
# 3 ELECTRICITY FINANCIAL MARKETS


Sydney Futures Exchange. Michelle Mossop (Fairfax Images)

Spot price volatility in the National Electricity Market can cause significant price risk to market participants. While generators face a risk of low prices impacting on earnings, retailers face a complementary risk that prices may rise to levels they cannot pass on to their customers. A common method by which market participants manage their exposure to price volatility is to enter into financial contracts that lock in firm prices for the electricity they intend to produce or buy in the future.

# 3 ELECTRICITY FINANCIAL MARKETS

This chapter considers:

- the structure of electricity financial markets in Australia, including the direct over-the-counter market, the brokered over-the-counter market and the exchange traded market on the Sydney Futures Exchange
- financial market instruments traded in Australia
- liquidity indicators for Australia's electricity financial markets, including trading volumes, open interest, changes in the demand for particular instruments, changes in market structure and vertical integration in the underlying electricity wholesale market
- price outcomes on the Sydney Futures Exchange
- other mechanisms to manage price risk in the wholesale electricity market.

While the Australian Energy Regulator (AER) does not regulate the electricity derivatives markets, it monitors the markets because of their significant linkages with wholesale and retail activity. For example, levels of contracting and forward prices in the financial markets can affect generator bidding in the physical electricity market. Similarly, financial markets can influence retail competition by providing a means for new entrants to manage price risk (box 3.1). More generally, the markets create price signals for energy infrastructure investors and provide a means to secure the future earnings streams needed to underpin investment.

## 3.1 Financial market structure

Financial markets offer contractual instruments—called derivatives—to manage forward price risk in electricity markets. While the derivatives provide a means of locking in future prices, they do not give rise to the physical delivery of electricity.

The participants in electricity derivatives markets include generators, retailers, financial intermediaries and speculators such as hedge funds. Brokers facilitate many transactions, but in other cases the contracting parties negotiate directly with one another.

Financial markets support wholesale electricity markets in various parts of the world, including Germany (European Energy Exchange), France (Powernext), Scandinavia (NordPool) and a number of markets in the USA. In Australia, two distinct electricity financial markets have emerged:

> over-the-counter (OTC) markets, comprising direct transactions between two counterparties, often with the assistance of a broker

> the exchange traded market on the Sydney Futures Exchange (SFE).

### Over-the-counter markets

OTC markets allow market participants to enter into confidential contracts to manage risk. Many OTC contracts are bilateral arrangements between generators and retailers, which face opposing risks in the physical spot market. Other OTC contracts are arranged with the assistance of brokers that post bid (buy) and ask (sell) prices on behalf of their clients. Financial intermediaries and speculators add market depth and liquidity by quoting bid and ask prices, taking trading positions and by taking on market risk to facilitate transactions.

Most OTC transactions are documented under the International Swaps and Derivatives Association master agreement, which provides a template of standard terms and conditions, including terms of credit, default provisions and settlement arrangements. While the template creates considerable standardisation in OTC contracts, the terms can be modified by agreement. In particular, it is open to market participants to negotiate OTC arrangements to suit their particular needs. This means that OTC products can provide flexible solutions through a variety of structures.

#### Box 3.1 Case study—Price spikes in the National Electricity Market—a retailer's exposure

On 31 October 2005, the New South Wales spot price spiked due to an outage on a major transmission line supplying Sydney. The repair of the line caused a second line to be taken out of service. The loss of transmission capacity meant that less electricity could be imported from the Snowy region. In addition, some New South Wales generators were constrained from operating at maximum output levels. Even though it was not a day of extreme demand, the New South Wales spot price rose as high as $7000 a megawatt hour (MWh) for some price intervals. While the spike affected only nine out of 48 price intervals on that day, an unhedged retailer would have faced significant losses that could not be recouped in the retail market.

To manage spot price risk, retailers can hedge their portfolios by purchasing financial derivatives that lock in firm prices for the volume of energy they expect to purchase in the future. This eliminates exposure to future price volatility for the quantity hedged, and provides greater certainty on profits. Similarly, a generator can hedge against low spot prices.

While retailers typically adopt a 'long' position in financial markets to protect against high spot prices, they sometimes take a 'short' portfolio position by deferring hedging. For example, a retailer might predict that forward prices will fall, such that hedge cover will be available at a better price in the future. This poses a risk that the retailer may be exposed to losses if forward prices rise.

The *Financial Services Reform Act 2001* includes disclosure provisions that relate to OTC markets. In general, however, the bilateral nature of OTC markets tends to make volume and price activity less transparent than in the exchange traded market.

## Exchange traded futures

Derivative products such as electricity futures are traded on registered exchanges. In Australia, electricity futures are traded on the SFE, in which participants (licensed brokers) buy and sell contracts on behalf of clients such as generators, retailers, speculators, financial intermediaries and hedge funds.[1]

There are a number of differences between OTC trading and exchange trade on the SFE:

- Exchange traded derivatives are highly standardised in terms of contract size, minimum allowable price fluctuations, maturity dates and load profiles. The product range in OTC markets tends to be more diverse and includes 'sculpted' products.
- Exchange trades are multilateral and publicly reported, giving rise to greater market transparency and price discovery than in the OTC market.
- Unlike OTC transactions, exchange traded derivatives are settled through a centralised clearing house, which becomes the central counterparty to all transactions. Exchange clearing houses, such as the SFE Clearing Corporation, are regulated and are subject to prudential requirements that mitigate credit default risks. This offers an alternative to OTC trading, in which trading parties rely on the credit worthiness of electricity market counterparties. More generally, liquidity issues can arise in OTC markets if trading parties reach or breach their credit risk limits with other OTC counterparties.

## Regulatory framework

Electricity financial markets are subject to a regulatory framework that includes the *Corporations Act 2001* and the *Financial Services Reform Act 2001*. The Australian Securities and Investment Commission is the principal regulatory agency. Amendments to the Corporations Act in 2002 extended insider trading legislation and the disclosure principles expected from securities and equity-related futures to electricity derivative contracts. The Energy Reform Implementation Group (ERIG) noted in 2006 that there remains some uncertainty among market participants as to their disclosure requirements under the legislation.[2]

In 2004, the Australian Accounting Standards Board (AASB) issued new or revised standards to harmonise Australian standards with the International Financial Reporting Standards. The new standards included AASB 139, which requires companies' hedging arrangements to pass an effectiveness test to qualify for hedge accounting. The standards also outline financial reporting obligations such as mark to market valuation of derivative portfolios.[3]

There are a number of further regulatory overlays in electricity derivative markets. For example:

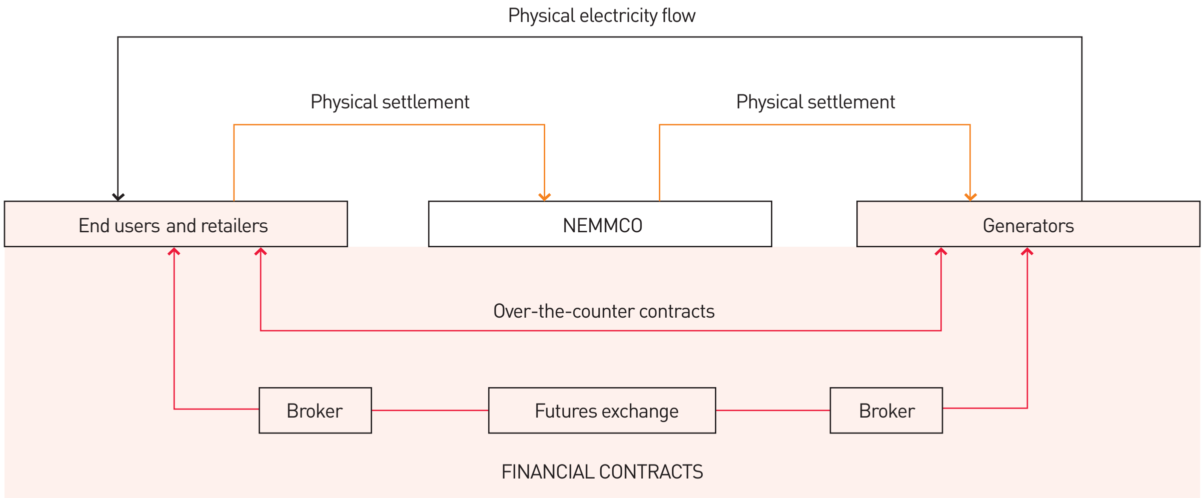
- the Corporations Law requires that OTC market participants have an Australian Financial Services licence or exemption
- exchange based transactions are subject to the operating rules of the SFE.

