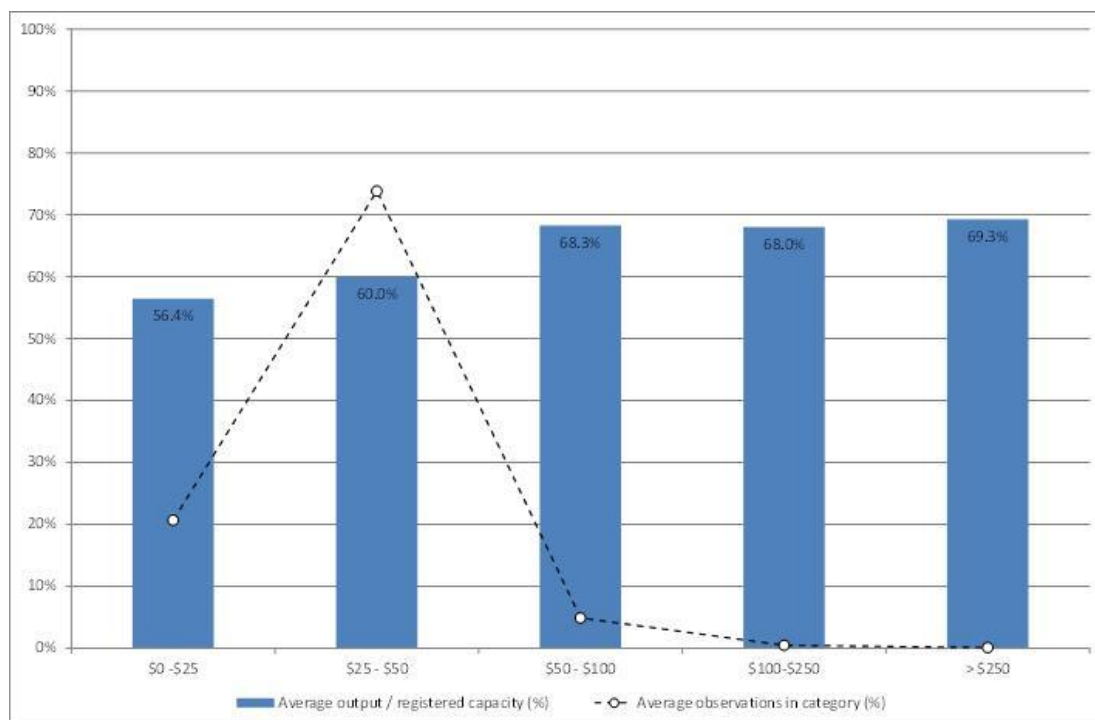
[...] South Australia had three years of high prices from 2007/08 to 2009/10. Prices in South Australia in 2007/08 averaged \$101/MWh, in 2008/09 were \$69/MWh and in 2009/10 were \$82/MWh. The 2007/08 South Australian price was the highest since NEM commencement, the 2009/10 price was the second highest since NEM commencement, and the 2008/09 price was the third highest since NEM commencement. While there are significant challenges for the AEMC in defining LRMC (as highlighted above), it is difficult to see how such price outcomes could be less than a market LRMC.

204. In this context, we consider that it is reasonable to ask whether there are factors that make competition among incumbents in South Australia less likely to constrain prices in the short run (when competition is between incumbents) and/or in the long run (when competition is also with potential new entrants).
205. High prices in South Australia are a potential indication of a lack of competition/competitive entry in South Australia. However, the prices need to be compared with the cost of servicing South Australia (and we note that NERA has estimated higher costs of serving South Australia). Moreover, prices in a region may be unusually high in any given year due to factors other than the exercise of SMP.
206. The evidence in the previous section also suggests that South Australia is one of the more concentrated industries in the NEM – at least as measured by the HHI on registered capacity of scheduled and semi-scheduled generation. However, aggregate measures of concentration such as these are potentially problematic when applied to generation markets.
207. This is because they do not capture the fact that, given the inability to store electricity, in certain market conditions prices are very sensitive to changes in supply such that even a small generator can have the incentive and ability to exercise (transitory) market power. Moreover, a large generator with low marginal costs may not have the incentive to act in this way. Ideally, what is needed is an assessment of the probability

and frequency of such events. This is a major modelling undertaking that is outside the scope of this report.

