Commentary on ACIL Tasman's approach for measuring energy costs

Introduction

Queensland Competition Authority

The Queensland Competition Authority (QCA) is responsible for determining and administering regulated retail electricity prices in Queensland for all customers that consume less than 100 MWh p.a.[1] These customers can choose to be supplied under these regulated arrangements or negotiate their own energy supply deal with any of the twenty eight competing electricity retailers operating throughout Queensland.[2] In this way the regulated price acts as a price cap for these eligible customers.

Building block approach

The QCA adopts a building block approach for determining the regulated price retailers are obliged to offer eligible customers. In general terms a building block approach involves a regulator separately determining the price for each cost item (a building block) and then adding these separate cost items up to establish a total price.

ACIL Tasman recommendation for the energy cost building block

ACIL Tasman is the consultant commissioned by the QCA to estimate the energy costs used in the formation of regulated retail tariffs for 2013-14.

The estimate of the energy costs in regulated retail tariffs tends to be a highly contentious issue. This is because the estimate of wholesale energy costs is the main factor determining whether the electricity retailers obliged to offer regulated tariffs will be able to recover their costs and make a fair return from satisfying the obligation. Most other cost items that make up a retail tariff are able to be passed through at the cost incurred by the retailer as, with few exceptions, these tend to be fixed in advance because they are determined by regulation (e.g. the high and low voltage network charges that tend to make up around 45% of an average household electricity bill. SRES costs on the other hand have proven to be quite problematic due to the variations in forecast and actual variables used).

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1 As well as larger business customers in the Ergon Energy distribution area.

2 Queensland has twenty nine licensed retailers but Ergon Energy is not permitted to market to contestable customers.

The difficulty for retailers is that their actual wholesale energy purchase costs are not set by regulation; rather their wholesale energy purchase costs will be determined by the forces of the most volatile market on earth – the National Electricity Market (NEM). To make matters worse, the price that retailers can charge for the energy supplied to eligible customers is fixed and set in advance of when retailers purchase energy for those customers. If the regulator underestimates a retailer's wholesale energy purchase costs, the retailer will be in a position where it pays more for the energy it supplies than the retailer receives from the customer. Effectively, this means that the retailer will be paying for the privilege of supplying regulated customers. This is more than a theoretical possibility – for example, the marginal cost of supplying an additional customer throughout 2007 and 2008 was considerably higher than the regulated price cap.

Given the risks faced by retailers in supplying regulated customers, it is important that the regulator has a sound basis for determining all the costs incurred by such retailers. This means that the regulator should ensure retailers supplying regulated customers are adequately remunerated for all costs and all risks that the retailer would normally be compensated for had they not been subject to regulation.

Review of ACIL Tasman recommendations

Following our review of the approach ACIL Tasman have proposed in their draft report of December 2012[3], given the form of regulation adopted by QCA and accepted by the Government for determining the retailers' wholesale energy costs, we believe there is a high likelihood that retailers supplying regulated customers may not recover their fair and reasonable costs and achieve a commercial return given the risks they face (i.e. an appropriate risk-adjusted return).

Purpose of this note

In the QCA's December 2012 Consultation Paper on cost components, the QCA stated that while it was "generally satisfied" with its approach for determining wholesale energy costs in its 2012-13 Determination, the Commission said it was "open to suggestions from stakeholders on how that framework might be improved or why an alternate approach might be appropriate for the 2013-14 review".[4]

The remainder of this note explains why we have formed an adverse view of ACIL Tasman's recommended approach and describes more appropriate

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3 ACIL Tasman (2012), *Estimated energy costs for sue in 2013-14 electricity retail tariffs* (ACIL Report), see: http://www.qca.org.au/files/ER-ACIL-EstimatedEnergyCostsForUseIn2013-14ElectrictyRetailTariffs-1212.pdf

4 Queensland Competition Authority (2012), *Consultation Paper, Regulated Retail Electricity Prices 2013-14, Cost Components and Other Issues*, December, p12.

approaches for determining retailers' energy purchase costs in the context of the form of regulation for this building block item.