1 In 2006 the Sydney Futures Exchange merged with the Australian Stock Exchange. The merged company operates under the name Australian Securities Exchange.

2 ERIG, *Discussion papers*, November 2006.

3 Mark to market refers to the valuation technique whereby unrealised profit or loss associated with a derivative position is determined (and reported in financial statements) by reference to prevailing market prices.

Figure 3.1
Relationship between the NEM and financial markets




Source: Energy Reform Implementation Group

## Relationship with the National Electricity Market

Figure 3.1 illustrates the relationship between the financial markets and the National Electricity Market (NEM). Trading and settlement in the NEM occur independently of financial market activity—although a generator's exposure in the financial market can affect its bidding behaviour in the NEM. Similarly, a retailer's exposure to the financial market may affect the pricing of supply contracts offered to customers.

## 3.2 Financial market instruments

The financial market instruments traded in the OTC and exchange traded markets are called derivatives because they derive their value from an underlying asset—in this case, electricity traded in the NEM. The derivatives give rise to cash flows from the differences between the contract price of the derivative and the spot price of electricity. The prices of these instruments reflect the expected spot price and premiums to cover credit default risk and market risk.

Table 3.1 lists some of the derivative instruments available in the OTC and exchange traded markets. Common derivatives to hedge exposure to the NEM spot price are forwards (such as swaps and futures), and options (such as caps). Each provides the buyer and seller with a fixed price—and therefore a predictable future cash flow—either upon purchase/sale of the derivative or, in the case of an option, if the option is exercised. The following section describes some of the instruments in more detail.

Table 3.1 **Common electricity derivatives in OTC and SFE markets**

| INSTRUMENT | DESCRIPTION |
|---|---|
| Forward contracts<br>– swaps (OTC market)<br>– futures (SFE) | Agreement to exchange the NEM spot price in the future for an agreed fixed price. Settlement is based on the difference between the future spot price and the agreed fixed price. Forwards are called swaps in the OTC markets and futures on the SFE |
| Options | A right—without obligation—to enter into a transaction at an agreed price in the future |
| – cap | A contract that places a ceiling on the effective price the buyer will pay for electricity in the future |
| – floor | A contract that sets a minimum effective price the buyer will pay for electricity in the future |
| – swaptions/future options | An option to enter into a swap/futures contract at an agreed price and time in the future |
| – Asian options | An option in which the payoff is linked to the average value of an underlying asset (usually the NEM spot price) during a defined period |
| – profiled volume options for sculpted loads | A volumetric option that gives the holder the right to purchase a flexible volume in the future at a fixed price |

## Forward contracts

Forward contracts—called swaps in the OTC market and futures on the SFE—allow a party to buy or sell a given quantity of electricity at a fixed price over a specified time horizon in the future. Each contract relates to a nominated time of day in a particular region. On the SFE, contracts are quoted for quarterly base load and peak load contracts, for up to four years into the future.[4]

For example, a retailer might enter into an OTC contract to buy 10 megawatts of Victorian peak load in the third quarter of 2007 at $59 a MWh. During that quarter, whenever the Victorian spot price for any interval from 7.00 am to 10.00 pm Monday to Friday settles above $59 a MWh, the seller (which might be a generator or financial intermediary) pays the difference to the retailer. Conversely, the retailer pays the difference to the seller when the price settles below $59. In effect, the contract locks in a price of $59 a MWh for both parties.

A typical OTC swap might involve a retailer and generator contracting with one another—directly or through a broker—to exchange the NEM spot price for a fixed price that reduces market risk for both parties. On the exchange-traded market, the parties (generators, retailers, financial intermediaries and speculators) that buy and sell futures contracts through SFE brokers remain anonymous, and the SFE Clearing Corporation is the central counterparty to all transactions. As noted, exchange trading is more transparent in terms and prices and trading volumes, but tends to offer a narrower range of instruments than the OTC market.[5]

## Options

While a swap or futures contract gives price certainty, it locks the parties into defined contract prices with defined volumes—without an opt out provision. An option gives the holder the right—without obligation—to enter into a contract at an agreed price, volume and term in the future. The buyer pays a premium to the option seller for this added flexibility.

A call (put) option effectively gives the holder the right to buy (sell) a specified volume of electricity in the future at a predetermined strike price—either at any time before the option's maturity (an 'American' option) or at maturity (a 'European' option). For example, a retailer that buys a call option to protect against a rise in NEM spot prices can later abandon that option if prices do not rise as predicted. The retailer could then take advantage of the prevailing NEM spot price.

4 A peak contract relates to the hours from 7.00 am to 10.00 pm Monday to Friday, excluding public holidays. Off-peak is outside that period. A flat price contract covers both peak and off-peak periods.

5 There are around 640 listed d-cypha SFE electricity futures and options products. The OTC market can support a virtually unlimited range of bilaterally negotiated product types.

Option products include caps, floors and combinations such as collars (see below). The range and diversity of products is expanding over time to meet the requirements of market participants. More exotic options include swaptions and Asian options (table 3.1).

**Caps, floors and collars**

Commonly traded options in the electricity market are caps, floors and collars.[6] A cap allows the buyer—for example, a retailer with a natural 'short' exposure to spot prices—to set an upper limit on the price that they will pay for electricity while still being able to benefit if NEM prices are lower than anticipated. For example, a cap at $300 a MWh—the cap most commonly traded in Australia—ensures that no matter how high the spot price may rise, the buyer will pay no more than $300 a MWh for the agreed volume of electricity. In Australia, a cap is typically sold for a nominated quarter—for example, July–September 2008.

By contrast, a floor contract struck at $30 a MWh will ensure a minimum price of $30 a MWh for a buyer such as a generator with a natural 'long' exposure to spot prices. Retailers typically buy caps to secure firm maximum prices for future electricity purchases, while generators use floors to lock in a minimum price to cover future generation output. A collar combines a cap and floor to set a price band in which the parties agree to trade electricity in the future.

### Flexible volume instruments

Instruments such as swaps and options are used to manage NEM price risk for fixed quantities of electricity. But the profile of electricity loads varies according to the time of day and the weather conditions. This can result in significant volume risk in addition to price risk. In particular, it can leave a retailer over-hedged or under-hedged, depending on actual levels of electricity demand. Conversely, windfall gains can also be earned.

Structured products such as flexible volume contracts are used to manage volume risks. These sculpted products, which are mainly traded in the OTC market, enable the buyer to vary the contracted volume on a pre-arranged basis. The buyer pays a premium for this added flexibility.

## 3.3 Financial market liquidity

The effectiveness of financial markets in providing risk management services depends on the extent to which they offer the products that market participants require. Adequate market liquidity is critical in this regard. In electricity financial markets, liquidity relates to the ability of participants to transact a standard order within a reasonable timeframe to manage their load and price risk, using reliable quoted prices that are resilient to large orders, and with sufficient market participants and trading volumes to ensure low transaction costs.

There are various indicators of liquidity in the electricity derivatives market, including:

- the volume and value of trade (including relating to NEM volumes)
- the open interest of contracts
- transparency of pricing
- the number and diversity of market participants
- the number of market makers and the bid-ask spreads quoted by them
- the number and popularity of products traded
- the degree of vertical integration between generators and retailers
- the presence in the market of financial intermediaries.