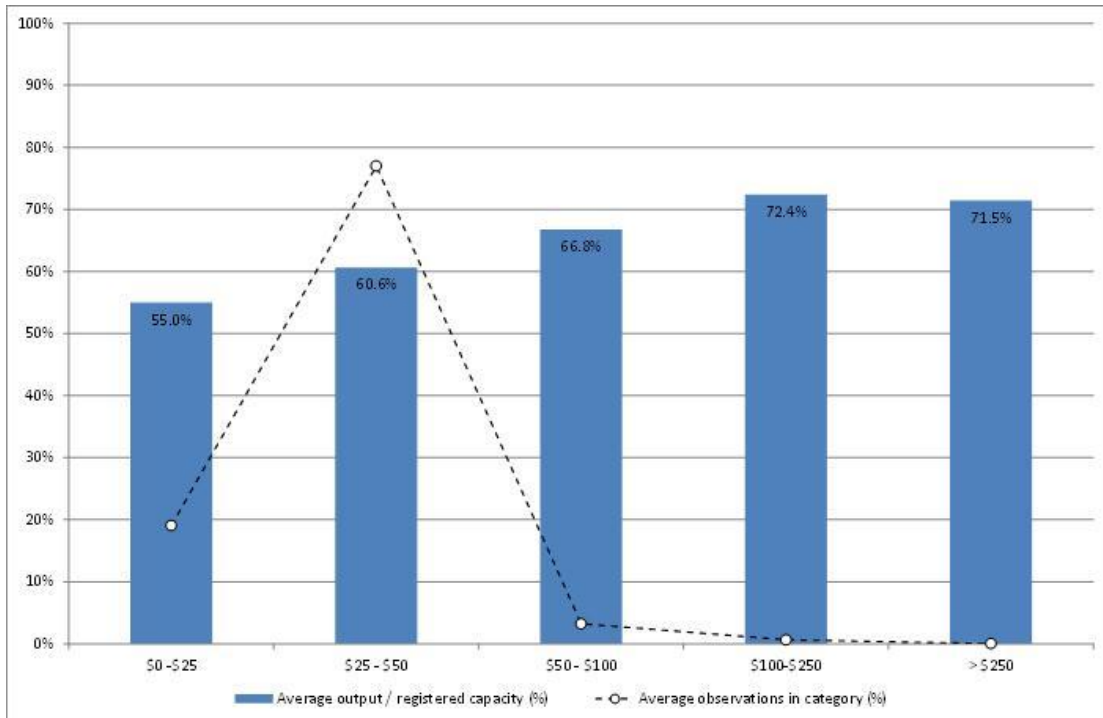
208. A flavour of the type of analysis required can, however, be gained from the following charts. These charts show how capacity utilisation relates to increases in prices. The bars shows what percentage of total registered capacity is operating on average when prices are at particular levels in each State (measured over every 5 minute interval in the year ending March 2012). A generator is only included in the calculation if it is actually running (i.e. generators that are not running are given zero weight).
209. The charts show that in Victoria, Queensland and New South Wales generators tend to increase supply as prices per MWh increase from \$0-\$25, \$25-\$50, \$50-\$100 and \$100-\$250. Capacity utilisation more or less stabilises as prices move into the +\$250 band (i.e. capacity utilisation neither climbs materially nor falls materially for very high prices).

