

## Australian Electricity Futures and Options Market



9<sup>th</sup> March 2011

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# About d-cyphaTrade



## d-cyphaTrade

- **Official Product Sponsor** of d-cyphaTrade ASX Australian Electricity Futures & Options market. Services:
  - Free industry **helpline**, energy futures market design and development, futures market **data services**, formal **education & training**.

## ASX Group

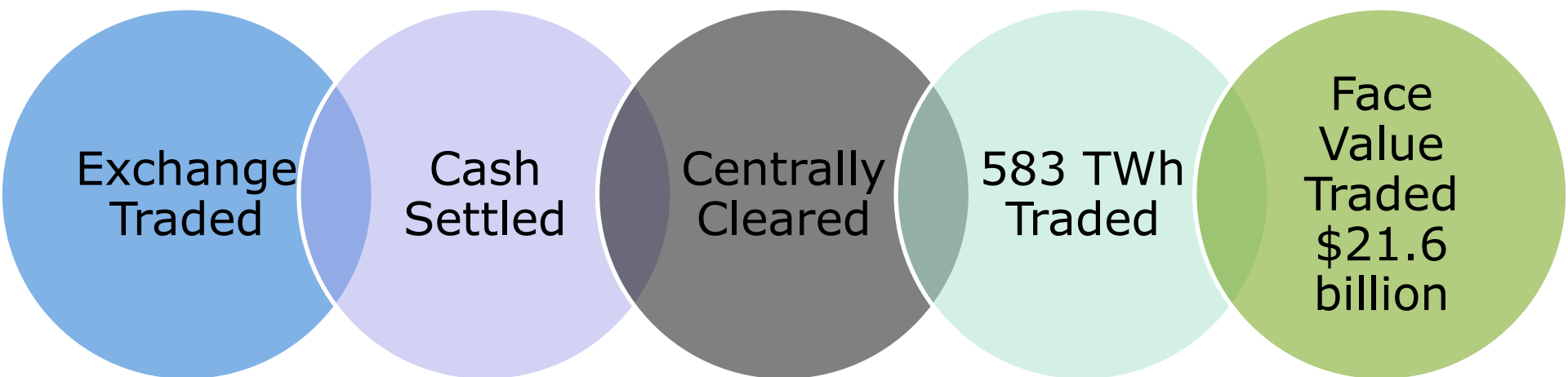
- ASX 24 is the licensed futures market responsible for market operation and trading.
- Products daily margined and cleared by ASX Clear (Futures).
- Compliance and Surveillance is performed by ASX Compliance and Australian Securities and Investment Commission (ASIC).

# 1. The Electricity Futures and Options Market



# Electricity Futures and Options

## Fast Facts – 12 months to 7<sup>th</sup> March 2011



- The world's largest exchange-traded electricity options market (by energy);
- 6 Investment banks set up electricity trading desks since 2010.

# Electricity Futures - Products



<b>Underlying Commodity</b>	<b>Electrical energy bought and sold in the NSW, VIC, SA and QLD wholesale pool markets conducted by AEMO.</b>
Contract Quarters	March (H), June (M), September (U) and December (Z).
The Cash Settlement Price	The arithmetic average of the NEM final base load half hour spot prices during the Contract Quarter, rounded to two decimal places. A Provisional Cash Settlement Price will be declared on the first Business Day after expiry of the Contract and shall be later confirmed on the third Business Day after expiry. N.b. \$300 Cap Futures use different calculation.
Trading Hours	9:00am – 4:00pm, Sydney time (Normal) 9:00am – 5:00pm, Sydney time (Block Trade)
Base Load Contract Unit	1 Megawatt of electrical energy per hour based on a base load profile. Where the base load profile is defined as the NEM base load period from 00:00 hours Monday to 24:00 hours Sunday over the duration of the Contract Quarter. The size (in Megawatt hours) of each contract quarter will vary depending on the number of days and base load hours within the quarter.  Note: \$300 Cap Futures are also available and trade out to 2 years.
Peak Period Contract Unit	1 Megawatt of electrical energy per hour based on a peak-period profile. Where the peak-period profile is defined as the NEM peak-period from 07:00 hours to 22:00 hours Monday to Friday (excluding Public holidays, as determined and published by ASX24) over the duration of the Contract Quarter.

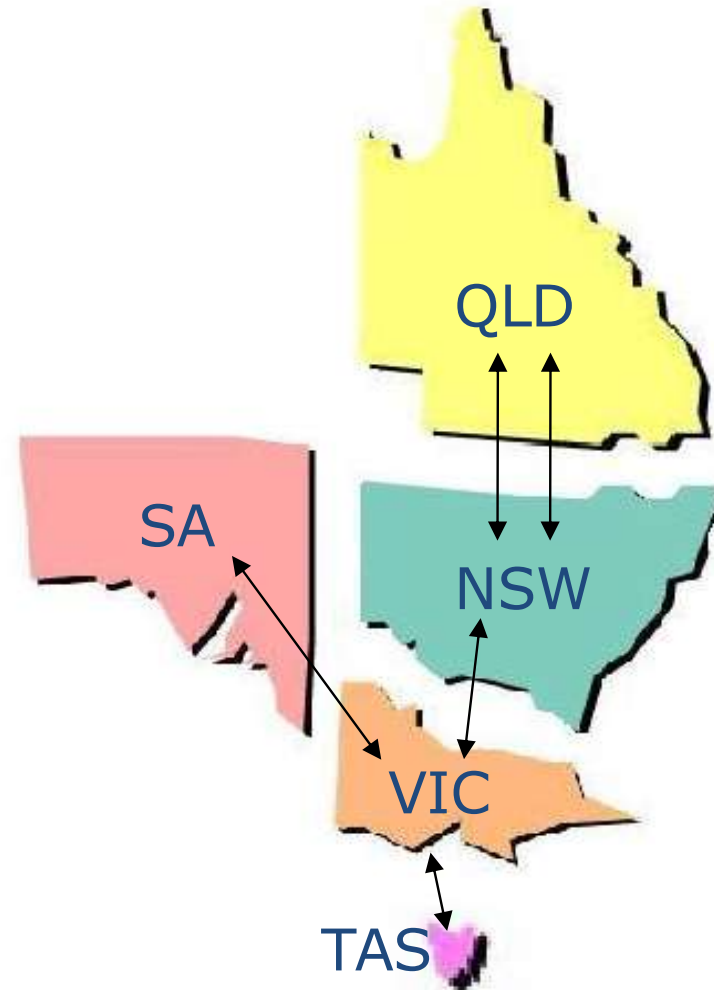
# Electricity Options



	Calendar Strip Options	1 <sup>st</sup> Quarter Peak Options
<b>Option style</b>	American	American
<b>Expiry date</b>	Options over Calendar 2012 futures: <ul style="list-style-type: none"> <li>• 21st November 2011.</li> </ul> Options over Calendar 2013 futures: <ul style="list-style-type: none"> <li>• 19th November 2012;</li> </ul> Options over Calendar 2014 futures <ul style="list-style-type: none"> <li>• 19th November 2013;</li> </ul>	Options over Q1 2012 futures <ul style="list-style-type: none"> <li>• 21st November 2011;</li> </ul> Options over Q1 2013 futures <ul style="list-style-type: none"> <li>• 19th November 2012.</li> </ul> Options over Q1 2014 futures <ul style="list-style-type: none"> <li>• 19th November 2013.</li> </ul>
Underlying delivery	4 consecutive Base Load quarter futures contracts comprising the calendar year (i.e. Q1, Q2, Q3 & Q4)	Peak Load Q1 Futures contract
Regions available	NSW, VIC, SA, QLD	NSW, VIC, SA, QLD
Exercise type	Manual	Manual
Quotation	AUD \$/MWh (e.g. \$2.34)	AUD \$/MWh (e.g. \$2.34)
Minimum Tick increment	\$0.01/MWh	\$0.01/MWh
Tick Value (per \$0.01/MWh increment)	Either \$87.60 (for an underlying year which is not a leap year); or \$87.84 (for an underlying year which is a leap year)	Between \$8.85 to \$9.30 depending on the number of hours in the underlying Peak Q1 futures contract
Exchange fee	\$0.0085/MWh per trade.	\$0.0175/MWh per trade.
Option Model used for Daily Price Settlement	Black & Scholes	Black & Scholes

# The Physical Electricity Market

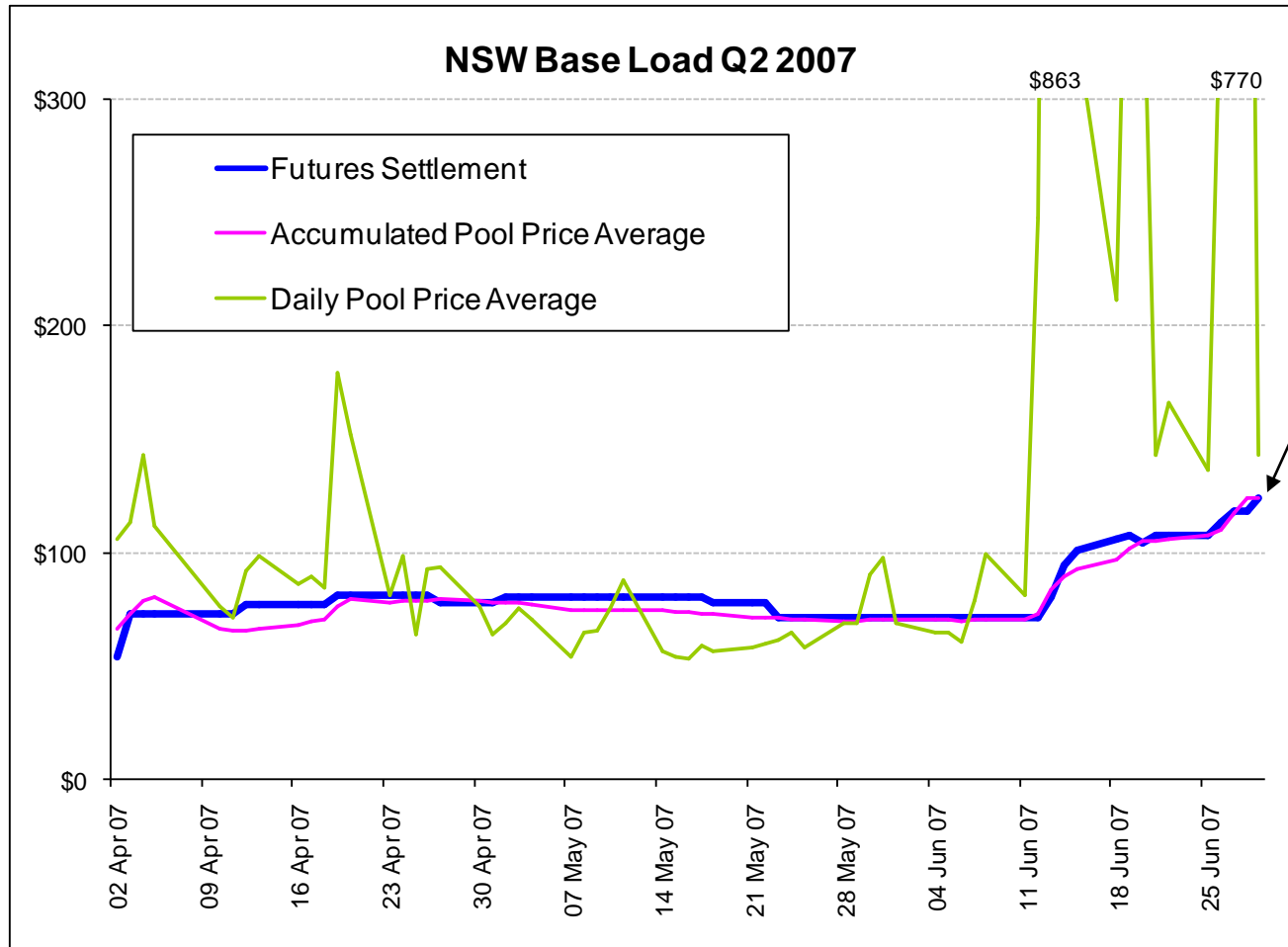
- > The Australian National Electricity Market (NEM) is an interconnected grid comprising several connected regional networks; New South Wales, Queensland, South Australia, Victoria and Tasmania.
- > The NEM spot pool market is operated by Australian Energy Market Operator (AEMO).
- > AEMO publishes a half-hourly spot pool price for electricity in each region based on a gross pool merit order dispatch system.
- > Retailers purchase power from AEMO at the common pool clearing price. Generators sell power to AEMO at the common pool clearing price.
- > The spot pool price varies from  $-\$1,000/\text{MWh}$  to  $+\$12,500/\text{MWh}$ .
- > **It is against this published regional pool price that futures contracts are (cash) settled upon expiry.**