This chapter focuses mainly on liquidity indicators relating to trading volumes, but it includes some consideration of open interest data, pricing transparency, changes in the demand for particular derivative products, changes in the financial market's structure and vertical integration.



6 While caps and floors are technically options—they are effectively a series of half-hourly options—they are typically linked to the NEM spot price and are automatically exercised when they deliver a favourable outcome. Other options, such as swaptions, are generally linked to forward prices, and the buyer must nominate whether or not the option is to be exercised.

## 3.4 Trading volumes in Australia's electricity derivative market

There is comprehensive data on derivative trading on the SFE, which is updated on a daily and real time basis. The OTC market is less transparent, but periodic survey data provides some indicators of trading activity.

### Trading volumes — Sydney Futures Exchange

Financial market vendors such as d–cyphaTrade publish data on derivative trading on the SFE. Table 3.2 and figure 3.2 illustrate the growth in trading volumes in electricity futures and options. Trading levels rose sharply from a low base in 2003–04, eased in 2004–05 and rose by 129 per cent in 2005–06. Growth then accelerated, with volumes rising by around 345 per cent in 2006–07. Traded volumes in 2006–07 reached around 125 per cent of underlying NEM physical demand. These outcomes appear to be consistent with the Australian Securities Exchange's view that futures market liquidity takes time to build from a low base to an 'inflection point' where proprietary trading firms, banks, funds and other speculators are attracted en masse.[7]

Trading on the SFE comprises a mix of futures (first listed in September 2002) and caps and other options (first listed in November 2004). Trading in options currently represents up to 40 per cent of monthly turnover.

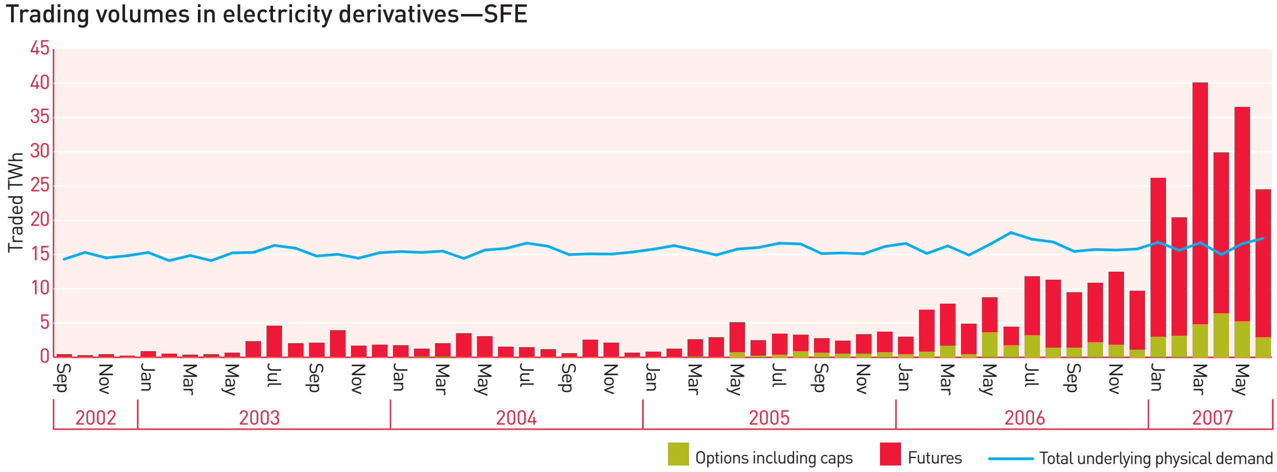
**Table 3.2 Trading volumes in electricity derivatives—SFE**

| | 2002–03 | 2003–04 | 2004–05 | 2005–06 | 2006–07 |
|---|---|---|---|---|---|
| Total trade (TWh) | 6.7 | 29.5 | 23.8 | 54.6 | 243.1 |
| Increase (%) | | 340.9 | –19.1 | 129.3 | 345 |

Source: d-cyphaTrade

Figure 3.3 shows the composition of futures and options trade on the SFE by maturity date, based on open interest data—the number of open contracts at a point in time (box 3.2). The SFE trades quarterly futures and options out to four years ahead, compared to three years in many overseas markets.[8] Liquidity tends to be highest one to two years out as electricity retail contracts typically run from one to three years with the majority being negotiated for one year. Some retailers do not lock in forward hedges beyond the term of existing customer contracts.

**Figure 3.2**
**Trading volumes in electricity derivatives—SFE**




Source: d-cyphaTrade

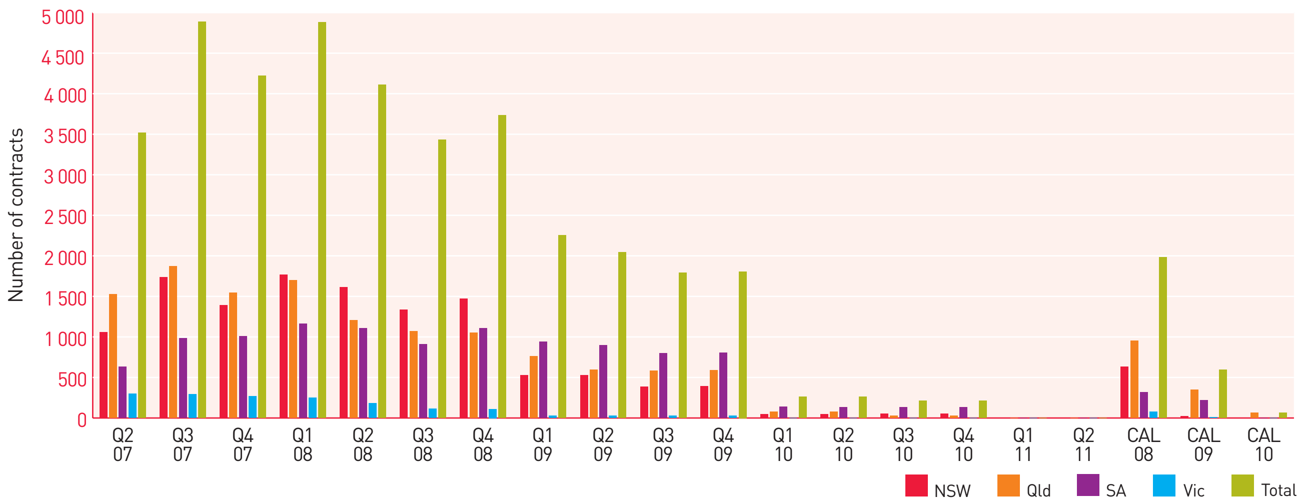
7 Australian Securities Exchange, *Submission to Energy Reform Implementation Group*, 2006.
8 See, for example, www.eex.de (Germany) or www.powernext.fr (France).

Figure 3.4 illustrates regional trading volumes. New South Wales, Queensland and Victoria have recorded significant growth in trading volumes since 2005, with exceptional growth in the early months of 2007. In 2006–07, Victoria accounted for 38 per cent of volumes, followed by New South Wales and Queensland (29 per cent each). Liquidity levels in South Australia have remained low since 2002. South Australia accounts for around 4 per cent of traded volumes (figure 3.5).