Figure 17 – Victorian capacity utilisation and price



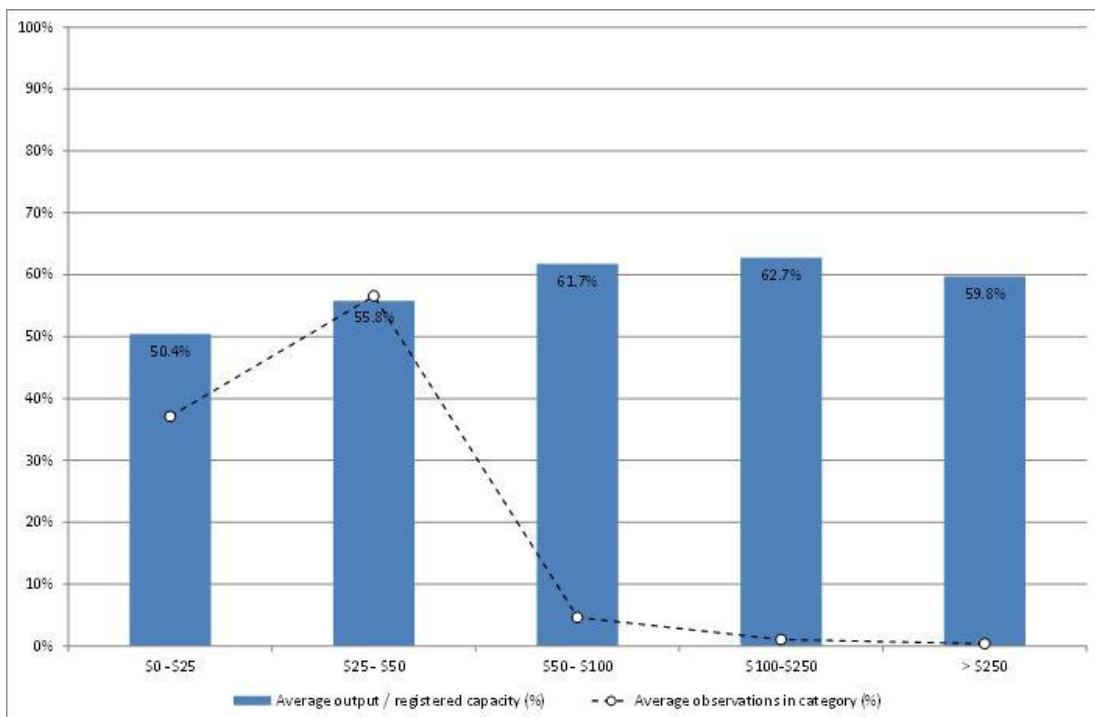
Source: AEMO, CEG analysis

Figure 18 – New South Wales capacity utilisation and price



Source: AEMO, CEG analysis

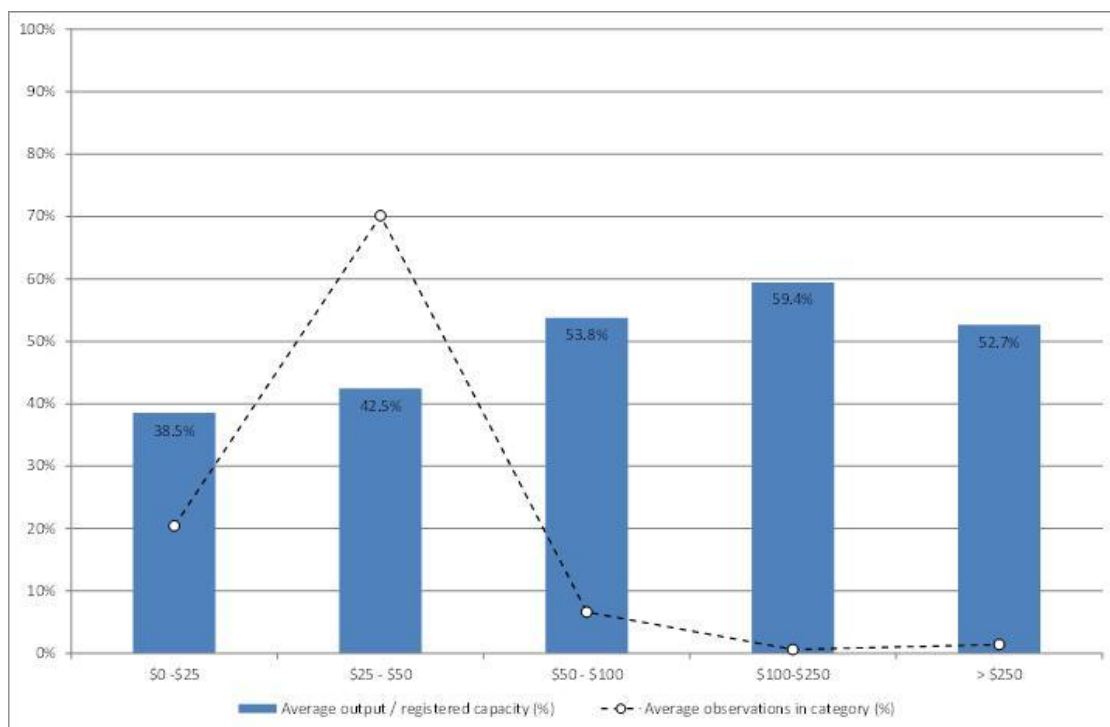
Figure 19 – Queensland capacity utilisation and price