ACIL Tasman's recommended approach

Portfolio of energy purchasing options

The Ministerial Delegation provides a Terms of Reference to the QCA for the Price Determination to be made by the Authority. Relevantly, the Delegation requires the QCA to have regard to the "actual costs of making, producing and supplying the goods or services". The key cost item that would not be able to be passed through to customers at the actual costs incurred by the retailer is the costs of purchasing energy for regulated customers. As noted above, ACIL Tasman has been commissioned by the QCA to, among other things, measure these wholesale energy purchase costs.

In its draft report, ACIL Tasman describes the way in which retailers manage their energy purchasing. In particular it notes that retailers "...enter into a wide range of physical and derivative arrangements to manage price risk".[5] ACIL Tasman goes on to note that:

> "These arrangements typically include:
>
> - acquiring and using own generation
> - power purchase agreements (PPAs) or tolling agreements with third party generators
> - bilateral arrangements between retailers and generators
> - broker arranged over the counter (OTC) contracts (may include a wide range of contract forms)
> - exchange-traded swap and cap contracts available in the futures market."[6]

In practice, retailers develop a portfolio of these energy purchasing options. The composition of this portfolio can vary over time to suit market conditions (for example the mix of hedge types and durations), the relative price and risk of these options, and whether the retailer is a relative newcomer to the market or a major participant serving the mass market.

In the current market, there is a great deal of uncertainty about the creditworthiness of a number of counterparties. Under these conditions, participants will tend to rely more heavily on the use of exchange-traded contracts either (1) to manage their exposure to poor credit counterparties or (2)

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5 ACIL Report, p.5.

6 ibid, p.5.

to acquire hedging cover if they themselves have a poor credit rating and cannot sell OTC contracts.

With greater price uncertainty and variability – due in part to uncertainty surrounding the future of carbon pricing and renewable policies and in part to unprecedented falls in electricity demand – the tenure of contracts has become shorter. This is because counterparties have been seeking to avoid the risk of holding out-of-the-money contracts.

New entrant retailers rarely have the need or ability to procure physical generation options (either as PPAs or owner-operator generation) to help hedge their load. This is because new entrant retailers typically have a small customer base and limited access to finance. Therefore, they typically find it difficult to justify or fund the acquisition of a physical generation option. Larger, more established mass market retailers do generally have physical generation options in their portfolio for a range of good commercial reasons discussed below.

ACIL Tasman disregard the retailers' physical generation costs

Having recognised that retailers do, in practice, employ physical generation options such as plant ownership, tolling or PPAs to minimise their energy purchases, ACIL Tasman then proceeds to ignore the costs retailers have incurred in securing these options:

> Where the process for investing in the plant is subject to competition, the effective price would also be expected to be related to the long run marginal cost (LRMC) of an increment in supply equivalent to the size of the generator. However, the price in these types of contracts would also be expected to be consistent with expected pool-hedge price outcomes over the life of the contract, otherwise entering them would make little sense given that energy would be available out of the market at the prevailing pool-hedge price. The costs involved in investing directly in generation would be expected to face the same disciplines.[7]

ACIL Tasman appears to be saying that the price retailers ought to have paid for PPAs should not exceed the price retailers would expect to pay for a string of shorter term contracts. We say 'appears' because the imprecision of ACIL Tasman's commentary creates some ambiguity about whether this interpretation of this pivotal passage is correct. For example, it is unclear what ACIL Tasman means in saying that "the costs involved in investing directly in generation would be expected to face the same disciplines". It is unclear to what disciplines ACIL Tasman is referring. It is also unclear whether ACIL Tasman is referring to the costs of any generator being compared against (1) hedges generally or (2) hedges of a particular type that reflect the characteristics of a particular generator. For

7 ACIL Report, p.6.

example, it would be inappropriate to compare the $/MWh price paid under a PPA relating to a peaking generator to the average cost of hedging the Net System Load (NSP) profile. However, it would seem, on the face of it at least, that is what ACIL Tasman is suggesting.

Concerns about ACIL Tasman's disregard of generation costs

Putting to one side our concerns about the ambiguity of ACIL Tasman's wording, ACIL Tasman has effectively said that the actual costs of procuring physical generation options can be safely ignored for the purposes of determining the regulated energy cost allowance.