# Futures prices *converge* (at end of quarter) to equal the pool price average of the quarter



Final futures expiry price = actual Pool Price QTR average

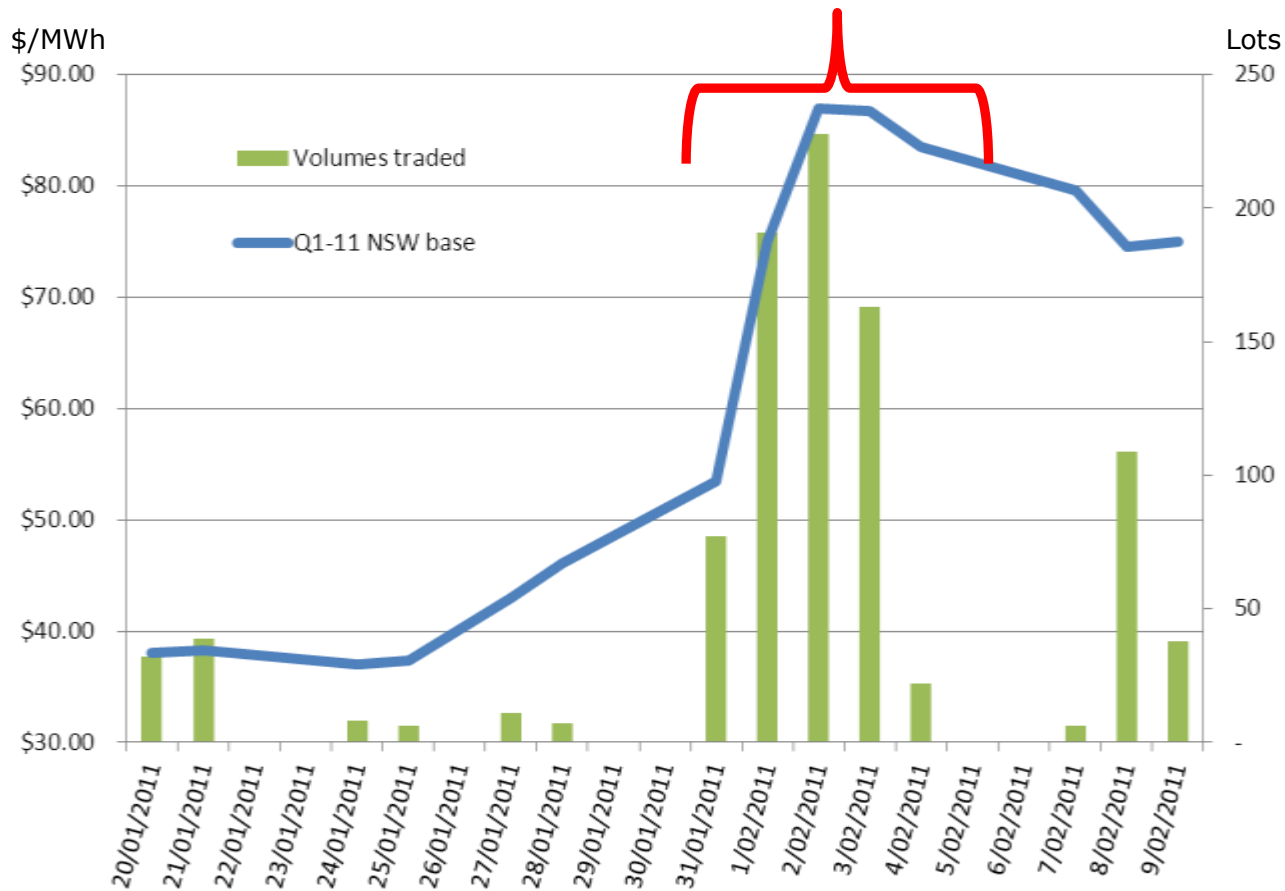


Hence generators and retailers use futures payoffs to **compensate** them for gains or losses from movements in their pool market price exposures

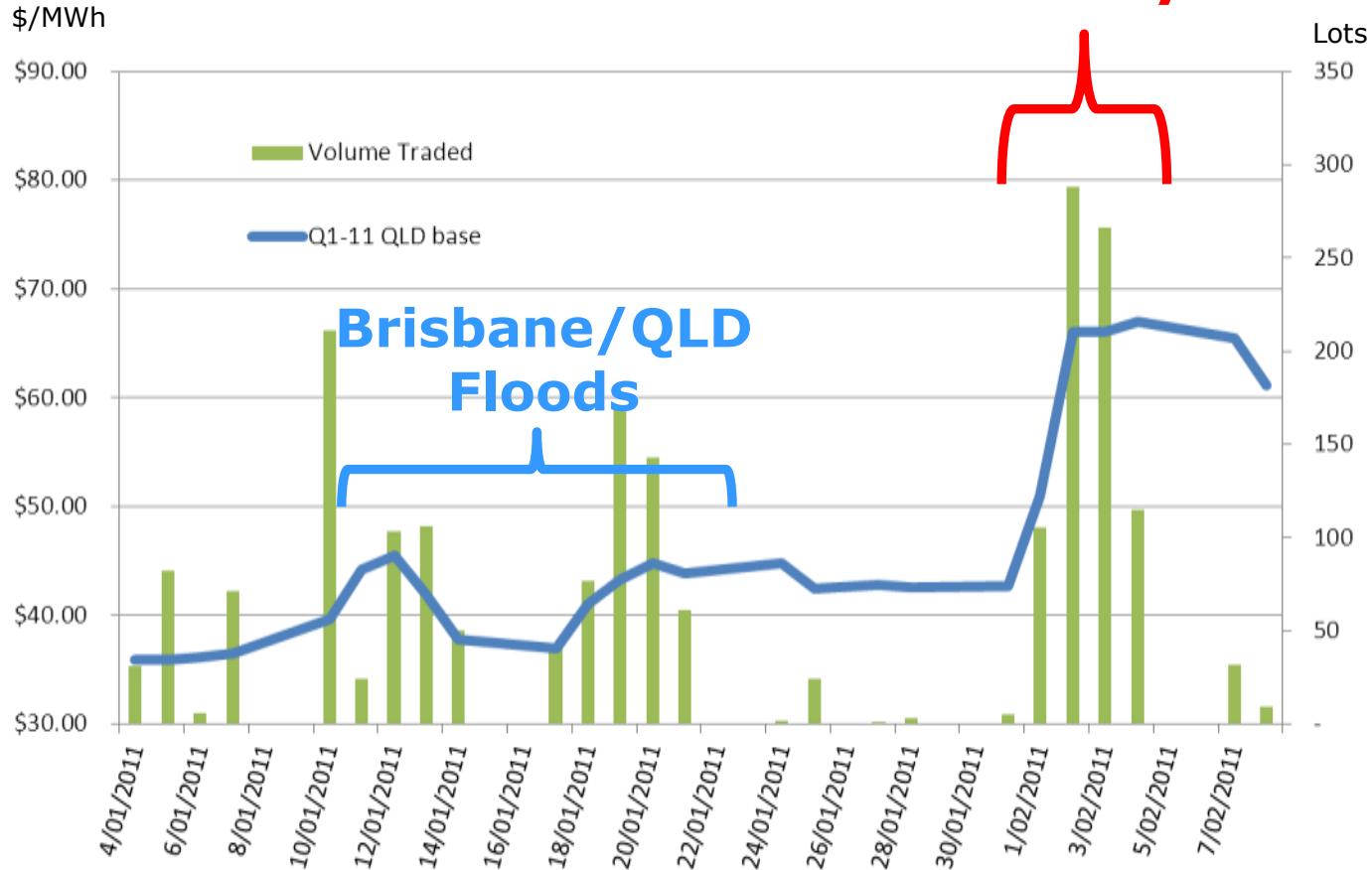
Historically, Spot market price volatility has been created by:

1. Weather-driven demand spikes (e.g. heat wave or cold snap effect on reverse cycle air-conditioning);
2. Carbon cost speculation
3. Interconnect outages (e.g. Vic bushfires Jan 2007);
4. Drought effect on Hydro plants and cooling of thermal plants (e.g. Feb to June 2007)
5. Generator outages/breakdowns (e.g. mechanical breakdown, mine flooding, intra-regional supply constraints)
6. Generation fuel supply shortages and price shocks (gas/coal supply)
7. Generator maximisation of pool prices