Source: AEMO, CEG analysis

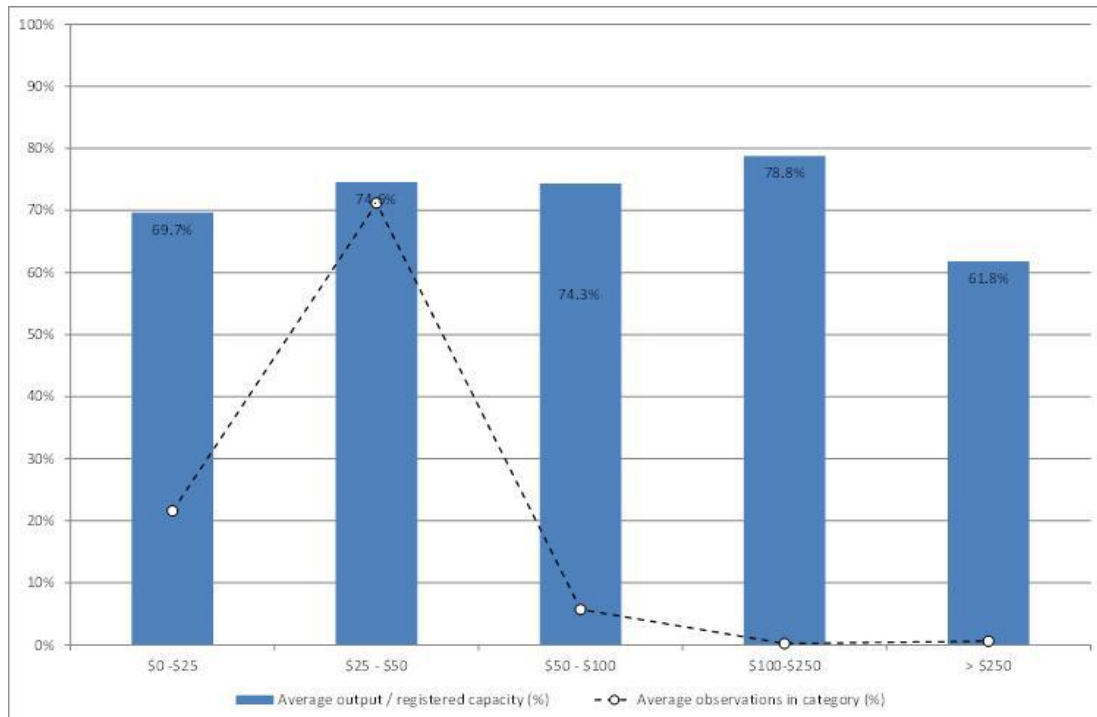
210. By contrast, capacity utilisation in South Australia and Tasmania follows more or less the same pattern for prices between \$0 and \$250. However, there is a clear reduction in available capacity when prices exceed \$250. One possible explanation for this is that high prices are caused by accidental outages, leading to the lack of availability of capacity. A related but different explanation is that South Australian and Tasmanian generators tend to *cause* higher prices by withholding capacity more often than do generators in other States. That is, rather than South Australian and Tasmanian generators failing to increase utilisation in periods of high prices it is the reduction in utilisation that drives high prices.

Figure 20 – South Australian capacity utilisation and price



Source: AEMO, CEG analysis

Figure 21 – Tasmanian capacity utilisation and price



Source: AEMO, CEG analysis

211. Of course, there are other potential explanations for the differences between the States. For example, it could be that South Australian generation plant cannot respond as quickly to changes in price (this explanation seems unlikely in the case of Tasmania as Tasmanian Hydro should be able to respond very quickly). Alternatively, it could be that transmission constraints in periods of very high prices force more plant in South Australia and Tasmania to operate at low utilisation than is the case in other states.
212. Nonetheless, this data provides some basis for believing that periods where generators have the incentive and ability to exercise (transient) market power are more common in South Australia and Tasmania than elsewhere. In Tasmania, this is clearly consistent with the high level of concentration. In South Australia this could reflect a higher frequency with which transmission constraints restrict competition from generators in other states (or the fact that large generators in South Australia also have a large presence in Victoria).
213. As described above, we do not focus on Tasmania given the ongoing review of the structure of the industry. We have, however, examined more closely the generators that contribute to the South Australian outcome. The primary driver of the fall in South Australian capacity utilisation when prices are above \$250 is AGL Energy's operation of the Torrens Island A power station. When prices were above \$250 this plant operated, on average, at a capacity that was 45% lower than its capacity when prices



were between \$100 and \$250. This was the second largest reduction in available capacity (between these price bands) for all scheduled thermal generators in the NEM.