**Figure 3.3**

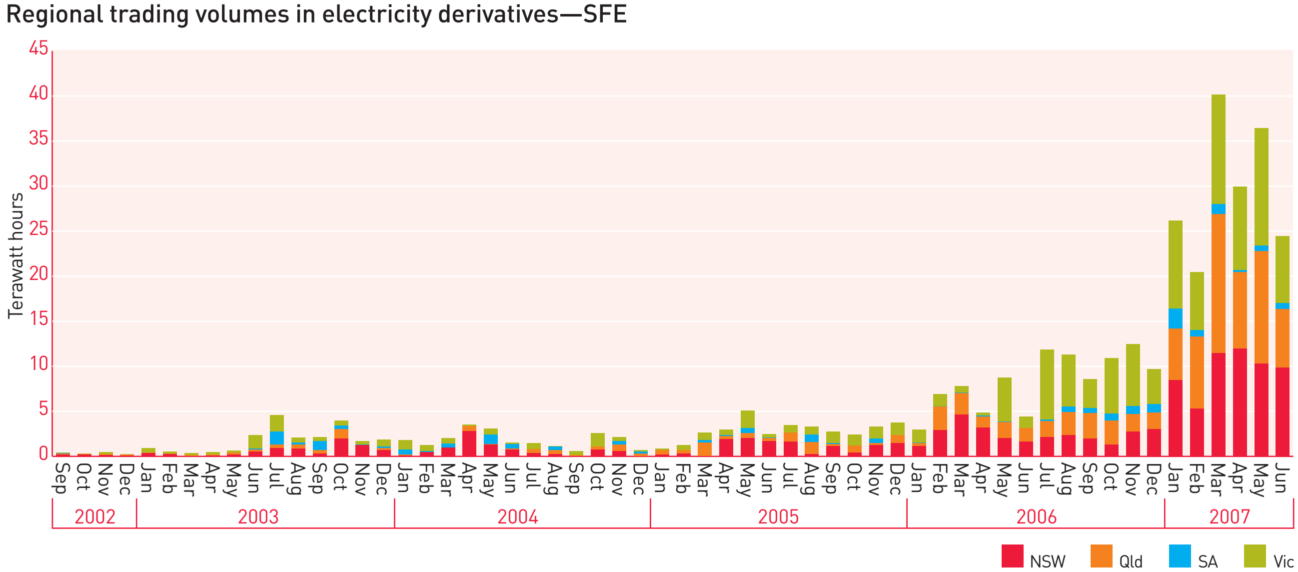
**Open interest in electricity forward contracts by maturity date at June 2007—SFE**




Source: d-cyphaTrade

**Figure 3.4**

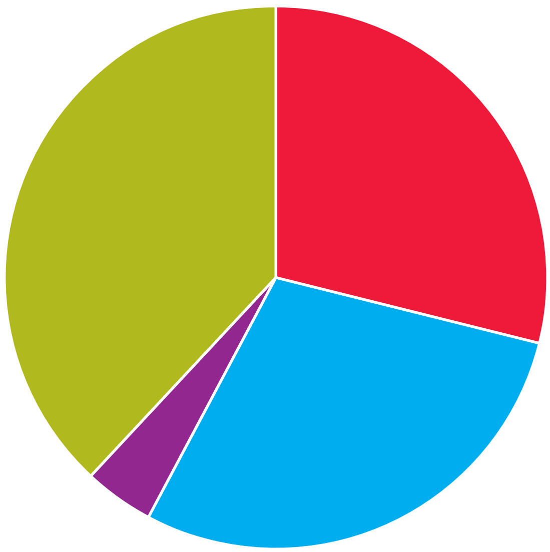
**Regional trading volumes in electricity derivatives—SFE**




Source: d-cyphaTrade

Figure 3.5

**Regional shares of SFE electricity derivatives trade (terawatt hours), 2006–07**



NSW **29%** Qld **29%** SA **4%** Vic **38%**

Source: d-cyphaTrade

## Trading volumes—OTC markets

There is limited data on liquidity in the OTC markets because transactions are only visible to the parties engaged in trade. The Australian Financial Markets Association (AFMA) conducts an annual survey of OTC market participants on direct bilateral and broker-assisted trade. AFMA reports that most, but not all, participants respond to the survey. A particular OTC transaction will be captured in the AFMA data if at least one party to the trade participates in the survey.

As figure 3.7 indicates, total OTC trades have averaged around 200 terawatt hours (TWh) a year since 2000–01. Volumes peaked at 235 TWh in 2002–03, and fell to 177 TWh in 2005–06. Turnover fell by 9 per cent in 2004–05, and by 11 per cent in 2005–06.


### Box 3.2 Open interest on the Sydney Futures Exchange

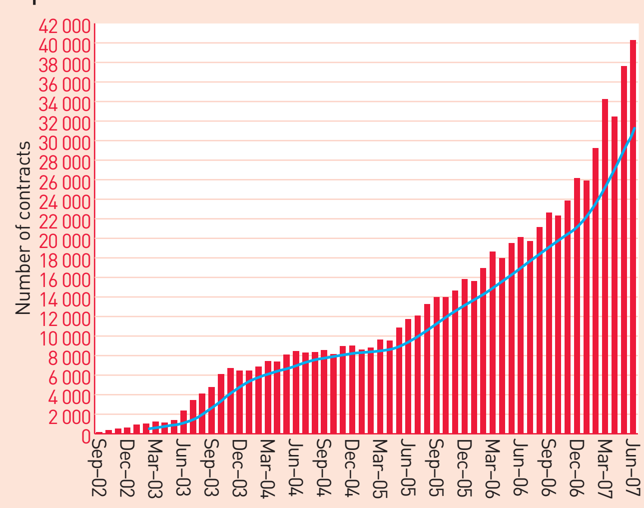
Many financial contracts are entered into, while others are closed out or transferred, every trading day on the SFE. Open interest refers to the total number of futures and option contracts that have been entered into and remain open—that is, have not been exercised, expired or closed out—at a point in time. In other words, it provides a snapshot on a particular day of all contracts that remain open, including contracts entered into on that day and those that have been open for days, months or years.

Trends in open interest provide one indicator of market liquidity, usually in conjunction with trading volumes. An increase in open interest typically accompanies a rise in trading volumes and reflects underlying demand growth. A decline in open interest indicates that market participants are closing their open position, which suggests they have less need to retain the hedges they have entered into.

As figure 3.6 illustrates, the SFE electricity futures market has experienced a steady increase in open interest since 2002. The number of open contracts rose from around zero in 2002 to over 40 000 in June 2007. This provides one indicator of rising overall liquidity in the exchange market.

Figure 3.6

**Open interest on the SFE**




Source: d-cyphaTrade

Figure 3.7

Regional trading volumes—OTC market

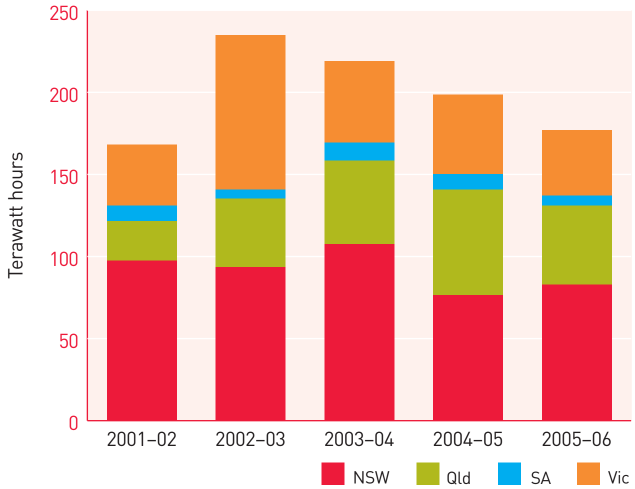
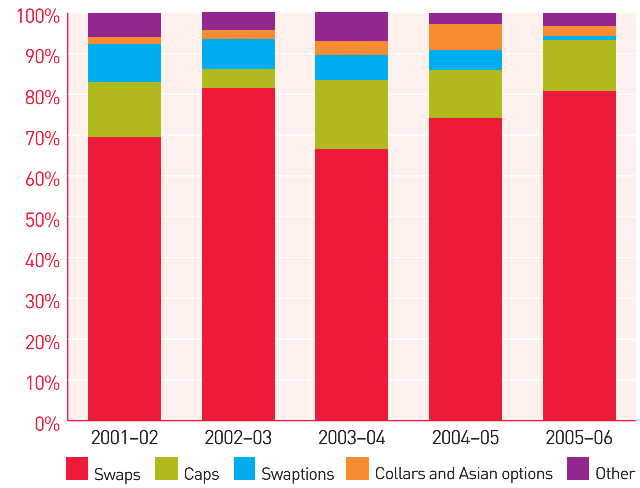



Figure 3.8

Trading volumes by derivative type—OTC market




Data source: AFMA, *2006 Australian Financial Markets Report*, 2006.