## NSW Heat Wave & Cyclone Yasi



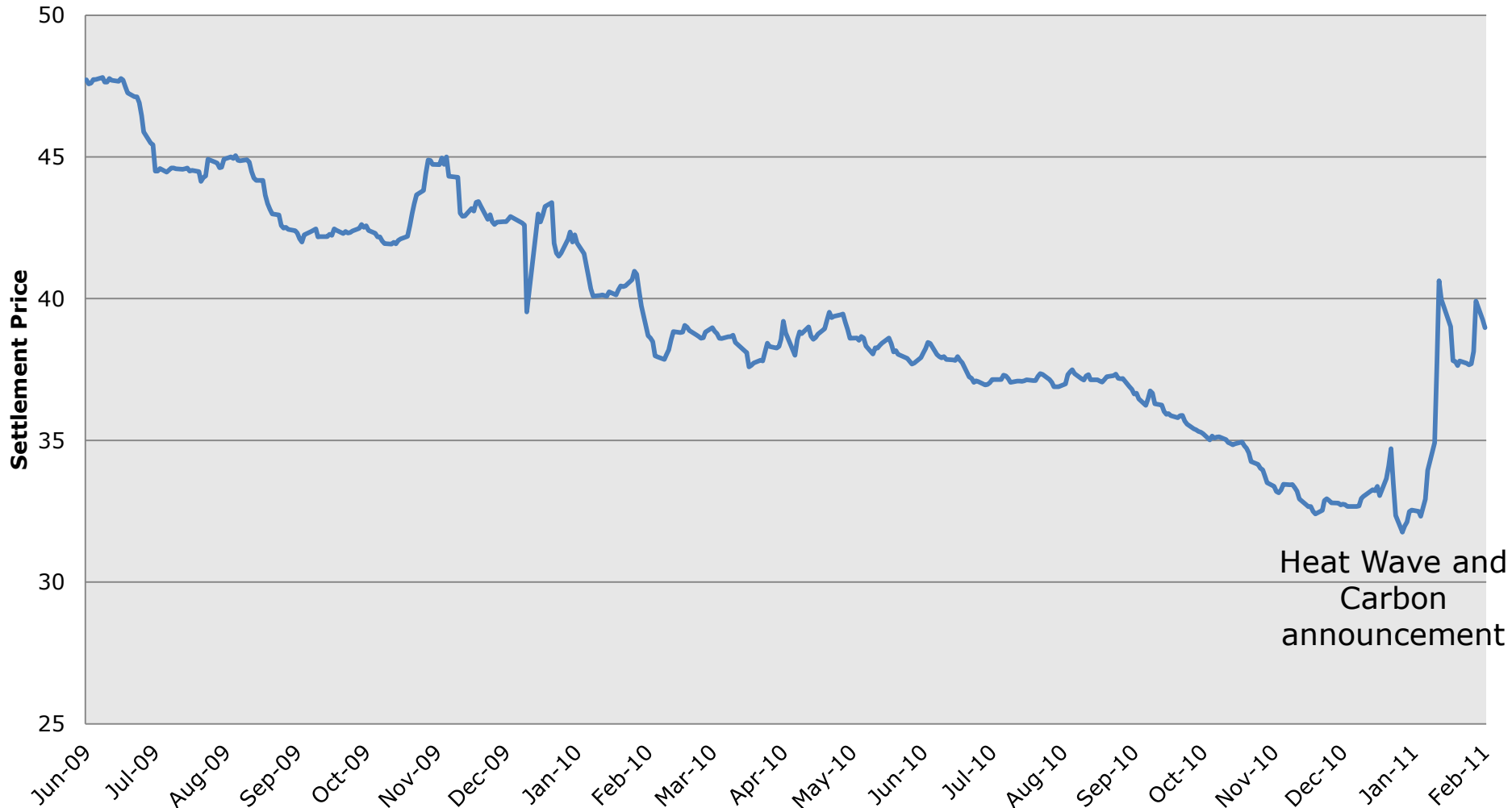
## NSW Heat Wave & Cyclone Yasi



# Eastern Power Index (EPI) Basket of Eastern Seaboard Electricity



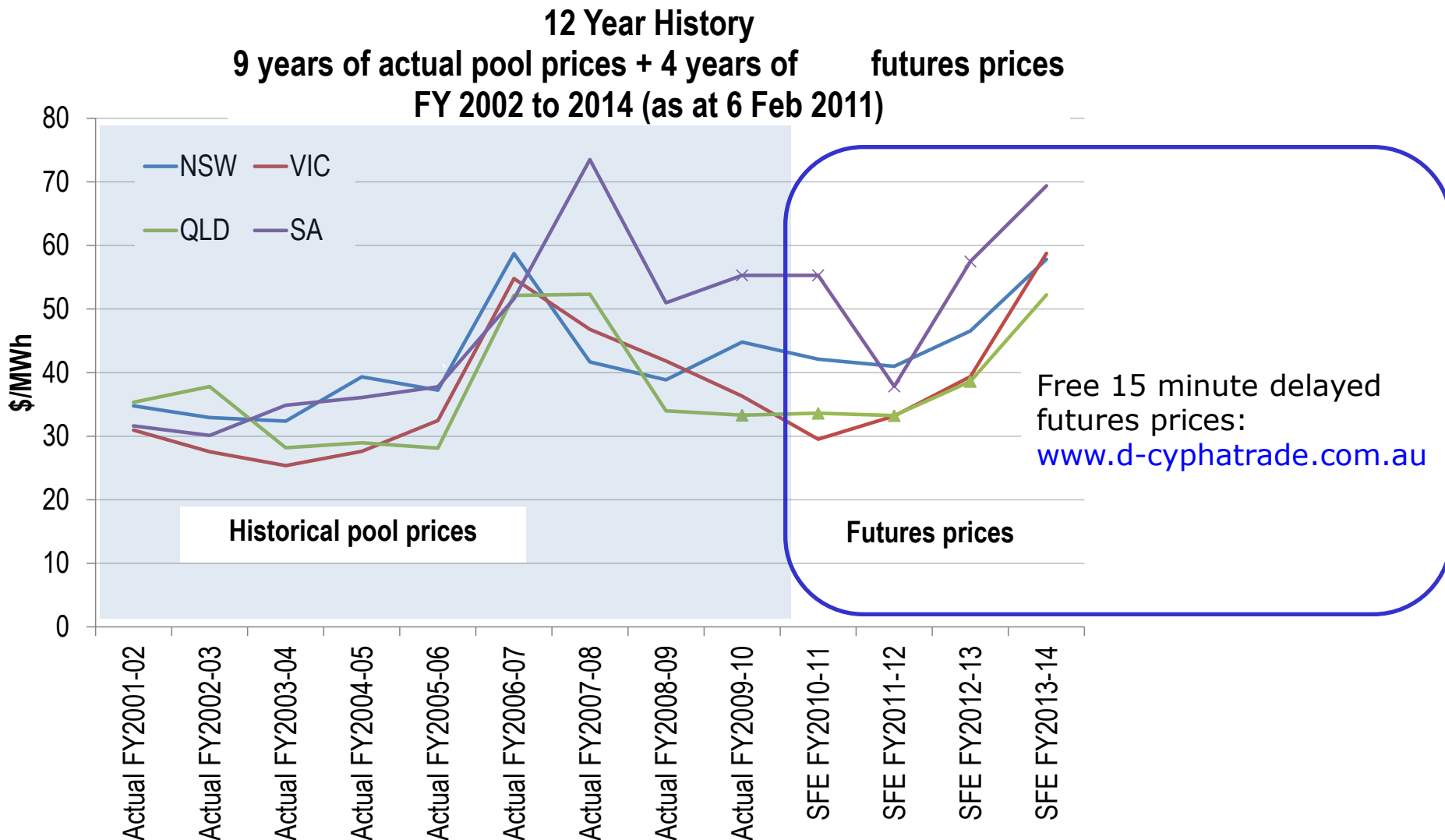
## EPI 2011



## 2. Electricity Futures Prices for the next 4 years



# Historical Pool Prices with 4 years of futures prices



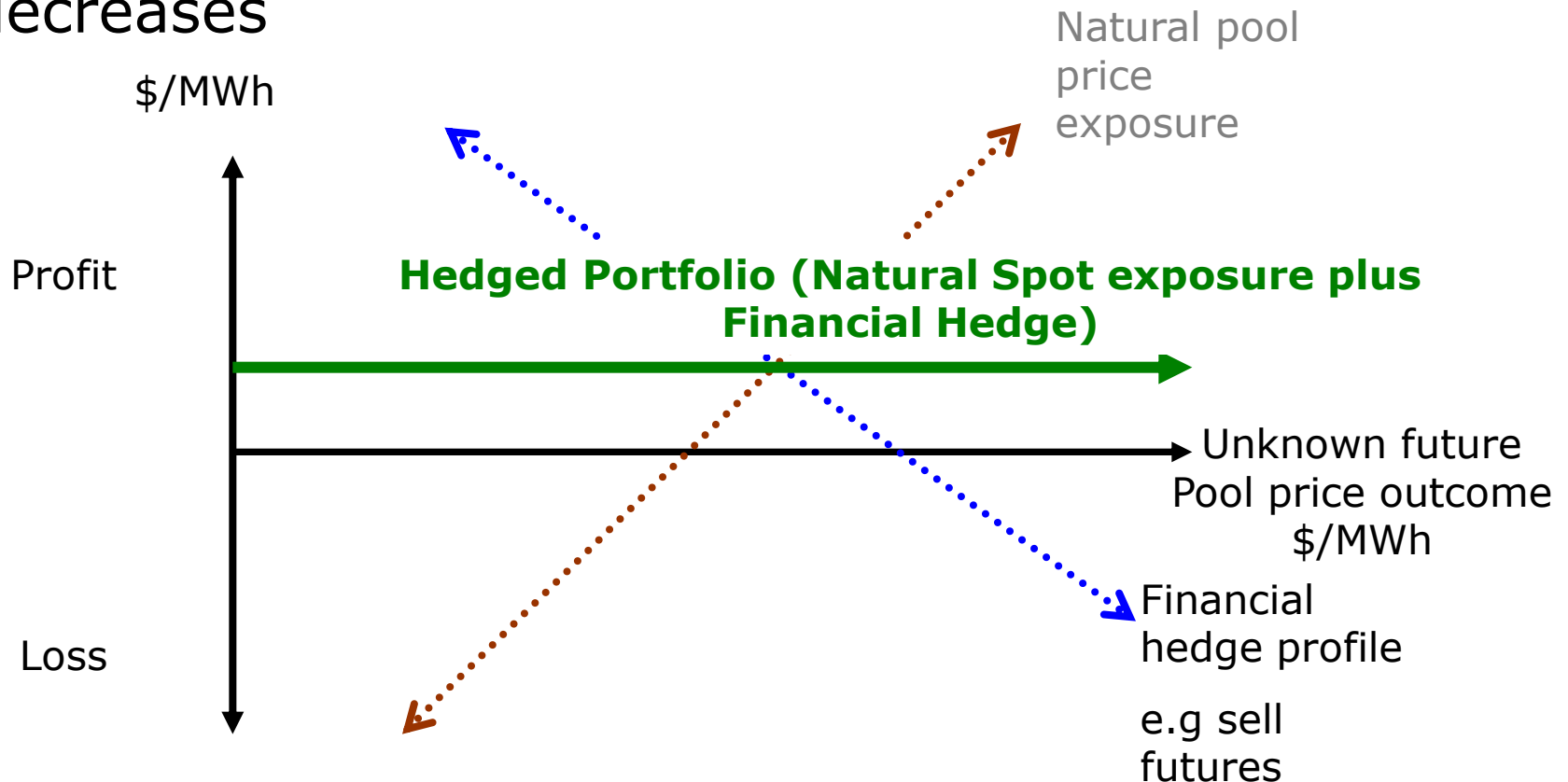
# 3. Hedging with Futures to avoid Carbon Costs (retailers)