214. Other South Australian power stations that also had materially reduced output (greater than 15 per cent reduction) when prices were above \$250 included: Hallet (TRUenergy), Pelican Point (International Power), Quarantine (Origin), Torrens Island B (AGL Energy) and Northern (Alinta). This covers all of the major generators in South Australia. This also represents 6 out of 17 scheduled thermal plants in the entire NEM that reduced output by more than 15% when prices rose above \$250. However, the two Torrens Island power stations owned by AGL represent the most significant combined reduction in capacity – in absolute terms and as a proportion of the generators total portfolio.
215. Of course, even if these facts were firmly established as arising from strategic behaviour (rather than, for example, unplanned outages) this only demonstrates that transient market power is being exercised more frequently by South Australian generators. It does not demonstrate either that:
- South Australian generators are earning (or expect to earn) excess profits.
 - As discussed in section 2.1 generators need to exercise transient market power in order to recover their full economic costs. It may be that South Australian generators need to exercise this level of transient market power in order to recover their full economic costs; or
 - there are barriers to entry in South Australia.
216. Nonetheless, this evidence does provide a further basis for being more concerned with competition in South Australia than in the other mainland regions of the NEM.

5.5. Overall conclusion

217. In this section, we have considered a wide range of evidence in relation to conditions that may give rise to barriers to entry in the NEM markets.
218. The weight of the evidence indicates that barriers to entry are unlikely to be a major concern in NSW, Queensland and Victoria, although this may be because competition between incumbent firms is strong rather than entry necessarily being easy in each of these States. In particular, individual firm market shares do not suggest a high likelihood of unilateral SMP and concentration levels are below or declining to be close to the ACCC's threshold for competition concerns. Evidence on pricing close to LRMC does not suggest that barriers to entry or lack of competition between incumbents are creating the potential for excess pricing. There has, in fact, been significant investment by new entrants in Queensland. While investment in new capacity relative to market size has been smaller in NSW and Victoria this appears to reflect the fact that less new capacity was needed in those States. We identified no evidence of strategic barriers to entry in NSW, Queensland or Victoria.

219. The Tasmanian market raises more serious concerns. This reflects the dominant position of Hydro Tasmania and evidence potentially consistent with capacity being withheld to drive up prices. This conclusion is in line with the report of the Independent Review of Tasmanian Electricity Supply Industry of March 2012 which found evidence of high degree of latent market power (albeit that Hydro Tasmania has generally chosen not to exercise its market power to date) and recommended significant restructuring of that market.
220. The evidence in relation to South Australia is mixed. AGL has a significant market share in South Australia. We found evidence potentially consistent with materially more capacity being withheld to drive up prices in South Australia than any other mainland state. We also found that vertical integration in South Australia is associated with reduced liquidity in contract/futures markets and it is reasonable to question whether, in this context, high volatility in South Australian prices (including frequent negative price spikes) may be creating a barrier to entry by independent non-vertically integrated generators (or incumbent generators with limited natural hedge in the form of retail sales). That said, the contribution to price volatility from South Australia's reliance on wind generation should not be underestimated. Our findings of evidence that may reflect strategic and/or structural barriers to entry are similar to those of the SFS Economics report.⁵⁰ On the other hand, pricing evidence from the NERA/Oakley Greenwood report suggests that barriers to entry are not so significant as to have allowed recent prices to be above LRMC (or that competition among incumbents is effective) – we believe that significant weight should be attached to this evidence as the most direct way to assess whether there are any competition problems (albeit that other evidence is also relevant so as to assess whether recent pricing behaviour is likely to be maintained into the future). AGL's ability to enter and become a substantial player in South Australia also suggests that barriers to independent generator entry were not significant earlier in the NEM's history. Of course, AGL's presence as a retailer in South Australia means that this conclusion only holds with regard to theories of barriers to entry that do not rely on independent generators being unable to obtain retail/contract cover.
221. Periodic reviews of the state of competition and the significance of entry barriers across all markets in the NEM is likely to be appropriate. However, the evidence reviewed as part of this report suggests that particular attention should be paid to Tasmania and South Australia. In Tasmania, the evidence of competition problems is clearest and a process is already in place to address that. In South Australia, the evidence is less clear. The evidence from the NERA report does not suggest either that competition is ineffective or barriers to entry are significant, although this is based on historical prices that may disguise latent market power (e.g. prices in the later part of the period examined by NERA may be depressed by more moderate weather patterns or by AGL having little incentive to raise prices due to retail/contract cover). We recommend that the relationship between prices and LRMC in South Australia be subject to ongoing review to identify whether the historical evidence was atypical. In addition, the level of strategic withholding, the impact of vertical integration and the

⁵⁰ SFS Economics, Barriers to entry in the South Australian region of the NEM, 2010, p.30.



problem of contracting for new entrants in South Australia should also be kept under review. More generally, this report and the related report by NERA offer a framework in which market participants can assess concerns about SMP and whether there exists a need for regulatory intervention.