On a regional basis, volumes fell in 2005–06 in Queensland, Victoria and South Australia, which AFMA attributed to ownership changes in those markets. Turnover rose in New South Wales. The low volumes recorded for South Australia are consistent across the OTC and exchange-traded markets.

Around 80 per cent of OTC trade in 2005–06 was in swaps, with the balance in caps, swaptions, collars and Asian options. The last three years have seen a shift away from exotic derivatives in favour of swaps (figure 3.8).[9]

## Composition of OTC trading

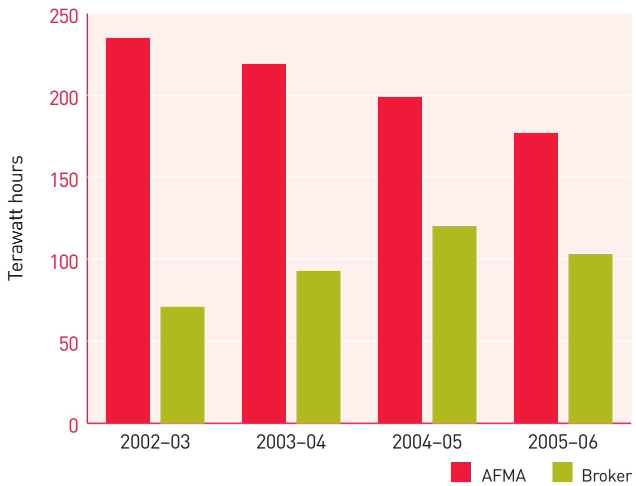
In 2006, PricewaterhouseCoopers (PwC) published a survey of liquidity in electricity derivatives,[10] which indicated that broker assisted trading in OTC markets rose strongly from 2002–03 to 2004–05 before falling by around 14 per cent in 2005–06.[11] PwC also compared its data against the AFMA survey data on total OTC turnover and found a trend away from direct bilateral trading towards broker-assisted trading (figure 3.9). Broker trading doubled from around 30 per cent of AFMA volumes in 2002–03 to around 60 per cent in 2005–06.

9 AFMA, *2006 Australian financial markets report*, 2006.

10 PwC, *Independent survey of contract market liquidity in the National Electricity Market 9th August*, commissioned by the National Generators Forum and Energy Retailers Association of Australia, 2006.

11 Broker assisted OTC trade fell in the year to 2005–06 but was more than offset by a significant rise in volumes on the SFE.

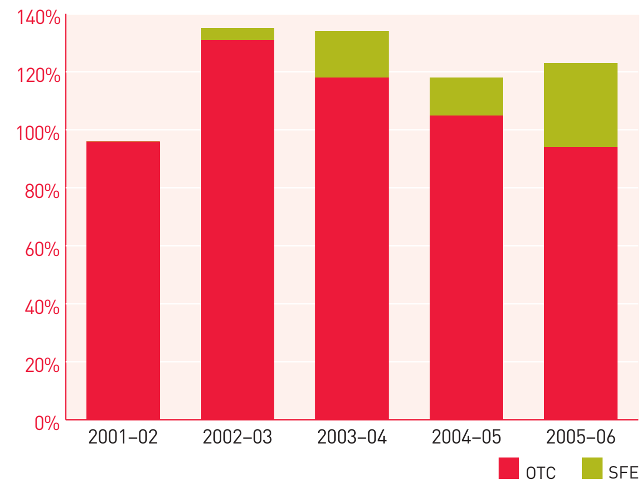
Figure 3.9
AFMA and PwC survey data on OTC trades




Note: The AFMA data includes direct bilateral trade and OTC broker activity. The difference between the two bars therefore represents an estimate of direct bilateral trade.

Source: PwC, *Independent survey of contract market liquidity in the National Electricity Market,* August 2006.

Figure 3.10
Trading volumes—OTC and SFE as a percentage of underlying NEM demand




Note: NEM demand excludes Tasmania, for which derivative products were not available.

Data sources: d-cyphaTrade/AFMA/NEMMCO.

## Aggregate trading volumes in OTC and SFE markets

Table 3.3 estimates aggregate volumes of electricity derivatives traded in OTC markets and on the SFE. The data is a simple aggregation of AFMA data on OTC volumes and d-cyphaTrade data on exchange trades. Figure 3.10 charts the same data in relation to the underlying demand for electricity in the NEM. The results should be interpreted with some caution, given that the AFMA data is based on a voluntary survey. This would result in the omission of transactions between survey non-participants. AFMA considers that the survey captures most OTC activity.

It should be noted that a particular contract may be traded more than once in a financial market if participants—including speculators—adjust their positions. This can result in derivative trading volumes that exceed 100 per cent of NEM demand. As figure 3.10 indicates, trading volumes were the equivalent of around 123 per cent of NEM volumes in 2005–06.

**Table 3.3 Volumes traded in OTC markets, SFE and NEM (terawatt hours)**

| | OTC | SFE | UNDERLYING NEM DEMAND |
|---|---|---|---|
| 2001–02 | 168.1 | 0 | 175.0 |
| 2002–03 | 235.0 | 6.7 | 179.3 |
| 2003–04 | 219.0 | 29.4 | 185.3 |
| 2004–05 | 198.9 | 23.9 | 189.7 |
| 2005–06 | 177.1 | 54.6 | 187.9 |

Note: NEM demand excludes Tasmania, for which derivative products were not available.

Data sources: d-cyphaTrade/AFMA/NEMMCO.

The data illustrates that the majority of financial trade until June 2006 occurred in the OTC markets. But OTC trading is declining both in absolute terms and relative to trading on the SFE. In 2005–06, OTC trade was equivalent to 94 per cent of NEM demand, down from 131 per cent in 2002–03. Volumes on the SFE rose from near zero in 2001–02 to levels equivalent to around 30 per cent of NEM demand in 2005–06. SFE trade grew exponentially in 2006–07, reaching around 125 per cent of underlying NEM demand.

Figure 3.11
Trading volumes by region—OTC and SFE as a percentage of regional NEM demand


Data sources: d-cyphaTrade/AFMA/NEMMCO

There are a number of reasons for the strong growth in exchange traded volumes. Amendments to the Corporations Act and the introduction of international hedge accounting standards to strengthen disclosure obligations for electricity derivatives contracts may have raised confidence in exchange-based trading. The SFE also redesigned the product offerings in 2002 to tailor them more closely to market requirements. These changes have encouraged greater depth in the market, including the entry of active financial intermediaries.

The increase in trading volumes on the SFE has also been driven by credit default risk issues in the OTC markets, where some trading parties may be reaching their credit limits with counterparties. The PwC survey of market participants cited anonymity and credit benefits as being among the reasons for the shift away from OTC markets towards exchange trading. This trend may continue with record forward prices in 2007 (section 3.7) creating large shifts in mark-to-market OTC credit exposures for some participants.[12]

Across the combined OTC and exchange markets, aggregate volumes peaked in 2002–03 and 2003–04 at over 130 per cent of NEM demand. Volumes fell below 120 per cent of NEM demand in 2004–05, but rose slightly in 2005–06.

Figure 3.11 charts regional trading volumes as a percentage of regional NEM demand. The share of total trade relative to regional NEM demand has been fairly steady in New South Wales, but has tended to rise in Queensland (despite a fall in 2005–06). In Victoria, a sharp fall in trade in 2003–04 was followed by a more stable trend. South Australia has experienced a sharp decline in trading volumes, with turnover falling from around 132 per cent of regional NEM demand in 2003–04 to 62 per cent in 2005–06. This compared with significantly higher rates in 2005–06 for Victoria (112 per cent), Queensland (121 per cent) and New South Wales (135 per cent).