## 1. Generators

If pool price outcomes in the future are low, the generator's revenue decreases

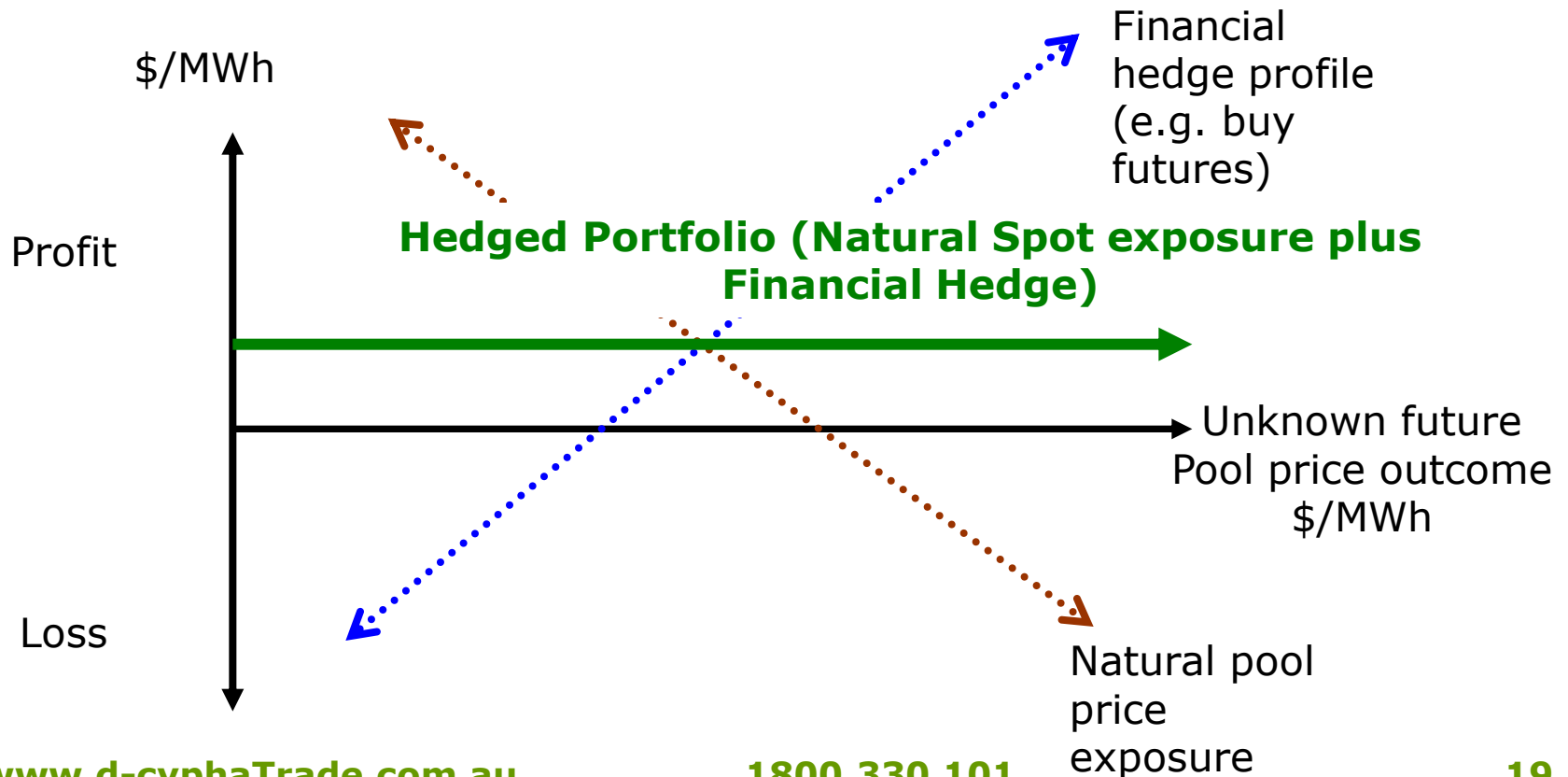
Sell Futures  
Buy Puts



## 2. Retailers

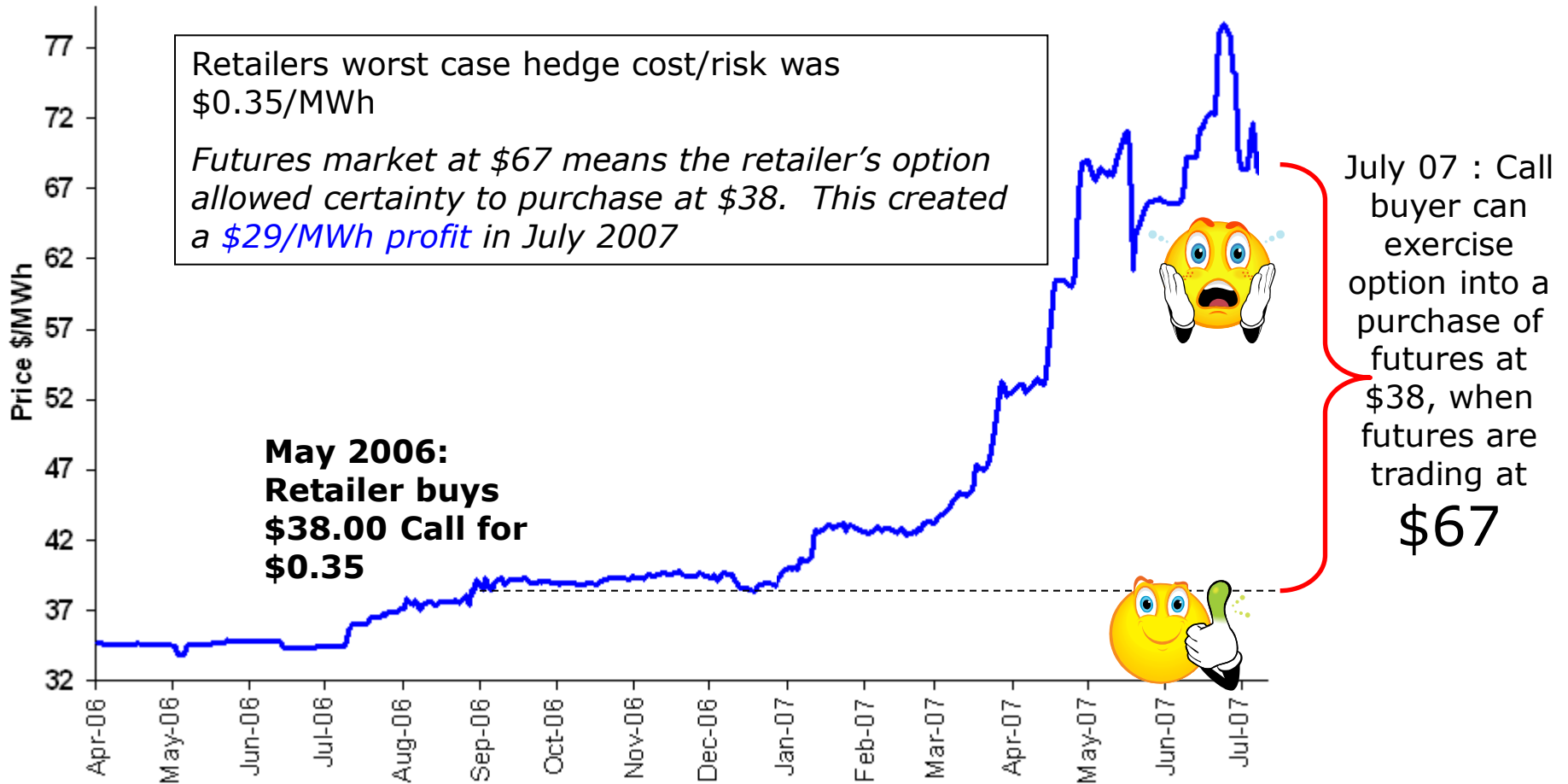
If pool price outcomes in the future are high, the retailers revenue decreases. Hence, buy futures to hedge the risk