In our view, ACIL Tasman's disregard of physical generation costs represents a significant misunderstanding of retailer behaviour and of the economics of the Australian (and indeed, international) power markets.

The real economic danger in the QCA adopting ACIL Tasman's logic is that it could undermine incentives for retailers to invest in new generation when it would be otherwise economic. While this point has been made many times by retailers, the connection between poor regulatory arrangements and its distortionary effects on generation investment is often not effectively explained. In the remainder of this sub-section, we will explain why ACIL Tasman's logic for disregarding generation costs is incorrect and how the translation of this flawed logic into a regulated retail price could distort the incentives to make economic investments in new generation capacity. To the extent that these distortions occur because of ACIL Tasman's recommendations being reflected in the regulated retail price, this is likely to result in a loss of economic welfare.

Reasons retailers invest in generation

Retailers invest in new generation (either as owner-operator, PPAs or tolling agreements) for a range reasons, including:

- Superior risk management – a retailer trading a generator provides superior risk management services because a generator dispatched in the pool earns the same price as the retailer has to pay for energy purchases from the same pool. The 'natural hedge' qualities of a generator allow retailers to more precisely match their purchases with their sales and contracted position. The closest equivalent financial instrument to the risk management qualities of a generator is a load-following hedge. However, ACIL Tasman reject the use of any financial instrument other than vanilla products arguing that "....a retailer's rationale for entering into more complex hedging arrangements would be because such arrangements would result in lower overall energy costs than the estimates from the simplified contract model – otherwise the

retailer would be expected to prefer the simplified contract model".[8] As discussed in more detail below this approach makes the implicit but erroneous assumption that a vanilla hedge providing the same benefits as a more structured hedge and therefore the price of the more structured hedge can be benchmarked against the price of a vanilla hedge.

- Manage credit risk exposure – a retailer may develop a generation position because it may be concerned about the deteriorating creditworthiness of generators. This could expose the retailer to the financial failure of key generator counterparties, which in turn would exposure the retailer to the risk of high spot prices.
- Manage hold-out and re-contracting risk – retailers are increasingly turning to more vertically integrated structures, partly as the generation sector consolidates. This is because retailers are concerned that they will be exposed to adverse spot or contract prices upon the maturity of tranches of their existing portfolio, especially if generators hold-out selling them contracts in an attempt to extract a better contract price from the retailer. If a retailer is able to meet some of its own power needs, there is less risk of potential generator counterparties holding out for higher contract prices.
- Increase competition in the spot market – retailers may invest in a generator to allow them to put downward pressure on excessive spot prices to reduce their overall energy purchase costs under conditions of system stress.

It is important to recognise that these reasons for acquiring a generation position are highly interrelated. For example, a retailer may acquire a generation position to sharpen its management of spot price risk (through a natural hedge) as well reducing re-contracting risks and to better manage the likelihood of damaging price spikes by bidding the generator's capacity to better manage energy purchase cost risks at times of system stress.

Apples and oranges and dynamic inefficiency

The discussion above highlighted that the value of a generator to a retailer is multi-dimensional – a generator is not just for the production and sale of energy. It should also be clear that some of these values cannot be achieved, or achieved at the same cost, through the use of standard form hedging contracts. For example, buying a standard form hedging contract (of the type ACIL Tasman uses to establish a reference price for generators) does not assist in managing credit exposure or assist in reducing re-contracting risk. Indeed, using a standard contract is more likely to deepen a retailer's exposure to credit risk and re-contracting risks. Similarly, the type of contracts used by ACIL Tasman as a reference price for any generation capacity that retailers may own cannot be used

[8] ibid, p13.

to decide how capacity will be traded and therefore has no direct influence over the spot price the retailer has to pay.