222. Finally, the Productivity Commission report found that certain emissions reduction measures are increasing costs above efficient levels. Although the Productivity Commission finds that this does not create a need to regulate the behaviour of generation firms, it does call for governments to review those measures so as to ensure that consumers are able to receive the lowest level of prices consistent with efficiently meeting environmental objectives.



Appendix A. Incentives to withhold supply

223. In this appendix we set out a conceptual framework that is used for analysing the ability and incentives for the exercise of SMP by firms operating in commodity markets, such as those for the wholesale supply of electricity. The purpose of doing so is to make clear the economic assumptions that are relevant to assessing the potential for market power in as rigorous and transparent a manner as possible.
224. Using this framework we describe the factors that are relevant to determining the incentives to exercise SMP in commodity markets such as those for wholesale electricity.

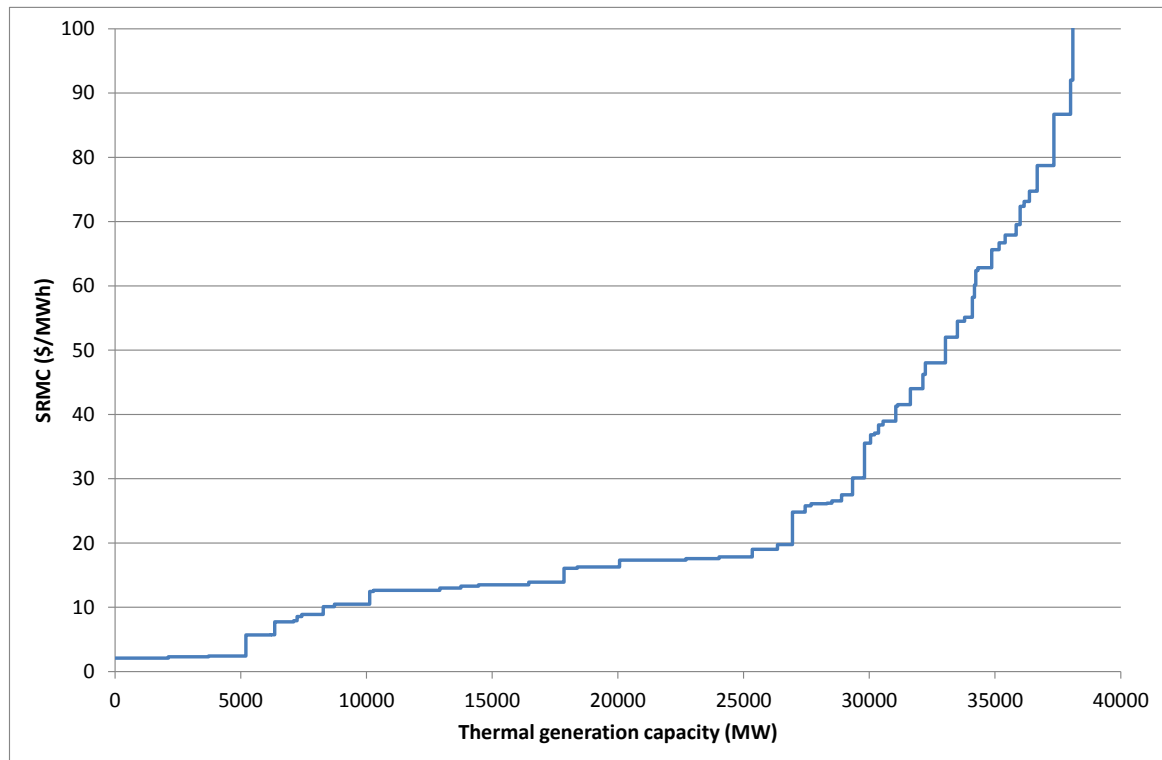
A.1. Commodity market cost curves

225. Commodity markets consist of relatively homogenous products with all suppliers receiving essentially the same price for their product (or different prices that reflect generally agreed and measurable differences in quality/location). Other examples of such markets include: wheat markets and crude oil markets.⁵¹ Long term contracts in these markets are common, with contract prices either periodically reviewed to reflect prevailing market prices or with contract prices reflecting the parties' expectations about the path of market prices over the life of the contract.
226. Producers in commodity markets may have differing costs of production and differing costs of increasing production. Differences in the cost of producing electricity will depend on fuel type and technology of the generation capacity and its location relative to demand. These differing costs at each level of production can be graphically illustrated on a cost of supply curve.
227. An example of such a supply curve is the 2011/12 short run marginal cost curve for thermally generated electricity capacity in the NEM whole.⁵² This cost curve does not account for inter- or intra-regional losses or the potential for constraints to affect competition nor does it account for hydro generation. The curve is provided for illustrative purposes only – in order to draw concrete conclusions one would need to account for the above listed factors. The curve is truncated at \$100/MWh. The proportion of capacity above that level is very low and the cost curve is extremely steep in that region.

⁵¹ This can be contrasted with markets with differentiated products where individual firms tend to face their own unique demand curves, based on customer preferences and the prices of imperfect substitutes. In this sort of market the standard institutional arrangement is for each firm to set its own price by reference to its own unique demand curve and cost characteristics. Examples of such markets include most consumer items from breakfast foods to MP3 players and many business inputs (such as software products).

⁵² Noting that it is for thermally generated capacity that the greatest ability to act strategically to influence prices is presented.

Figure 22: NEM SRMC cost curve for thermal electricity generation capacity