12 For example, retailers that purchased OTC base load calendar 2008 contracts prior to the significant price rises in 2007 may be exposed to substantial contract replacement costs if their OTC counterparties default.

The PwC survey of market participants found that a majority of respondents considered that liquidity in South Australia's financial markets was inadequate. Survey respondents raised a number of possible issues, including the relatively small scale of the South Australian electricity market, perceptions of risk associated with interconnection, generation capacity and extreme weather, and perceptions of high levels of vertical integration.[13] ERIG also noted gaps in the liquidity and depth of financial markets in South Australia. It also noted liquidity issues for Tasmania, which was not physically connected to the NEM until 2006. More generally, there are gaps in the market for sculpted and flexible products, which are mainly traded in the direct OTC market.[14]

## 3.5 Price transparency and bid-ask spread

While trading volumes and open interest provide indicators of market depth, part of the cost to market participants of transacting is reflected in the bid-ask spread (the difference between the best buy and best sell prices) quoted by market makers and brokers. A liquid market is characterised by relatively low price spreads that allow parties to transact at a nominal cost.

d-cyphaTrade and other market data providers publish bid-ask spreads for the exchange-traded market. In 2007 most spreads were in a range of $2 to $3. In a 2006 survey of bid-ask spreads in the OTC market, PwC found that spreads of $1 or more are not unusual and that spreads are higher for peak than off-peak periods.

The survey indicated a number of market gaps—for example:

- bids and offers were not evident for short-term products or beyond calendar year 2010
- there was a lack of bids and offers for all products in South Australia.[15]

## 3.6 Number of market participants

Ownership consolidation, such as vertical integration across the generation and retailer sectors, can affect participation in financial markets. In particular, vertical integration can reduce a company's activity in financial markets by increasing its capacity to internally offset risk. Figure 3.12 displays PwC estimates of the match of generation and retail load for Origin Energy, AGL and TRUenergy across the Victorian and South Australian markets in 2005–06.[16] While each generator has significant price and risk positions that need to be managed all have announced proposals to develop new generation projects.

KPMG estimate that vertically-integrated firms account for about 14 per cent of installed capacity across the NEM. The United Kingdom market has significant vertical integration—six vertically-integrated firms dominate the market—and low levels of financial market liquidity. ERIG considered that if the Australian market were to evolve to a handful of balanced participants, little financial trade would be expected.[17]

13 PwC, *Independent survey of contract market liquidity in the National Electricity Market,* August 2006, p. 28.

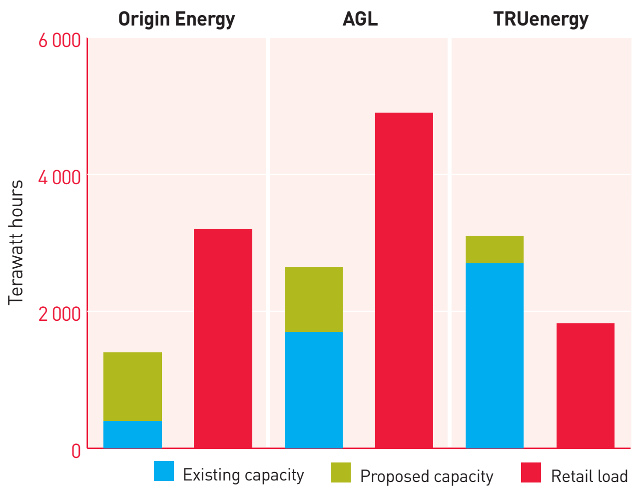
14 ERIG, *Discussion papers*, November 2006, p. 194.

15 PwC, 2006, p. 16. See footnote 13.

16 Figure 3.12 excludes TRUenergy's contractual arrangement for Ecogen Energy capacity in Victoria (around 890 MW). In January 2007 AGL entered agreements to acquire the 1260 MW Torrens Island power station in South Australia from TRUenergy, and to sell its 155 MW Hallett power station to TRUenergy. The transaction was completed in July 2007, and is not reflected in figure 3.12.

17 ERIG, 2006, pp. 195–6. See footnote 14.

Figure 3.12
Generator capacity and retail load of vertically integrated players in Victoria and South Australia, 2005–06




Note: Average retail load is determined based on the estimated market share of each retailer as a proportion of NEM demand for 2005–06. Market share has been estimated from annual reports. This information is not intended to be an accurate reflection of participants' positions, rather an estimate of the possible degree of vertical integration.

Source: PwC, *Independent survey of contract market liquidity in the National Electricity Market,* August 2006.

While integration has reduced the number of generators and retailers in the financial markets, there has been new entry by financial intermediaries such as BP Singapore, ANZ, Optiver, Attunga Capital, Commonwealth Bank and Arcadia Energy. ERIG considered that the increasing involvement of financial intermediaries is evidence of a dynamic market.

## 3.7 Price outcomes

### Base futures

Average price outcomes for electricity base futures[18] are reflected in the Australian Power Strip (APS). The strip represents a basket of the electricity base load futures listed on the SFE for New South Wales, Victoria, Queensland and South Australia. It is calculated as the average daily settlement price of a common quarter of base futures contracts, one year ahead across the four regions. The APS is published daily by d-cyphaTrade and is tradeable on the exchange.[19]

APS data is available from the commencement of d-cyphaTrade in 2002. Figure 3.13 shows that until 2007, base load futures followed seasonal patterns, with higher prices in summer (Q1) before easing in subsequent quarters. This reflects that NEM spot prices also tend to rise in summer and illustrates the linkages between derivative prices and underlying NEM wholesale prices. Base futures prices rose more sharply than usual in Q1 2007, and continued to rise strongly against historical trends in Q2 2007. This pattern mirrored high prices in the physical electricity market, caused by tight demand-supply conditions (section 2.5).

The persistence of high forward prices in 2007 suggests that the market is factoring in expectations of tight supply in the physical electricity market for most of 2007 and into 2008. Higher forward prices may also reflect concerns about the possible effects of carbon trading on energy prices.

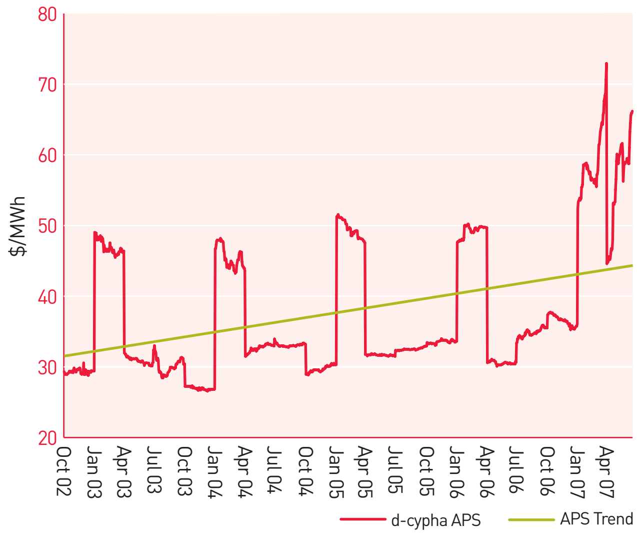
The trend line in figure 3.13 averages out seasonal impacts to show the underlying trend in base futures prices. Across New South Wales, Victoria, Queensland and South Australia, average prices rose from around $34 in 2002 to $44 in June 2007—a rise of around 29 per cent over five years. Most of this increase derives from price activity in 2007.