ACIL Tasman's flawed approach to comparing all energy purchasing options to the price of an exchange-traded hedge is clear throughout the document. For example:

> The approach is a simplification of the actual contract market in that it is based on observable prices for base, peak and cap contracts only. It does not include other instruments available to retailers, and about which ACIL does not have sufficient information to use to estimate energy costs, such as purchase of predetermined load profiles and use of own generation. The effects of these simplifications are not able to be estimated, but we consider that a retailer's rationale for entering into more complex hedging arrangements would be because such arrangements would result in lower overall energy costs than the estimates from the simplified contract model – *otherwise the retailer would be expected to prefer the simplified contract model* [emphasis added].[9]

ACIL Tasman's approach involves assuming that any energy purchasing option can be compared to the cost of an exchange-traded hedge, irrespective of the risk characteristics or by-products of these other purchasing options. This is equivalent to QCA benchmarking the cost of all a retailer's skilled employees to the cost of the cheapest unskilled workers, on the basis that workers work the same hours.

If retailers are prevented from recovering the costs of efficient generation investments they make to manage their single largest controllable costs – wholesale energy purchase costs – due to distortionary price regulation based on poor economics rather than competitive forces - then those retailers will stop investing in these options. More specifically, if the QCA accepts ACIL Tasman's advice that it is appropriate to ignore a retailer's cost of acquiring an efficient portfolio, including generation assets, then retailers will be deterred from investing in new generation. Given that one of the key reasons retailers invest in generation is to manage extreme pressure on spot prices, and hence contract prices, it seems logical to expect that wholesale prices are more likely to be higher if retailers are deterred from investing in new generation facilities. Under these circumstances, retailers will need to find other, inevitably higher cost, ways of achieving the services provided by own-generation options. As a result, customers will, in all likelihood, face the prospect of higher retail prices caused by a rise in wholesale prices and, concomitantly, higher retail margins. As is well known, higher electricity prices caused by inefficient behaviour will result in lower economic welfare.

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9 ACIL Report, p.13.

Ex-post vs ex-ante

One of the key problems in ACIL Tasman's approach to calculating energy purchase costs lies in the inappropriate use made of *ex-post* electricity prices.

As indicated above, one of the reasons retailers invest in generators is to manage extreme pressure on spot prices under conditions of system stress. To the extent a retailer's investment in a new generator is successful in this, it will in turn lower the contract price. This will lower a retailer's costs to the extent the retailer is exposed to spot and contract prices. This relationship between the spot and contract price is acknowledged by ACIL Tasman:

> The prices offered and bid for OTC contracts and exchange traded contracts will be governed by a host of considerations but paramount is the expected pool or market price which the counterparties collectively perceive will prevail for the energy being contracted (volume, shape and tenor). This is because the pool price is the prevailing price available to retailers and generators so and it would make little logical sense to offer and bid prices which are markedly different from the expected pool price level.[10]

When retailers make the (*ex-ante*) decision to invest in a generator, one of the variables they consider is the effect the investment will have on the spot and therefore the contract price *ex-post* their generation investment (ignoring the other services a generator provides a retailer, as briefly discussed above). More specifically, a retailer will compare the wholesale energy purchase costs it would face in the absence of making the generation investment to the energy purchase costs it would face if it did make the investment. If the savings in the retailer's wholesale energy purchase costs exceed the cost of developing and operating the generator, then all other things being equal, it would be profitable for the retailer to invest in the generator.

A simplified presentation of this point is shown in Figure 1 and Figure 2. Figure 1 depicts the stylised supply/demand diagram presenting the well known economic concept that the intersection point between the industry supply and demand curves determines the equilibrium price (Price 1). The supply curve depicts the increasing costs of three different generators. The area of each bar in the figure depicts the cost of the relevant generator (cost multiplied by quantity of output).[11] The highest cost operating generator determines the spot price. All generators earn this price and all retailers pay this price.