Source: AEMO data, CEG analysis

228. In a perfect commodity market while different firms may have different production costs, their output is perfectly substitutable in all dimensions (from physical characteristics to reliability of supply etc). In this sort of market all units will sell for the same price – there is no prospect for one firm to raise its price above the prices charged by other firms. In this case the single market price is set by the interaction of the total market supply and total market demand.
229. A firm with SMP will not, in general, exercise its power by raising its price directly above the market price. Rather, it will restrict its output and thereby reduce total market supply and raise the market price indirectly. The size of the impact on the market price will depend on the costs incurred by the producers in the rest of the market to replace the withheld output and the elasticity of the market demand curve. For illustrative purposes we assume that the total market demand is perfectly inelastic, i.e. vertical, at the quantity of 30,000 MW.⁵³
230. Imagine that at a given point in time demand and supply (with no withholding) were in equilibrium with an output of 30,000 MW and a price of \$30/MWh (ie, on the industry supply curve at 30,000 MW in the above figure). Now imagine that there was a cumulative reduction in supply of 2,000 MW from one or several baseload producers.

⁵³ While this is a simplification, similar argument can be made under more general assumptions.

Such a reduction would cause the industry supply to fall by 2,000 MW.⁵⁴ In order to induce replacement of this lost output and, hence, remain in the market equilibrium, prices would need to rise from \$30/MWh to \$40/MWh. For this reason the shapes of individual producers' supply curves are critical determinants of the incentives for withholding.⁵⁵

231. In this example, with perfectly inelastic demand, were any firm to engage in such withholding conduct then they would stand to gain \$10/MWh on all of their remaining sales. This would represent the benefit to them from withholding supply. However, the cost of withholding would be foregone profit margin on the withheld sales. The balance of these considerations determines whether there is a net incentive to withhold sales.

A.2. Incentives to withhold supply and the concept of the 'critical slope'

232. In this section we mathematically formalise the above considerations and describe the derivation of the concept of a 'critical slope'.
233. We ask ourselves 'under what conditions will withholding supply become profitable for a firm'? As described above, whether withholding supply will unilaterally increase profits depends on:
- the loss of profits on the supply withheld; and
 - the higher profits resulting from higher prices on the remaining sales.
234. The balancing of these two effects determines the profit maximising strategy. This trade-off can be formulated algebraically as follows.

$$\Delta\pi = \Delta p(q - \Delta q) - (p - c)\Delta q, \text{ where:} \quad (1)$$

$\Delta\pi$ = the change in profits as a result of withholding Δq in supply;

Δp = the change in market price as a result of withholding Δq ;

q = the base level of sales before withholding Δq ;

p = the market price without withholding Δq ; and

c = the average unit cost of the production avoided as a result of withholding Δq in supply.