Buy Futures  
Buy Calls  
Buy Caps



# Retailer call purchase to hedge rally

## VIC Baseload Calendar 2008






# Futures hedge pool price risk

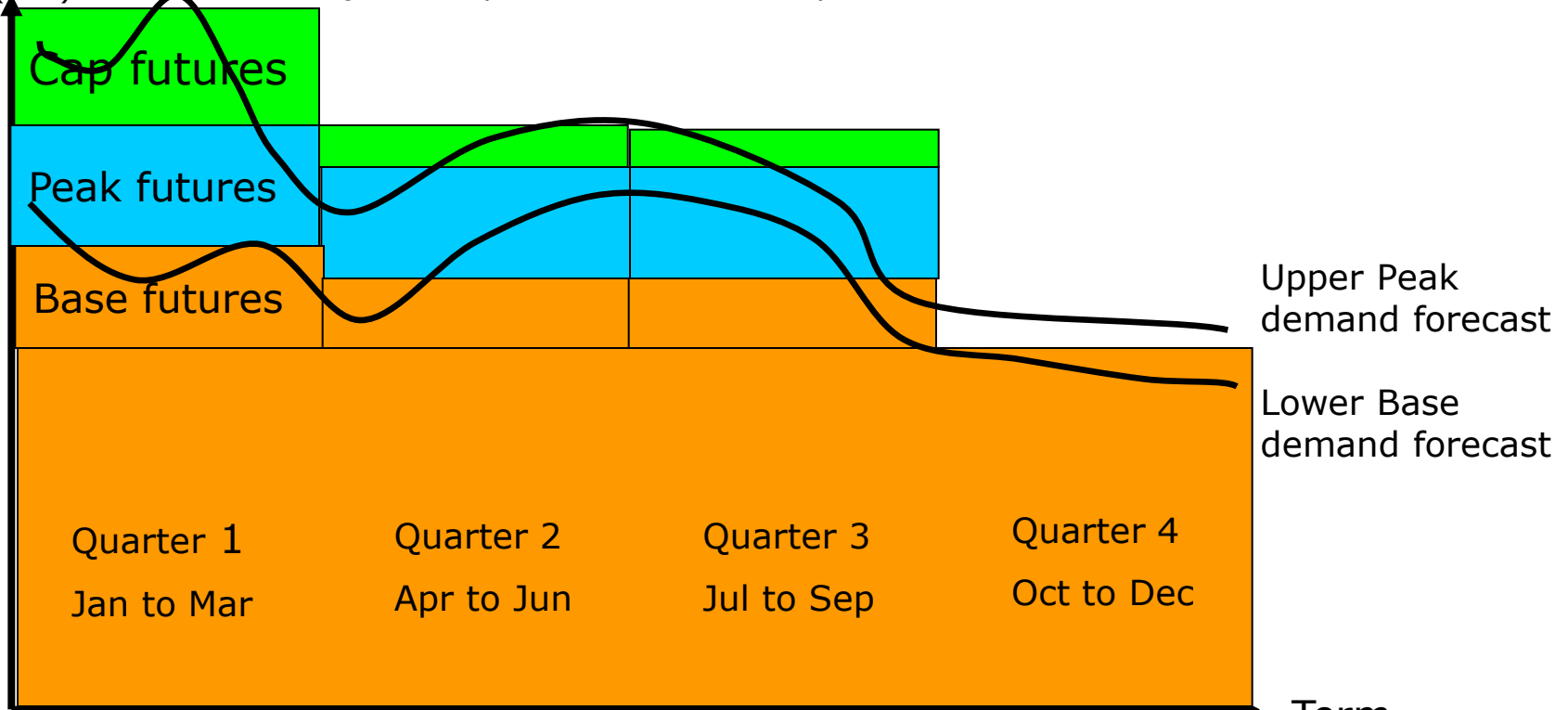
## NEM Retailers – “Building Block” hedging

### > Managing demand volume Risk

- > Using generic (cheapest) financial products to fit probable flat load volume (demand) exposure. Then fill in peak flex risk (i.e. upward demand flex) with more expensive “peak” instruments, just for upward demand flex exposure.

-  Cap futures \$300+ protection
-  Peak Load futures \$63/MWh
-  Base Load futures \$37/MWh

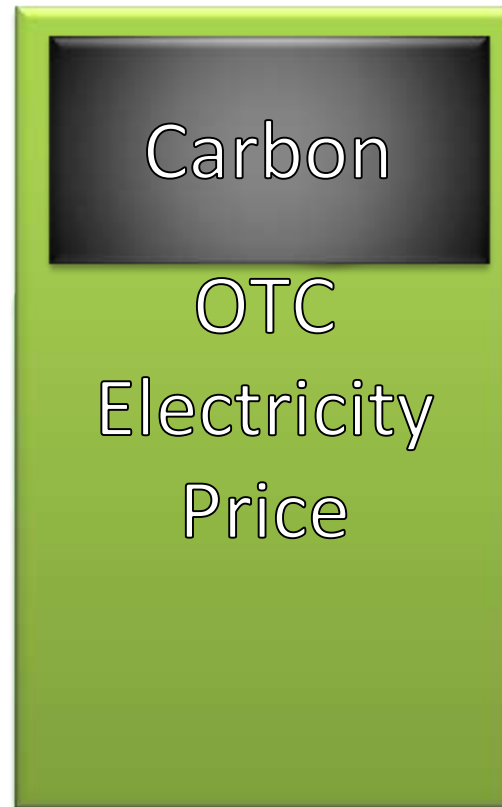
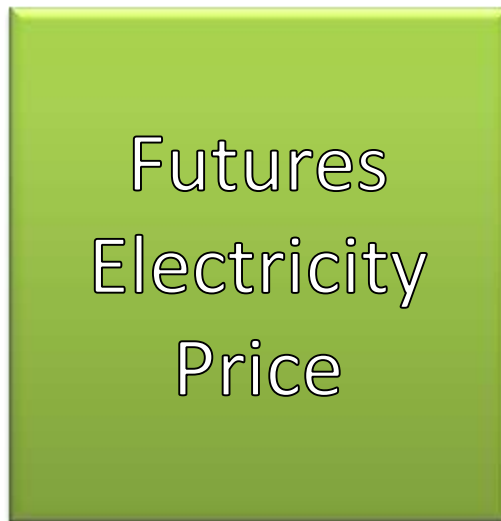
Demand Volume (MW)



# Retailer's electricity hedging when carbon cost is introduced

\$/MWh

1. Electricity futures (carbon clean)
- or*
2. Electricity OTC hedge with carbon price escalator



# Retailer's electricity hedging when carbon cost is introduced



## ***Electricity Futures Hedge***

- > i.e. retailer that hedged their 2012 electricity price using **futures** at \$50/MWh today, **pays \$50/MWh** regardless of if carbon is introduced

## ***Electricity OTC Hedge***

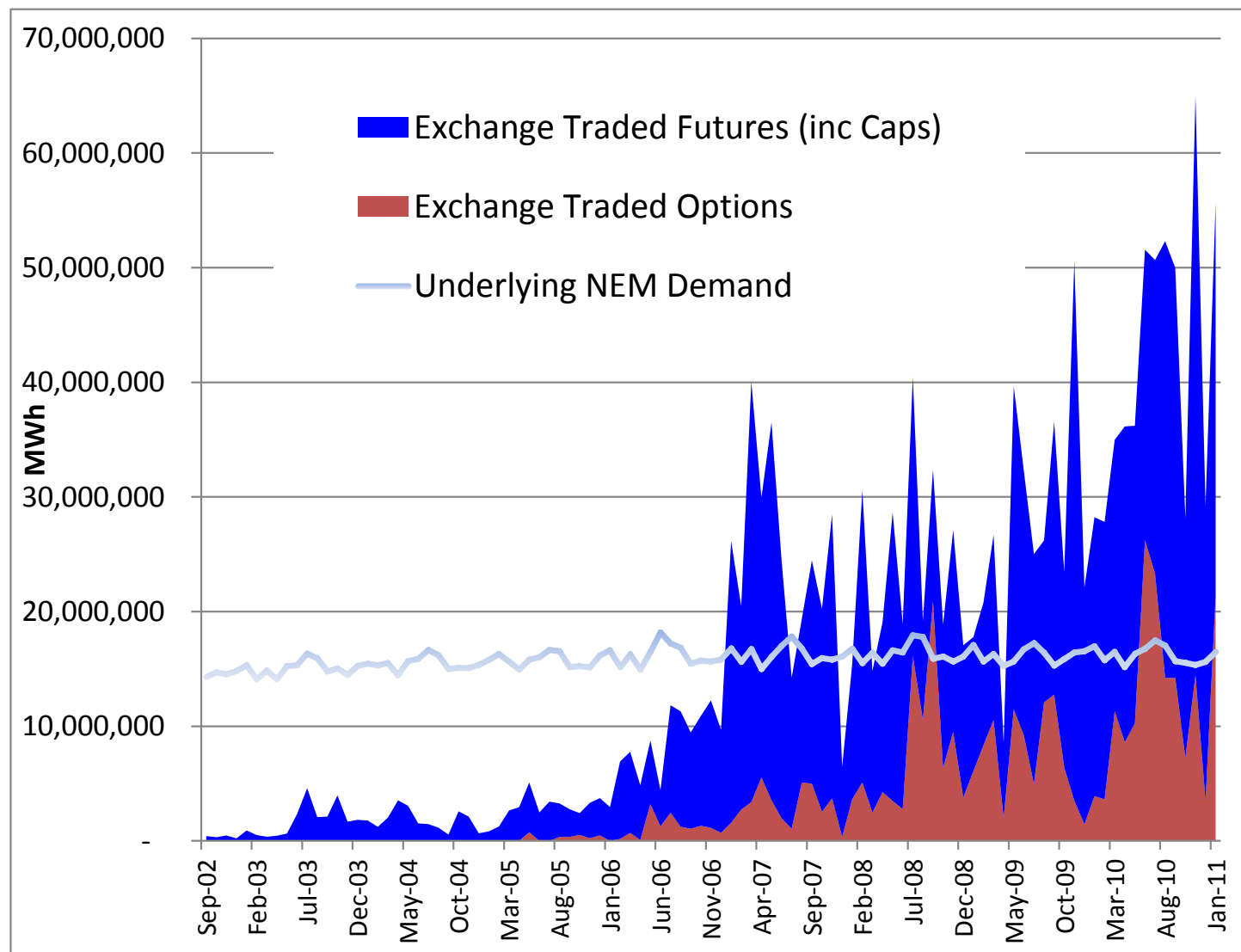
- > a retailer that hedged their 2012 electricity price using a \$50/MWh **OTC contract** today (with a carbon price escalation clause), would have to pay \$50/MWh **PLUS the Carbon Price** for their electricity if carbon is introduced. **E.g. \$75/MWh** (based on a \$25 per tonne carbon cost).