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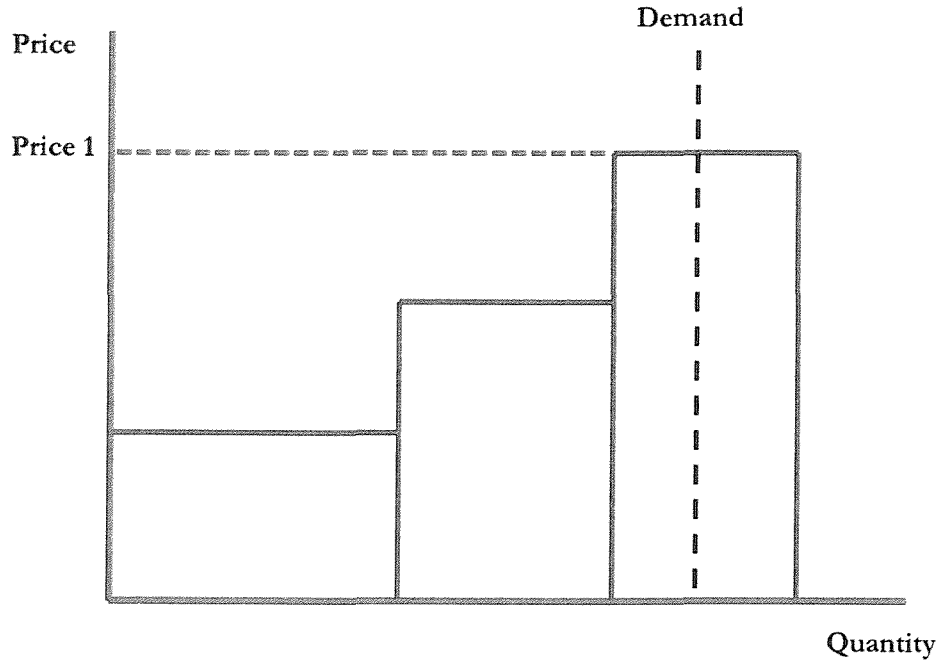
10 ACIL Report, p.6.

11 Fixed costs are zero in this stylised example.

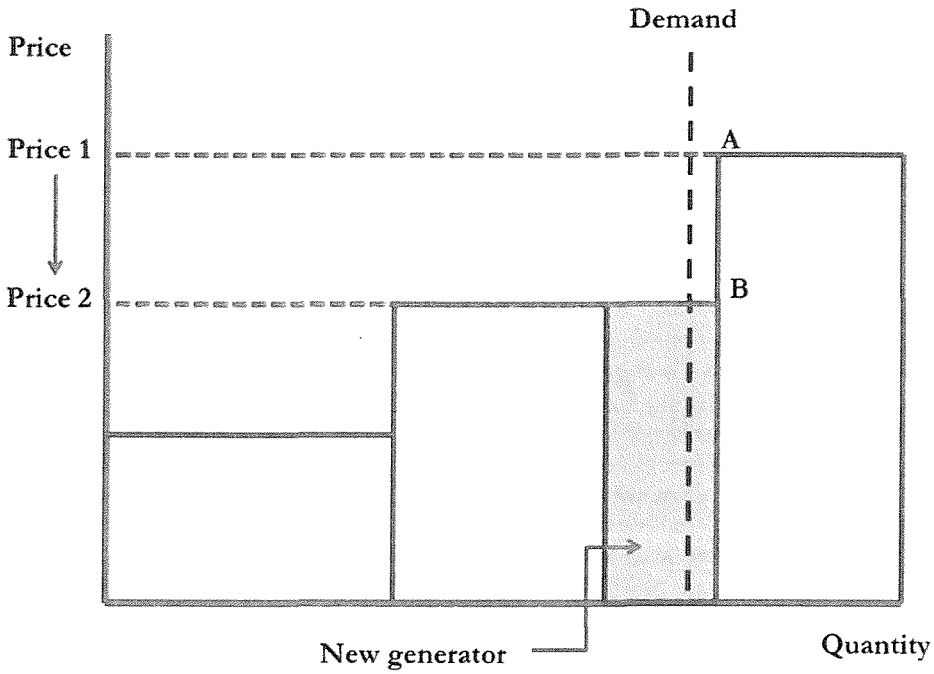
Figure 1: Supply, demand and price



Consider now Figure 2. This shows the effect on price of a retailer investing in a new generator. The new generator is shown as the shaded bar in Figure 2. The effect of adding the new generator to the market is that the previously most expensive dispatched generator no longer generates and so does not set the price. This results in the price falling from Price 1 to Price 2. The effect on the costs of purchasing energy from the market is that it falls by the rectangle marked by Price 1, Price 2, A and B.[12] Against this saving in the energy purchase cost must be netted the cost of building and operating the new generator (the shaded area). It can be clearly seen in this highly simplified example that the savings in energy purchase cost easily outweigh the costs of the new plant. In this case it is profitable to build the generator.