⁵⁴ Which would cause a shift in the supply curve or a portion of it.

⁵⁵ Another critical determinant is the slope of the total market demand curve.

235. The conditions for withholding of supply to be profitable can be derived by rearranging equation 1 which reduces to:

$$\Delta\pi \geq 0 \Rightarrow \Delta p(q - \Delta q) \geq (p - c)\Delta q \quad (2)$$

236. Equation 2 simply states that profits will increase if the increase in price multiplied by the remaining sales $\Delta p(q - \Delta q)$ exceeds lost profits on the production that is withheld $(p - c)\Delta q$. This equation can also be re-expressed to determine the minimum sensitivity of market price to the withheld sales at which withholding will be profitable.

$$\Delta\pi \geq 0 \Rightarrow \frac{\Delta p}{\Delta q} \geq \frac{p - c}{q - \Delta q} = \text{the 'critical slope'} \quad (3)$$

237. The determinants of the critical slope are most relevant to assessing the incentives of a firm (or cartel such as OPEC) to withhold supply. Provided (the absolute value of) the actual slope of the residual demand curve faced by the producer⁵⁶ ($\frac{\Delta p}{\Delta q}$) is higher than the critical slope then an incentive exists to withhold supply.

238. Consistent with the above discussion, this formula states that the critical slope is lowest when:

- the base level of sales for the firm is highest (ie, the higher is q); and
- the lower is the profit margin on withheld sales (ie, the lower is $p - c$).

239. As described in our previous report, the above analysis is equivalent to a standard critical loss analysis – except equation 3 derives a ‘critical slope’ instead of a ‘critical loss’.

A.3. What does it mean to withhold sales?

240. It is important to properly define what it means to ‘withhold supply’. The exercise of market power by ‘withholding of sales’ can only be meaningfully measured relative to a counterfactual level of sales that would be profitable but for the existence of market power. That is, one cannot describe a failure to operate at full capacity or a failure to develop new capacity as a *per se* exercise of market power by the firm withholding of supply. That conduct is only an exercise of market power if capacity utilisation/expansion is rational and would have been undertaken but for the firm’s desire to influence market prices.

⁵⁶ Residual demand for the output of a particular producer is the difference between the total market demand and the total supply by other producers. Therefore, it is determined by both the demand-side and supply-side conditions in the market.



Appendix B. Computation of Herfindahl-Hirschman Index

241. The Herfindahl-Hirschman index is a measure of the size of firms in the same industry relative to the size of the industry. It is computed as a sum of squares of the market shares of all the firms (where the shares can be expressed as either fractions or percentages). When shares are expressed as percentages, the HHI can vary from 10,000 to 0. The lower is the HHI, the less concentrated is the industry under consideration.
242. To compute HHIs for the NEM, as per Figure 5, the following assumptions were made:
- Only existing scheduled and semi-scheduled generating facilities were considered;
 - The HHIs were computed separately for each state;
 - The industry shares were computed with respect to the registered capacity, as reported in the corresponding SOO for a given year (so that the data labelled 2005 on the chart correspond to the SOO released in 2005);
 - The study sample includes the data covered in the SOOs for 2000-2011;
 - All generators, owned by / registered to Snowy Hydro throughout the entire study sample, were excluded from consideration (this does not include Valley Power Peaking Facility, which was originally owned by Edison Mission Energy and Contact Energy). This assumption is made in order to avoid observing an arbitrary 'step change' in HHI when Snowy Hydro's Snowy Mountain assets were allocated to Victoria and New South Wales in the SOO;
 - Rather than attributing market shares to individual power stations or registered participants, we chose to focus on the parties who ultimately own the generating facilities; the New South Wales parties who entered GenTrader agreements giving them rights to dispatch and sell electricity output were also considered to be 'owners' of the respective generating facilities;
 - To establish ownership, we used various publically available sources, including State of Energy Market Reports by the AER for 2007-2011;
 - Where a generating facility was owned by several parties, we allocated the registered capacities to those parties in proportion to their ownership percentage; for instance, if a generating facility with capacity 100MW is owned by companies A and B so that A holds 10% and B holds 90%, 10MW would be allocated to A and 90MW to B;
 - To obtain the industry shares of the parties, we added their proportional capacity ownership in all generating facilities;
243. Finally, we squared the shares obtained in this way, and added them together to obtain the HII for a given region of the NEM.