# 4. Liquidity

## Electricity Futures and Options



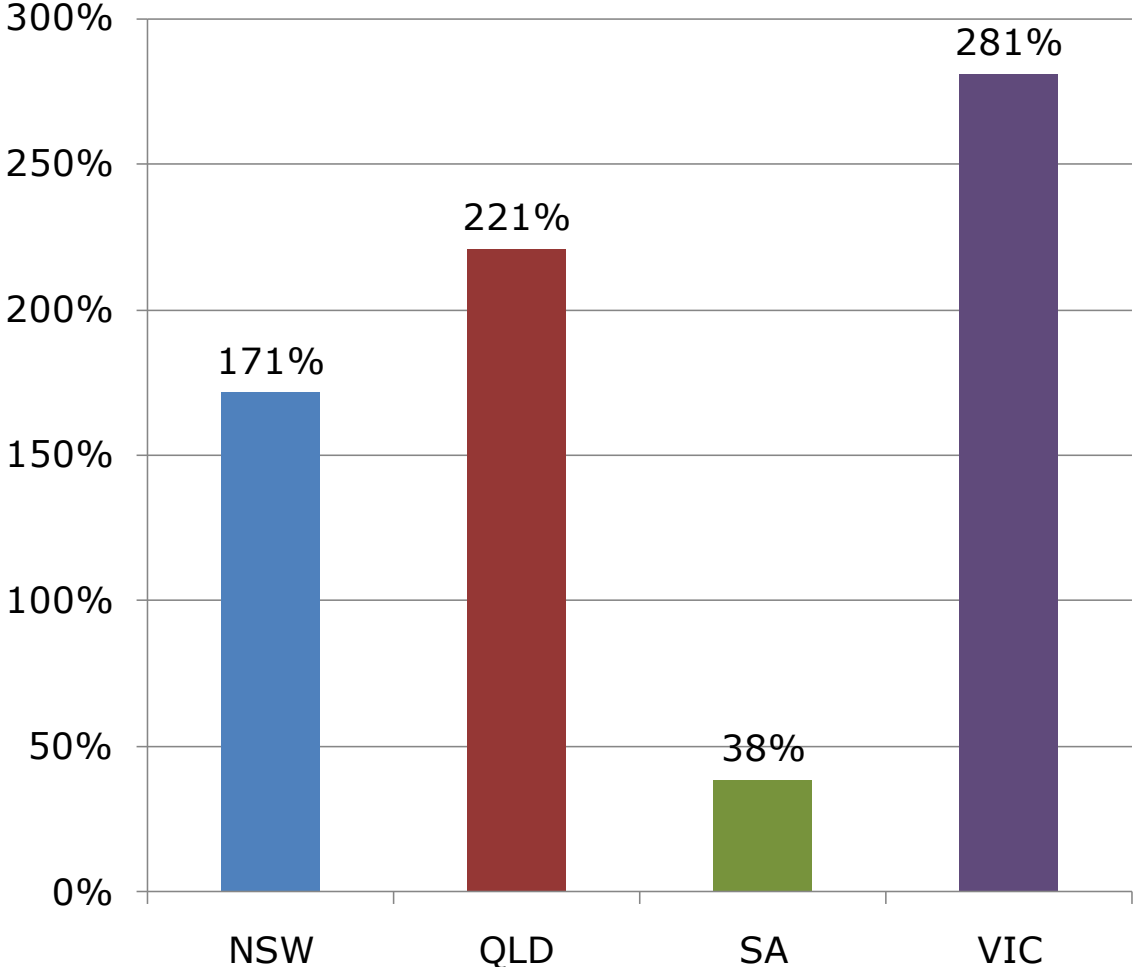
# Futures and Options Liquidity monthly



# Futures & Options Liquidity



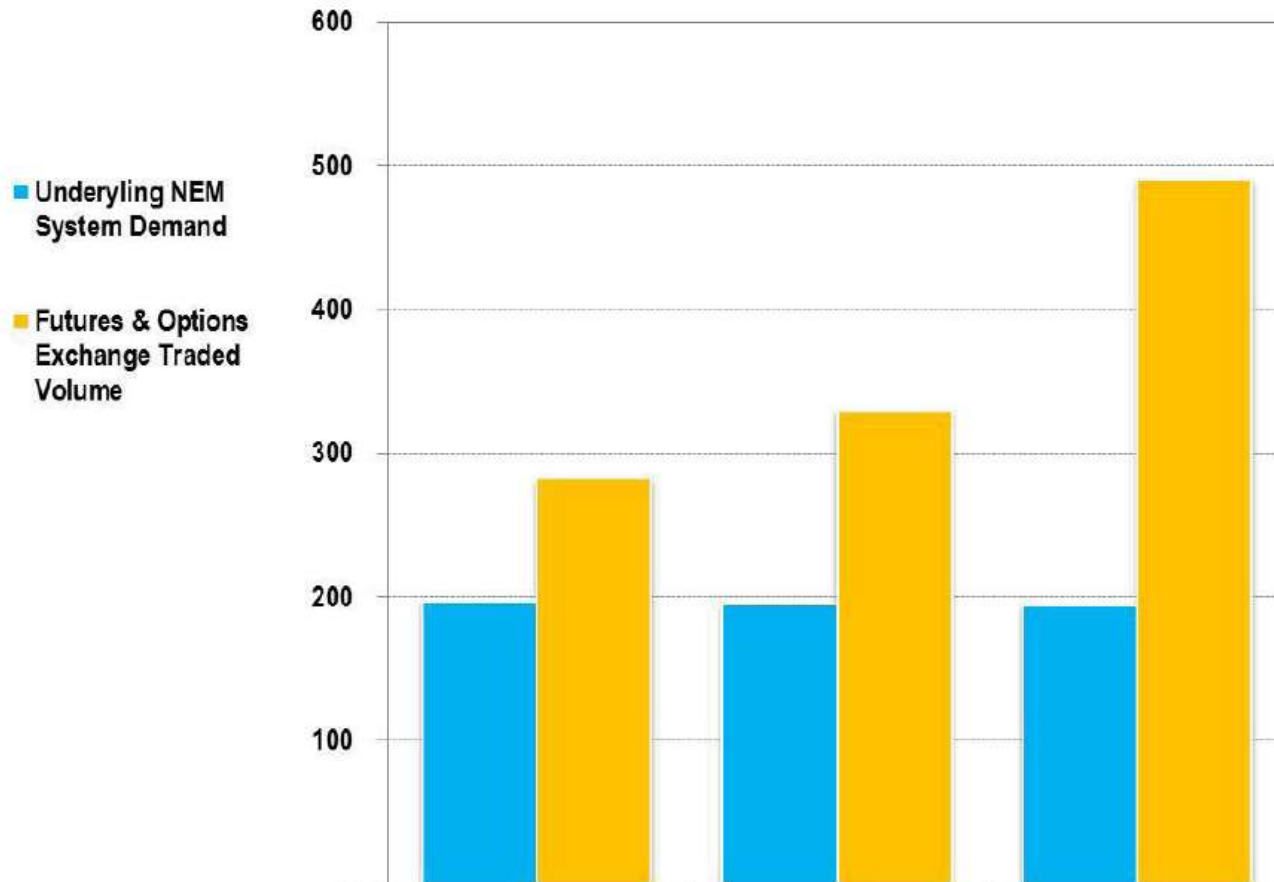
**Regional Exchange-Traded Volume as % of Underlying System Demand, FY09/10**



# Futures & Options Liquidity

Futures & Options Exchange Traded Volume vs. Underlying System Demand

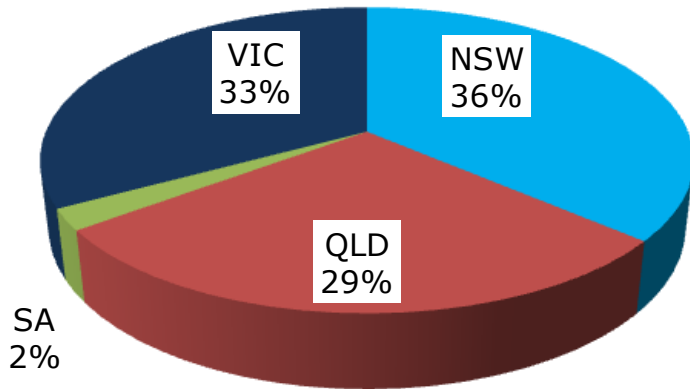
TWh



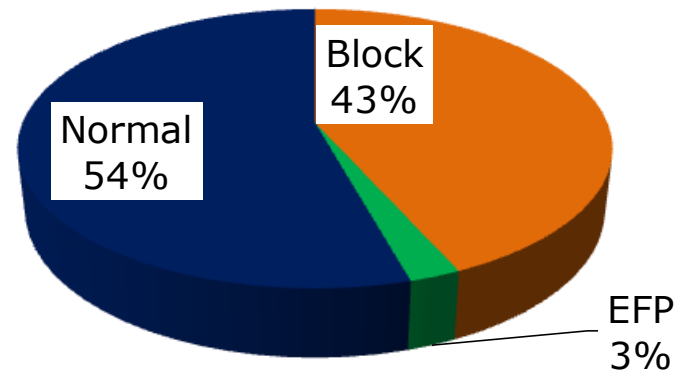
	Cal 2008	Cal 2009	Cal 2010
Underlying NEM System Demand	196.70	194.47	194.21
Futures & Options Exchange Traded Volume	282.63	329.67	490.27
%	144%	170%	252%

# Futures & Options Liquidity

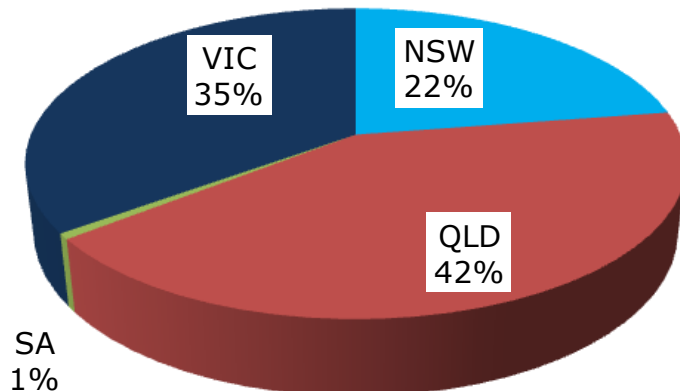
**Futures Trades by State  
Jan 07 - July 10**



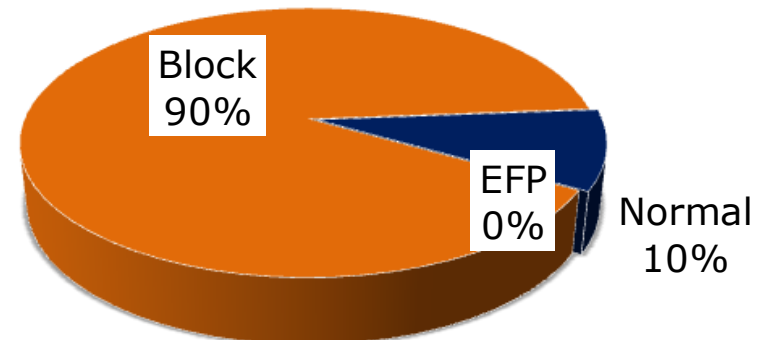
**Trading Mechanism comparison  
for Futures Trades  
Jan 06 - July 10**