12 Where A refers to the intersection of the demand curve and the price of the erstwhile most expensive dispatched generator and B refers to the intersection of the demand curve and the price of the current most expensive dispatched generator.

Figure 2: Retailer investment in new generation



The addition of a small amount of capacity to the existing system can reduce prices by a disproportionately large amount, whereas the decision to delay investment can lead to large price deviations from system average cost. It is for this reason that retailers, particularly ones that serve mass market customers, are increasingly developing vertically integrated generation-retail businesses – to avoid recontracting risks and large price deviations.[13]

Further, the lumpy nature of generation plant investments may lead to transient over-supply in the system in the post-entry environment, a generally accepted proposition in industrial organisation literature. During the oversupplied period, competition amongst the supply-side for generation dispatch frequently leads to spot prices that are more reflective of the short run cost rather than the full cost of the marginal generator. During this period (as is the case at present in Queensland) the spot and contract prices therefore do not reflect the full cost of the investment, and hence under recover the full investment cost. Overtime the supply/demand balance will tighten and spot (and contract) prices will tend to recover, to the point that the next such investment is made, at which point this cycle can be expected to repeat.

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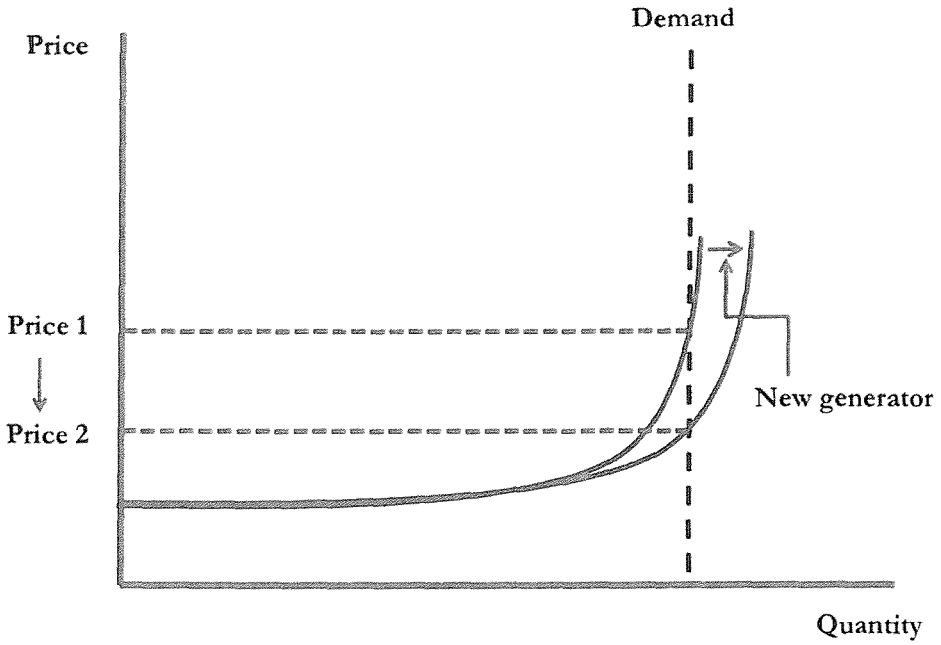
13 There are spillover effects to all buyers from any new generation investment and it is important that a retailer be able to appropriate enough benefits from their investment in new generation investment to make the investment financially worthwhile. It is more likely that a retailer with a large customer base can achieve this outcome. This helps explain why larger retailers tend to have a larger share of their energy purchase portfolio accounted for by physical or effective ownership of generation assets.