18 Base load futures cover the hours from 0.00 to 24.00 hours, seven days a week.

19 The contracts included in the basket are based on a rolling one-year forward continuation strip. The APS therefore includes the prices for quarter base load futures contracts for New South Wales, Victoria, South Australia and Queensland that are one year forward of the current quarter. For example, if the current quarter is Q3 2007, the prices included in the APS will be for Q3 2008 contracts. In Q4 2007, the prices will roll forward to Q4 2008 contracts. The components of the Australian Power Strip are rolled over to the next listed contracts at the commencement of each new quarter (on the first business day in January, April, July and October).

Figure 3.13

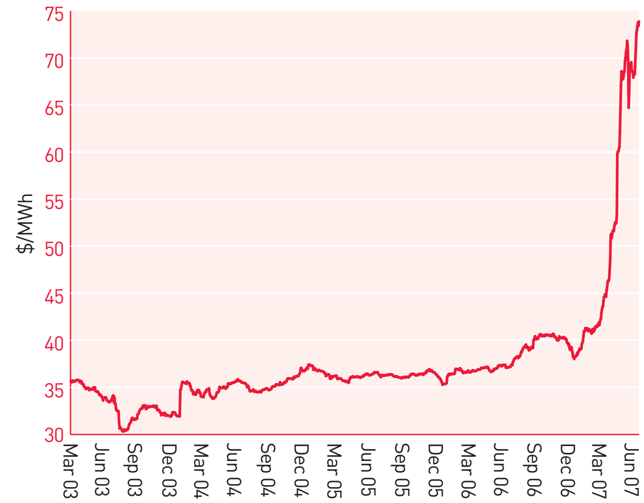
Australian Power Strip listed on the SFE




Source: d-cyphaTrade

Figure 3.14

National base futures prices—rolling calendar year




Source: d-cyphaTrade

Figure 3.14 sets out an alternative indicator of base futures prices, based on the average price of a national basket of contracts for the following calendar year. The use of calendar years removes seasonality from the data. The basket consists of New South Wales, Victorian, Queensland and South Australian base futures. The chart illustrates that base futures prices were fairly stable for many years before rising in late 2006 and again—sharply—in 2007. The price of base load calendar contracts rose by around 90 per cent between 1 January 2007 and 22 June 2007.

Figure 3.15 tracks spot prices in the NEM against the APS for base futures. In general, contract markets trade at a premium to the physical spot market for an underlying commodity to cover the cost of managing risk. On average, base futures prices in the NEM have reflected a fairly constant premium over spot prices of around $2 to $3 a megawatt hour.[20] This relationship became blurred in the volatile market conditions that prevailed in 2007, when both NEM prices and the APS rose sharply.

## Peak futures

Prices for peak futures[21] have historically been higher than for base futures. Figure 3.16 charts the prices of peak futures that mature in the first quarter (Q1) 2008 in four regions of the NEM against open interest (open contracts) in those instruments. Open interest rose steadily from 2005, mostly in Victorian instruments. The negligible interest in South Australian peak futures is consistent with low levels of liquidity in that region.

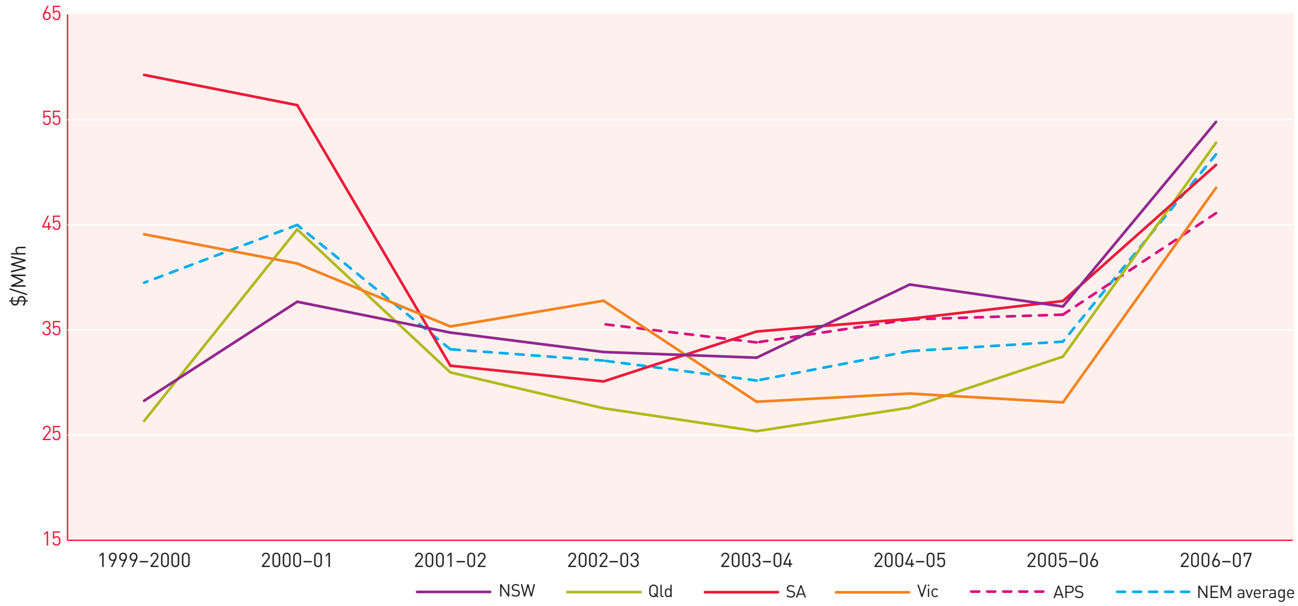
Prices for all Q1 2008 peak contracts rose during 2006, and again—more sharply—in 2007, partly in response to rising wholesale prices. As noted, there were indications in 2007 that the market was factoring in expectations of tight supply conditions in the physical electricity market at least into early 2008.

20 KPMG estimate that the premium in the contract market as a whole (base and peak contracts) relative to the NEM spot price is around $4 to $5 a megawatt hour (ERIG, *Discussion papers*, November 2006).

21 Peak futures cover the hours from 07.00 to 22.00 hours Monday to Friday, excluding public holidays.

Figure 3.15

NEM annual average prices and Australian Power Strip annual average

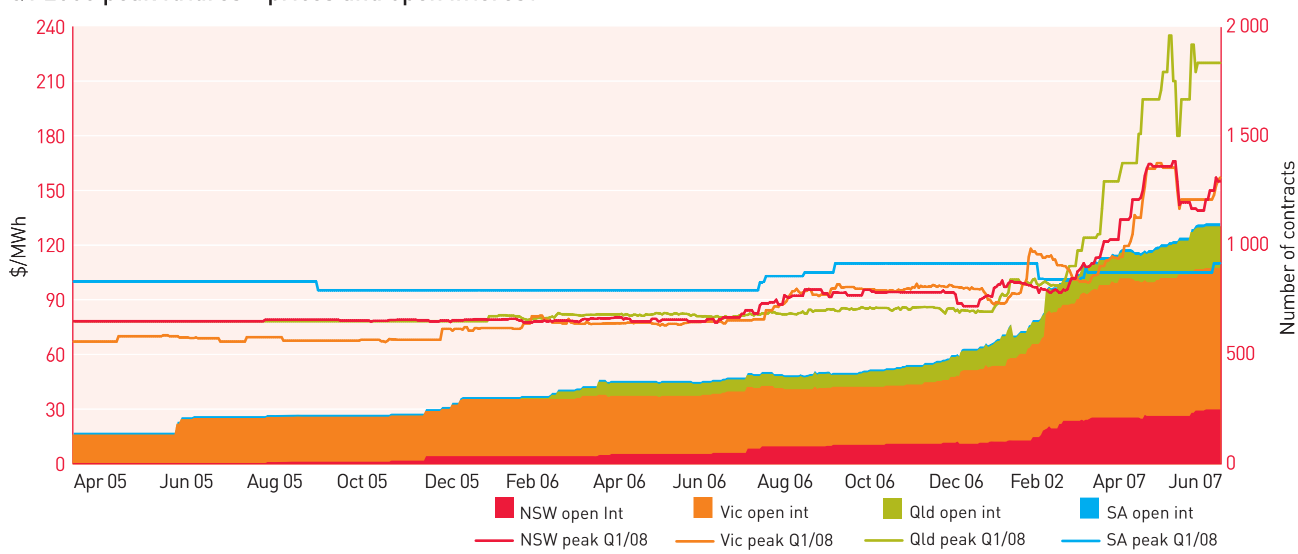



Note: NEM prices are time-weighted averages to allow comparability with the Australian Power Strip (APS)

Data source: NEMMCO/d-cyphaTrade

Figure 3.16

Q1 2008 peak futures—prices and open interest




Note: Open Int = open interest; Q1 = quarter 1

Data Source: d-cyphaTrade

### Future forward prices

Figures 3.17 and 3.18 provide a snapshot on 25 June 2007 of the forward prices for base load and peak load futures for New South Wales, Victoria, Queensland and South Australia on the SFE. The charts show the trading prices on that date for futures that mature in the period 2007-2011. These are often described as forward curves. The first four quarters of a forward curve are the prompt quarters. Later quarters are called forward quarters.