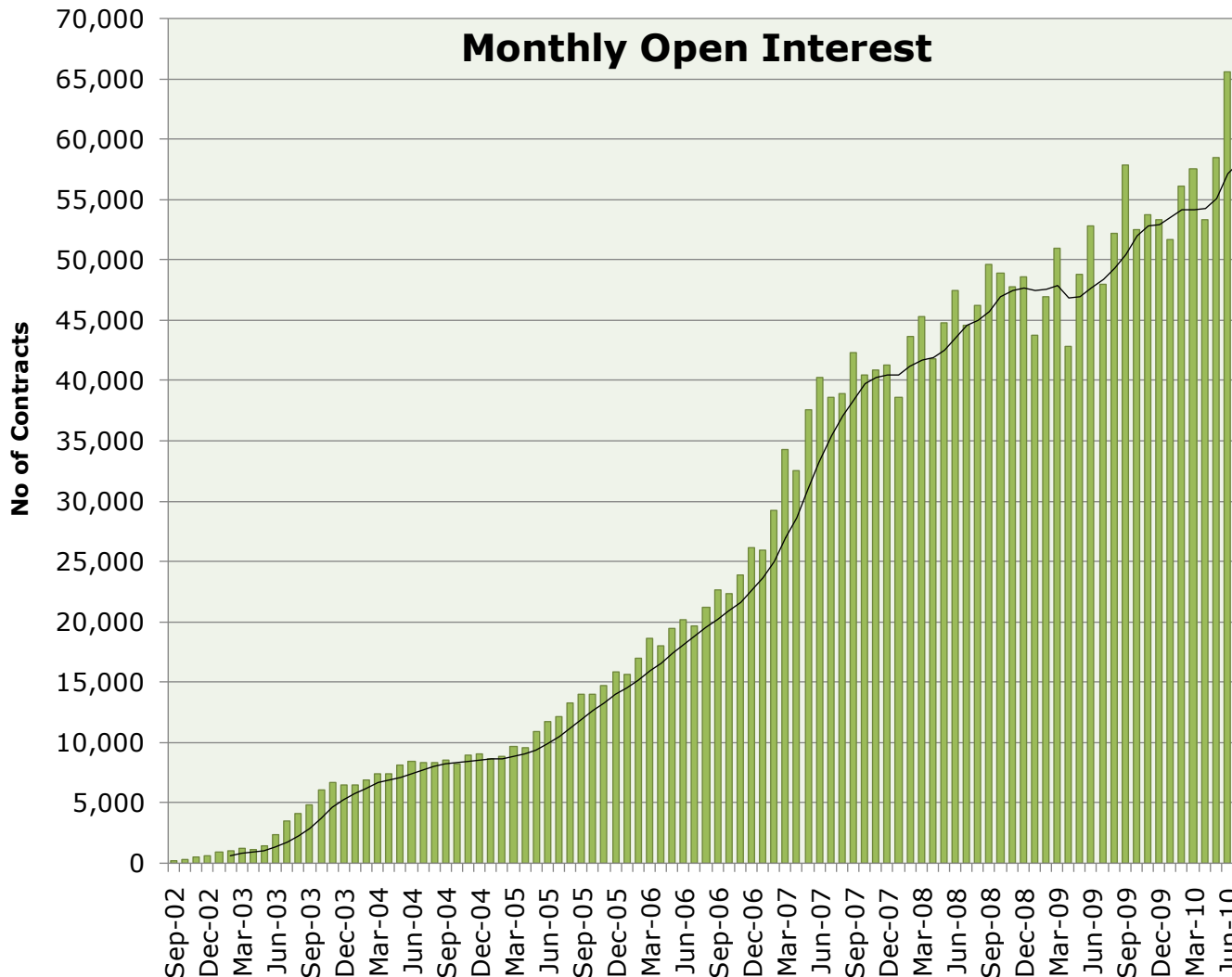
**Options Trades by State  
Jan 07 - July 10**



**Trading Mechanism  
comparison for Options Trades  
Jan 06 - July 10**



# Open Interest

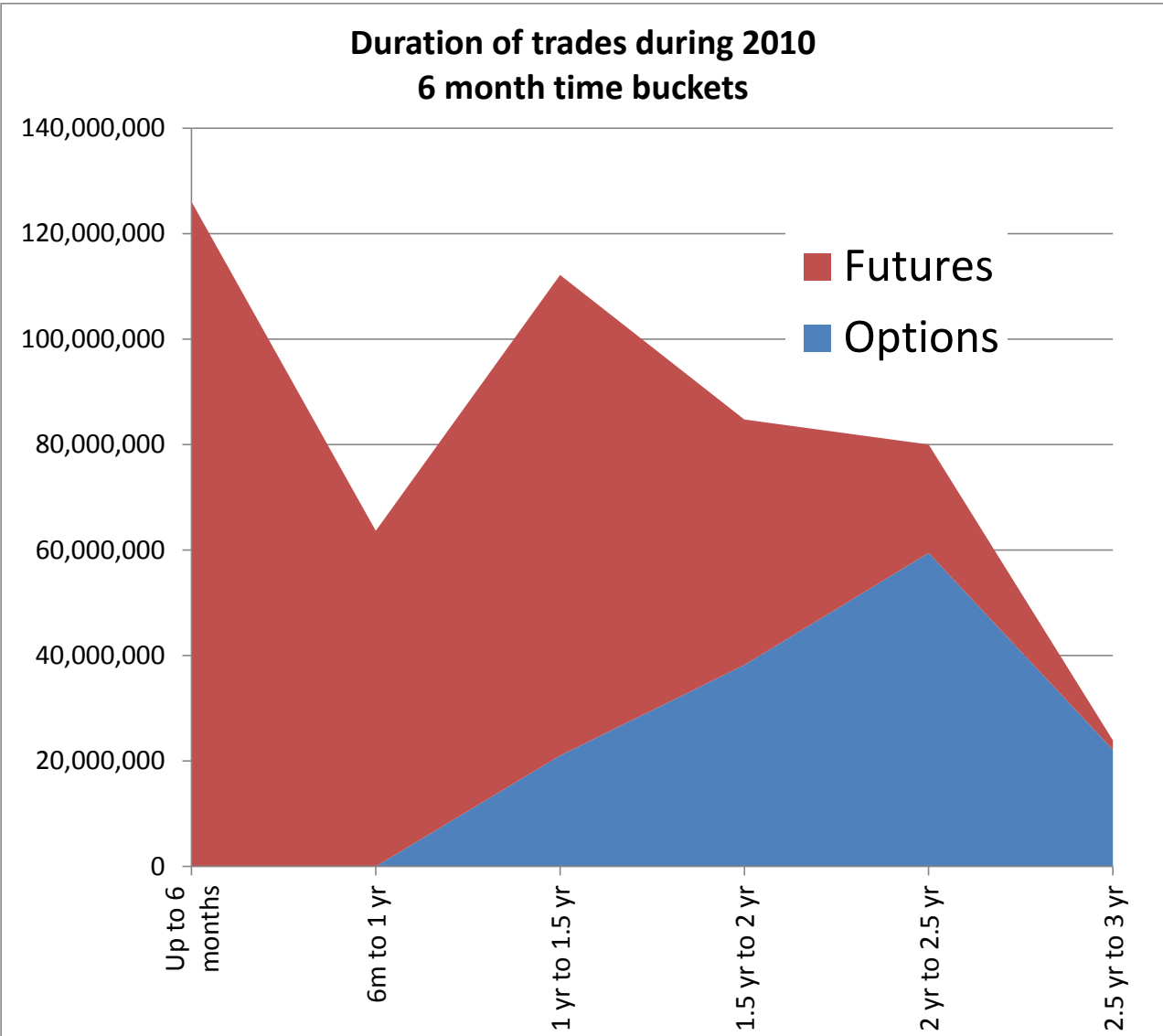


**DEFINITION**  
The total number of futures and/or options contracts that are not closed or delivered on a particular day.



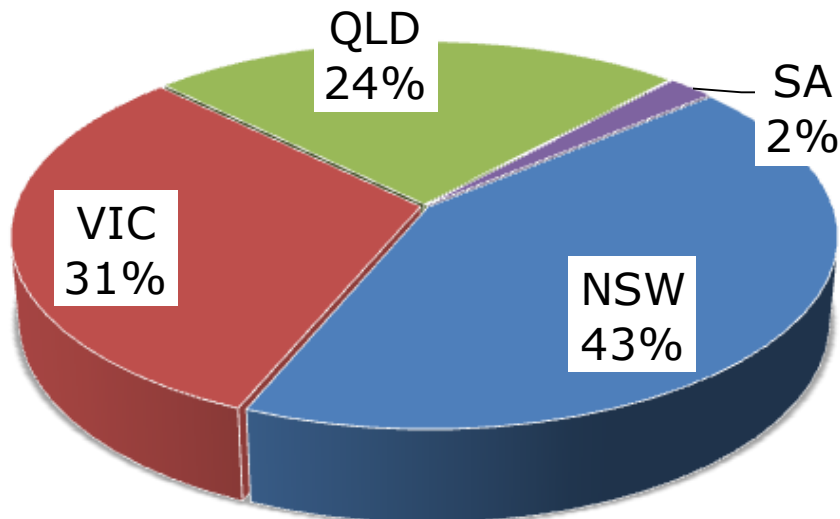
**RECORD OPEN INTEREST**  
30 June 2010  
**65,536** contracts  
131,072 sides  
222,438,798 MWh  
Face Value \$8.9 billion

# Duration of Futures and Options trades (MWh) (6 month intervals)– traded during 2010

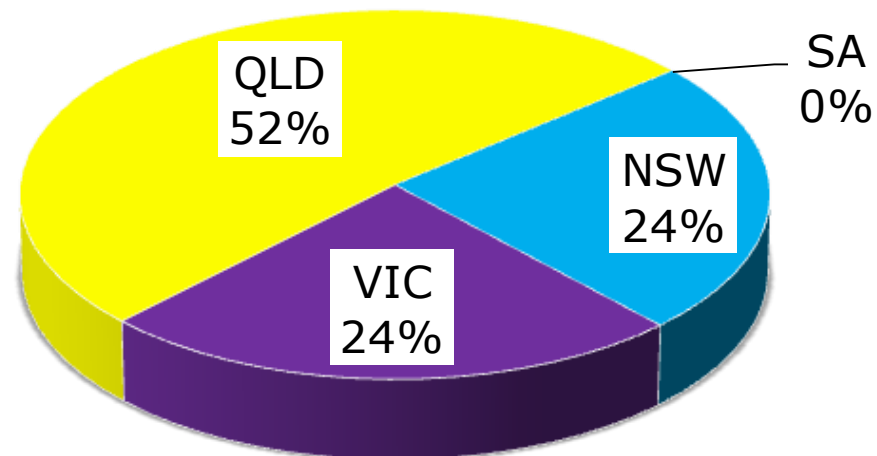


Shows most liquidity exists between 6 months and 2.5 years

**Futures OI % by Region  
02/08/10**



**Options OI % by Region  
02/08/10**



# 5. Compliance and Risk Management Benefits



# Transparency and credit risk benefits for Risk Management



- > Much of the appeal of the Australian Electricity Futures market for risk managers includes:
  - > **1. Transparency benefits:**
    - a. **Independent** daily revaluations (daily settlements across 3,000 products) by regulated Market Operator using **market consensus** "real" bids and offers;
    - b. Real time transparency (of both underlying electricity pool prices and futures prices) via T.Reuters, Bloomberg etc;
    - c. 3<sup>rd</sup> party confirmation via ASX Clear (Futures) Clearing firms