The relevance of this discussion to ACIL Tasman's approach is as follows. Knowing that retailers have incurred the cost of investing in new generation, which from time to time may have the effect of lowering spot prices on a transient basis, which benefits customers in the long run, ACIL Tasman uses *ex-post* spot and contract prices to provide a reference price for the generation investment made by a retailer. This means that the economics of the retailer's investment in generation will be undermined by the regulatory treatment of its generation costs and create a disincentive for timely investment in new plant which otherwise ensures physical and systemic stability of the grid. If regulated prices ignore these commitments by only focusing on short run prices in spot and futures markets, the investment in new generation may be unprofitable, not because of anything fundamental about market competitiveness or the supply and demand characteristics of the market, but because of a regulatory artefact (and one based on a misunderstanding about retailer cost structures) that disrupts the natural course of a market. The application of ACIL's methodology in the current environment coincides with a protracted period of oversupply in the NEM, exacerbated by broader domestic and international economic conditions. Thus the shortfall between the energy cost implied by ACIL's current methodology, and the true cost of energy supply is material. If this approach were to persist, retailers will face an incentive to substantially delay, or potentially avoid, making future generation investments, ultimately leaving consumers to bear inefficiently high costs over the long run. It is difficult to see how this is in the best interests of consumers.

Figure 3: Stylised NEM supply curve



Ultimately, the continuation of this regulatory treatment, or the continuation of retail price regulation, will deter retailers from investing in new generation plant that has the effect of keeping prices under control and within a 'manageable band'. While the approach adopted by the QCA will deliver a short term reduction in consumer tariffs, which no doubt will be politically popular, it is difficult to see how this will be in the long term interests of electricity consumers or the State.

Addressing the flaws in ACIL Tasman's recommended approach

Two key alternatives

Assuming regulation of retail prices continues in Queensland (which is not preferable) there are two main alternatives for correcting the ACIL Tasman approach.

The first corrective approach assumes that the QCA continues applying the market based approach for determining the energy cost component of regulated tariffs (modified market based approach). The second corrective approach focuses on modifying the form of regulation while retaining ACIL Tasman's approach for measuring market based energy purchase costs (modified form of regulation). These options are discussed below.

Modified market based approach

The key problem with using a market based approach *alone* to estimate a retailer's wholesale energy purchase cost is that such an approach must comprehensively reflect the efficient behaviour of a retailer. Unfortunately, it is difficult for a regulator to determine what constitutes efficient retailer energy purchase costs. In part this is because retailers make commercial decisions in the context of an ever changing market while a regulator has make a determination of efficient purchasing decisions at a prior snapshot in time. Moreover, regulators typically have limited to no direct and/or recent experience in making energy purchasing decisions and so are in a poor position to decide what is or is not efficient. It is also impossible for a regulator to determine all the factors that *have* influenced retailer behaviour in the past let alone what may influence their choices in the future. Further, it is very difficult for a regulator to put themselves in the position of the retailer who is required to make energy purchasing choices in real time with a set of risk preferences that are often not specified or difficult to specify, and subject to change.

At the very least, if the QCA is to rely *exclusively* on a market based approach for determining the efficient energy purchase costs of a retailer (which it has), it must take a more sophisticated approach than recommended by ACIL Tasman, which simply assumes that retailers only use vanilla hedging products. It is not sufficient for the QCA to justify using ACIL Tasman's approach simply because the current value of vanilla hedging instruments is more transparent than the price of other instruments or options, including long-dated (physical) instruments.

It is also inappropriate for ACIL Tasman to ignore the cost of generation options on the basis that a retailer would not choose these options in preference to a hedge if the hedge were cheaper. The implicit assumption of homogeneity of all hedging options that ACIL Tasman uses to justify its simplistic treatment of non-vanilla hedging products should be rejected by the QCA. Use of such a simplistic approach will drive the retailers to make economically sub-optimal decisions that will work against the long term interest of customers and the wellbeing of the State economy by stoking price volatility.

In summary, if the QCA chooses to rely solely on the market based approach for estimating efficient energy costs, ACIL Tasman should be required to include a wider range of energy hedging options and properly specify the services they each provide retailers.

Modified form of regulation

As indicated above, retailers face potentially significant financial risks from the QCA undertaking an incomplete evaluation of the optimal mix of energy purchasing options, where the QCA relies solely on a market based approach for determining energy purchase costs.

This risk could be largely mitigated if the QCA adopted a form of regulation where wholesale energy costs are based on generation costs. More specifically, the QCA should adopt the principle that energy purchase costs are based on the higher of the market based costs or the Long Run Marginal Costs (LRMC) of generation. This approach minimises (but does not eliminate) the risk that regulated prices will be set below retailers' actual costs, thereby minimising the risk of financial failure of the retailers and/or undermining the incentives to undertake optimal investments in new generation. Using this approach lessens the need for the QCA to as comprehensively measure the efficient energy purchase costs under the market based approach, as recommend above.