The charts reflect that first quarter futures prices (for the summer quarters) tend to be higher than for other quarters for base and peak load contracts. As noted, prices for Q2, Q3 and Q4 2007 futures were unseasonably high.

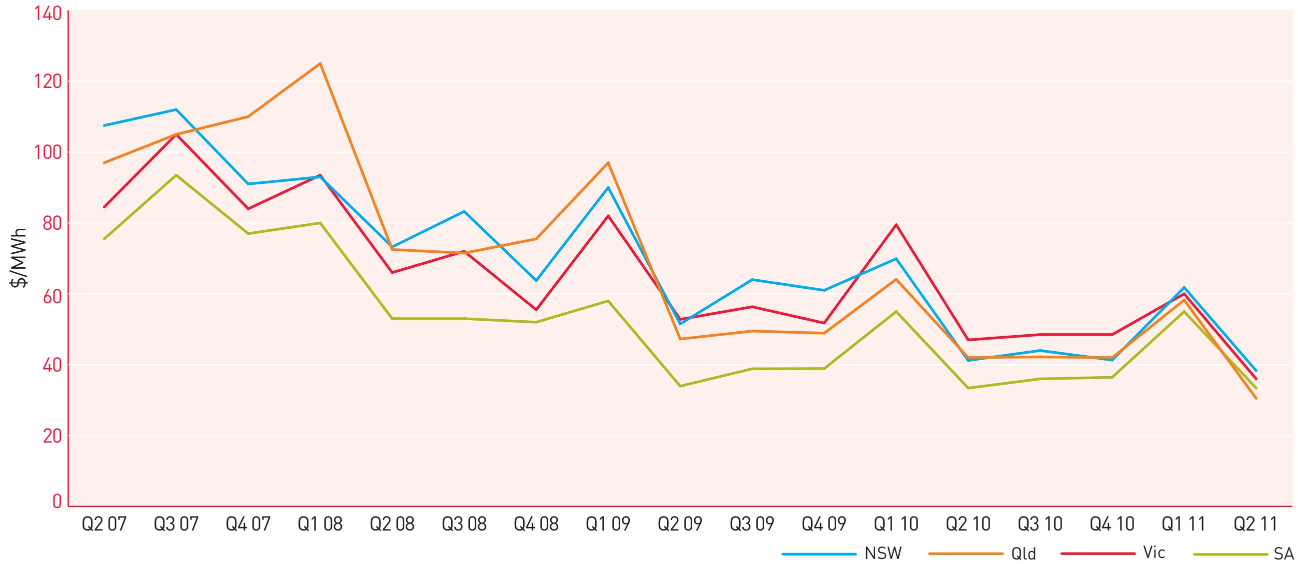
In June 2007, the market was mostly trading in backwardation—that is, futures prices for the prompt quarters (in 2007 and Q1 2008) were trading above prices for the equivalent quarters in later years. In commodity markets, backwardation usually indicates a perceived shortage of physical supply in the short to medium term that the market anticipates will reduce in the longer term. The charts suggest that the market expects a continuation of tight supply-demand conditions for electricity for the duration of 2007 and at least into the summer of 2008, but a gradual easing in conditions in later years (for example, due to expectations of an investment response to increase capacity). Forward prices are nonetheless persistently high compared to historical levels out to at least 2010.

## 3.8 Price risk management — other mechanisms

Aside from financial contracts there are other mechanisms to manage price risk in electricity wholesale markets. As noted, some retailers and generators have reduced their exposure to NEM spot prices through vertical integration. In addition:

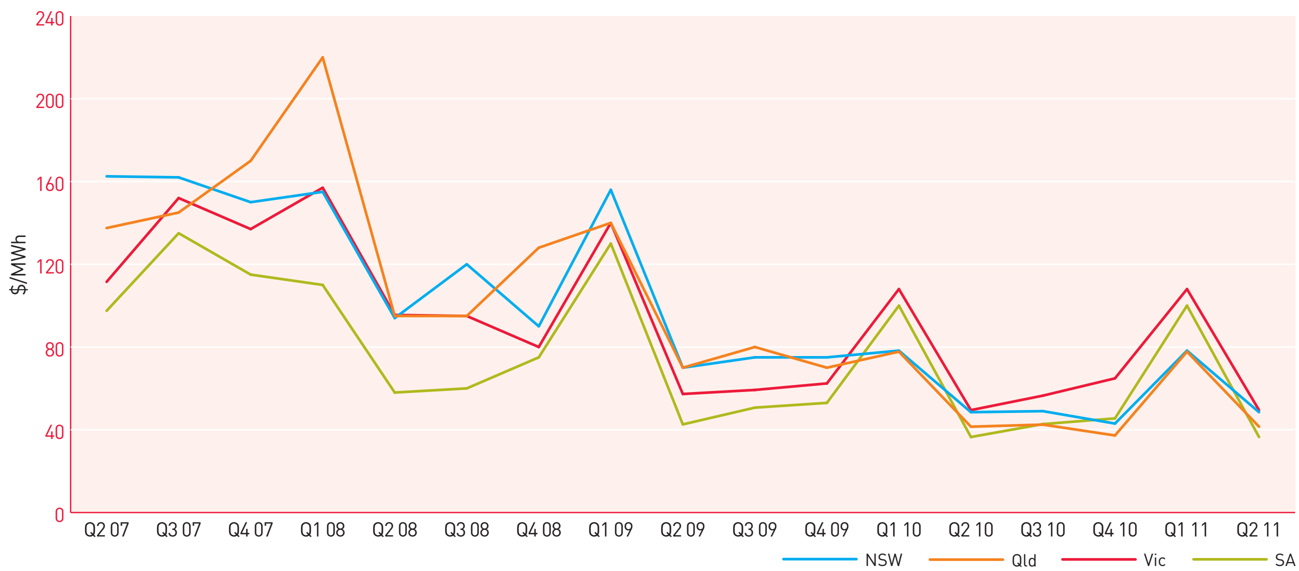
- In New South Wales the Electricity Tariff Equalisation Fund (ETEF) provides a buffer against prices spikes in the NEM for government-owned retailers that are required to sell electricity to end users at regulated prices. When spot prices are higher than the energy component of regulated retail prices, ETEF pays retailers from the fund. Conversely, retailers pay into ETEF when spot prices are below the regulated tariff. ETEF was due to expire in 2007, but the New South Wales Government has announced that it will extend its operation until June 2010.
- Auctions of settlement residues allow for some financial risk management in inter-regional trade, although the effectiveness of this instrument has been the subject of some debate (section 4.7).

## Figures 3.17
### Base futures prices at 25 June 2007




Source: d-cyphaTrade

## Figures 3.18
### Peak futures prices at 25 June 2007




Source: d-cyphaTrade