# Transparency and credit risk benefits for Risk Management



## > 2. Credit Risk mitigation (central clearing) benefits:

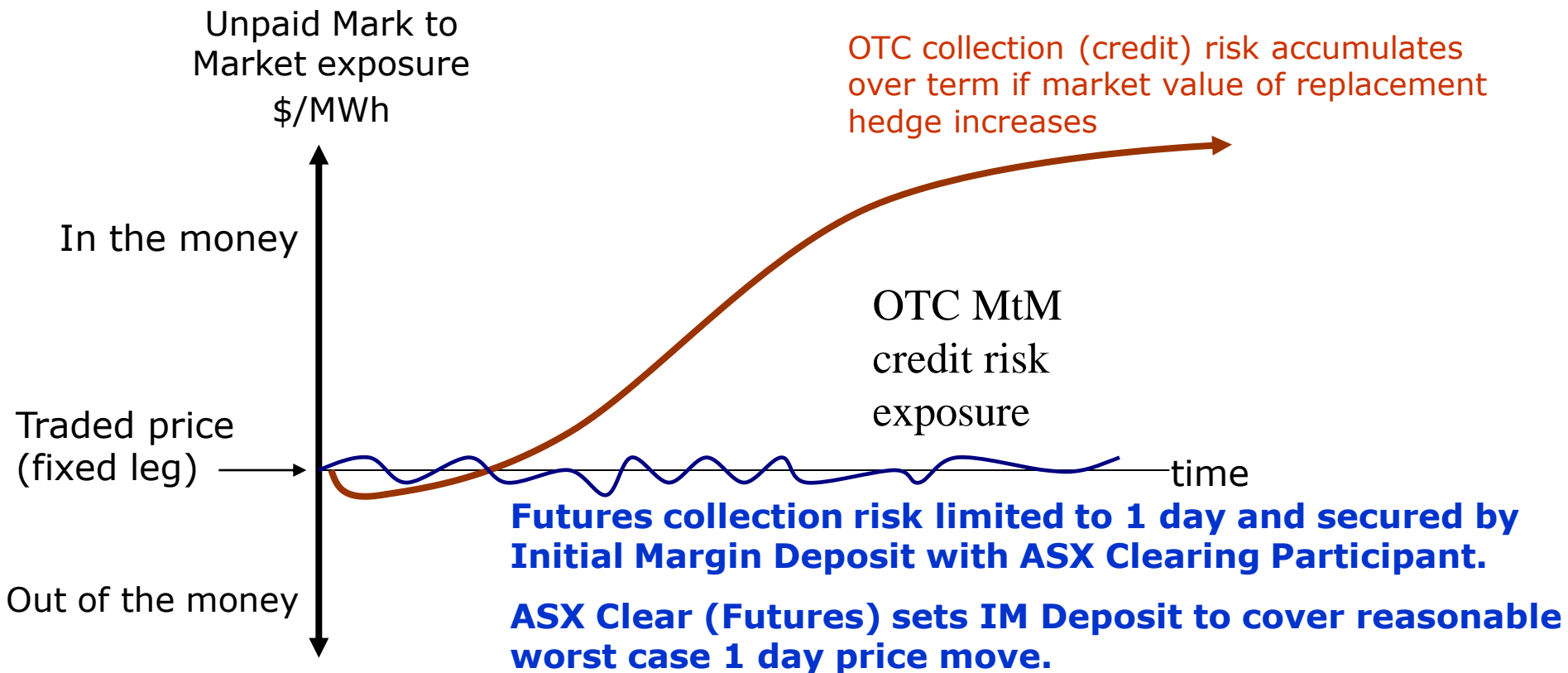
- a. **Centrally cleared**, netted and **daily margined** products: mitigates credit risk, negates need for credit risk assessment of trading counterparties;
- b. Avoids credit risk liquidity squeezes that afflict OTC markets;
- c. Licensed Clearing and Settlement Facility: ASX Clear (Futures)
- d. Investment signalling for utility companies and new asset investors (independent evaluation of project viability).

> US legislation (Frank Dodd's) in response to OTC credit defaults during GFC is to **force OTC trading onto Clearing Houses** to avoid credit risk. Due to take effect July 2011.

# ASX Clear (Futures) daily margining reduces credit default risk



1. OTC default risk = up to 4 year contract duration, normally unsecured
2. **Futures risk = Limited to 1 day price move and secured by initial margin**



# 6. Why Investment Banks are entering the Electricity Futures Market



- > Emerging Market Returns
- > Booming liquidity growth – world's biggest exchange traded electricity options market
- > Centrally cleared so relatively cheap to trade
- > No OTC credit default risk necessary (think GFC)
- > Transparent and independent position revaluations
- > Customer and Investor flow business (e.g. hedging for industrials and electricity price-linked investments)

- > Sophisticated systems are not yet being applied in market, despite strong liquidity !
  - > **Futures arbitrage** opportunities (algo trading). Arbitrage between cash settled futures contracts is common;
  - > **Option opportunities** (large size of market combined with lack of sophistication);
    - Large "price insensitive" hedging flows (collars, call spreads, outright) creates opportunity for sophisticated:
      - Volatility traders (volatility spread opportunities);
      - Directional option traders: can "cherry pick" trades.

# Common Electricity Trading strategies adopted by financial traders



- ❑ Inter-product spreading (cap spreads, inter-regional spreads);
- ❑ SRA spread traders (buy non-firm Transmission rights, sell futures inter-regional spread);
- ❑ Weather related strategies
- ❑ Fundamental water storage, gas price (fuel source) strategies
- ❑ Carbon cost speculation (longer dated contracts)



# 7. Impact of NSW Privatisation on Futures and Options Market



## Potential Liquidity and Credit Risk Impacts

1. NSW retailers & generators will no longer have “free” [implicit] credit support from NSW government to back (i) OTC hedges and (ii) AEMO spot market guarantee support (retailers only)
2. Non-government owners will find it more difficult to find willing OTC hedge counterparties (consider claims of financial distress by other non-government generators).
3. ETEF artificially crowded out NSW hedge market liquidity. Liquidity will increase when ETEF is phased out.

Hence: Increased use of centrally cleared futures contracts to achieve superior liquidity and avoid OTC credit default risk

## Potential Futures Price Impacts

1. Private generation owners might dispatch generators more aggressively (higher pool prices) to maximise return on investment and to squeeze out new entrant retailers (which don't own generators).
2. High NSW pool prices (and hedge markets) no longer a zero-sum-gain for NSW government i.e. it is “massively” long generation and has an incentive to increase asset value for next round of privatisation.

# Data Sources, References and Links



# d-cyphaTrade Historical Market Data Services



To start your free 30 day trial period  
please go to:-  
[www.d-cyphaTrade.com.au/subscribe](http://www.d-cyphaTrade.com.au/subscribe)

Settlement price & Open Interest files are available for Futures, Options & Caps. Full trade log history.

The underlying data can be exported into CSV

Data is available for all of these products:

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Chart Data Futures Options WEPI APS Implied Futures Interregional Caps Tradelog

VIC Base Load Q1 2008 over 1 Month

(BVH8) VIC Base Q1 08 for Mon 29 Oct 2007 to Wed 28 Nov 2007 Download as CSV

Date	Open	High	Low	Settle	Vol	OpenInt
Mon 29-10-2007	80.00	80.00	80.00	80.00	10	1186
Tue 30-10-2007	78.00	79.00	76.50	79.00	20	1196
Wed 31-10-2007	0.00	0.00				
Thu 01-11-2007	79.98	79.98				
Fri 02-11-2007	0.00	0.00				
Mon 05-11-2007	78.00	78.00	76.50			
Tue 06-11-2007	0.00	0.00				
Wed 07-11-2007	76.25	76.25				
Thu 08-11-2007	76.35	76.35				
Fri 09-11-2007	76.25	76.25				
Mon 12-11-2007	60.36	60.36	50.00			
Tue 13-11-2007	71.00	74.00	44.00			
Wed 14-11-2007	50.42	50.42	43.00			
Thu 15-11-2007	80.00	97.25	49.00			
Fri 16-11-2007	90.00	90.00	48.00			
Mon 19-11-2007	90.02	90.02	76.00			
Tue 20-11-2007	0.00	0.00				
Wed 21-11-2007	0.00	0.00				
Thu 22-11-2007	77.80	77.80	77.50			



# d-cyphaTrade free support for new entrants



## Free over the phone general information:

- Free call 1800 330 101 (within Australia) or
- +61 2 9237 0900 (international)

## Free intra-day email alerts:

- Options order email alerts
- Off-market email alerts; Block Trades, Custom (strategy) market, Exchange for Physical & Request for Quote

## Free intra-day delayed market data online:

- Futures and option trades
- Daily open interest
- Market bids/offers

## Free online information:

- Product specifications, initial margins, trading rules and more
- Weekly and periodic market news bulletins

# ASX 24 Clearing Participants



- > Please see the link below for a full list of Entities offering ASX Clear (Futures) clearing services:  
[http://d-cyphatrade.com.au/clearing/clearing\\_contacts](http://d-cyphatrade.com.au/clearing/clearing_contacts)

<b>Barclays Capital</b> James Davison +61 2 9334 6105	<b>Halifax Investment Services</b> (Retail Client Advisor) Steve Conrad +61 2 9241 4321
<b>Citigroup Global Markets</b> Channy Shergill +61 2 8225 6024	<b>JPMorgan Markets</b> Ian Nissen +61 2 9220 1396
<b>Credit Suisse</b> Ann Smart +61 2 8205 4748	<b>Macquarie Bank Limited</b> Marty Rodway +61 2 9323 8663
<b>Deutsche Bank</b> Tony Mendes +61 2 8258 1282	<b>MF Global Australia Limited</b> Tony Fay +61 2 8273 8801
<b>Fortis Clearing Sydney Pty Ltd</b> Barry Parker +61 2 8221 3000	<b>UBS</b> Amanda Boteler +61 2 9324 3113

## Industry & Government Links

### **Australian Energy Market Operator (AEMO)**

- [www.aemo.com.au](http://www.aemo.com.au)

### **Australian Energy Regulator (AER)**

- [www.aer.gov.au](http://www.aer.gov.au)

### **Australian Securities Exchange (ASX)**

- [www.asx.com.au](http://www.asx.com.au)

### **Bureau of Meteorology (BOM)**

- [www.bom.gov.au](http://www.bom.gov.au)

## Recommended Industry References

### **AER: "State of the Market Reports 2010"**

- <http://www.aer.gov.au>

### **AFMA: "Australian Financial Markets Report 2010"**

- <http://www.afma.com.au>