The superior risk characteristics of this form of regulation are the reason that retailers generally supported the previous regulatory approaches adopted in NSW and South Australia.

Comparison with ESCOSA and IPART

We note that the QCA has referred to the recent work of ESCOSA and IPART, claiming that these regulators and governments are showing a preference for an approach similar to the QCA's approach.[14]

On this score it is worth noting that following the Draft Determination by ESCOSA that used a market-based approach and resulted in AGL mounting a legal challenge to ESCOSA's draft decision, the South Australian Government decided to abandon retail price regulation altogether. This means that in South Australia there has never been and will not be an application of the so-called 'market-based' approach recommended by ACIL Tasman.

In the case of NSW, IPART is required to have regard to a balance of the costs of generation and the costs of hedging – it is not a purely market-based approach as recommended by ACIL Tasman.

In any case, the fact that other regulators and governments have shown some interest in a regulatory approach does not imply that the approach is a good one. It may be that these other regulators and governments are responding to short term pressures rather than considering the long term consequences of these

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14 Queensland Competition Authority (2012), Regulated Retail Electricity prices 2013-14 Cost Components and Other Issues, Consultation Paper, December, p13.

approaches. It is important that if regulation of retail prices remains in place (and we would recommend against that), prices should be set in a way that does not create further inefficiencies in the manner ACIL Tasman's recommended approach would.

Flawed understanding of LRMC

In an attempt to discourage further advocacy by retailers of the use of LRMC in Section 4 of its report, ACIL Tasman states:

> In general retailers still considered the use of LRMC as their preferred approach to estimating or, at least, providing a floor to wholesale energy costs although none specified how the LRMC should be calculated. As discussed at all stages of the 2012-13 notified tariff review, ACIL Tasman does not regard LRMC as an appropriate approach to estimating wholesale energy cost. *In any case, because of an expected oversupply of generation in 2013-14 in Queensland, the LRMC to supply any additional load in 2013-14 would equal the marginal cost of the lowest cost of an existing generator* [emphasis added]. Being an existing plant, this LRMC would not include fixed or capital and can be expected to be noticeably lower than market based methodology being proposed by ACIL Tasman.

This understanding of estimation of LRMC does not accord with any approach broadly accepted in economics for estimating the LRMC of generation.

The standard framework for considering the LRMC of a given load is detailed in "*What are Marginal Costs and How to Estimate Them?*" by Ralph Turvey, regarded as one of the fathers of LRMC estimation in power systems.

In brief, the standard approach involves estimating the costs incurred in investing in a new generator sooner than would otherwise be the case – for example, in response to a change in the regulated load – taking into account the time periods over which the costs will need to be incurred in each case. [15]

A hypothetical increase in demand over and above predicted levels would result in the need to bring forward the investment in new generation that would otherwise not be expected to occur until a later date. LRMC is calculated by estimating the change in the present value of total costs incurred to meet that increment in demand sooner rather than later.

The capital cost component of LRMC is calculated by comparing the present values of a forecast capacity expansion with the present value of the same expansion undertaken at an earlier point in time. ACIL Tasman implies that in the presence of spare capacity, the capital cost component of LRMC is zero.

Certainly it is the case that if there is a relatively high degree of spare capacity at the present, the incremental capacity cost of meeting an additional unit of

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15 Professor Ralph Turvey, *What are Marginal Costs and How to Estimate Them*, Centre for the study of regulated industries (CRI), The University of Bath, March 2000.

demand in the future will be lower than if demand and supply were in balance. But as Turvey notes, it is important to consider the lumpiness of capital and the effect this has on this price variations. Sometimes it is not possible, or economic, to add small increments to the system (e.g. due to minimum plant size or scale economies) and this means that there will be times where prices are low following a supply side investment, but this does not mean that *costs* are low. Either way, it is clear that the incremental capital cost will not be zero, as suggested by ACIL Tasman.