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Importance and Evolution of Forward Markets in Electricity

ISCR Conference Wellington

Paul Quilkey
4 September 2003



“...forward prices also comprise the most vital decision parameters when planning energy linked projects.”

‘Managing Energy Price Risk’



Perspective

- Electricity market deregulation commenced in the 1990's
- Geographies evolved at different rates as a function of market design and market attributes
- Credibility of electricity markets damaged by Enronitis
- Electricity markets evolved and regressed in a short period of time – part of a natural cycle
- Electricity price risk management is as new as the market itself
- Fundamental to price risk management is the concept of a forward market



When is a Market a Market ?

Term is often misunderstood and misapplied in electricity

Characteristics of a market

- **Multiple buyers**
- **Multiple sellers**
- **Hedgers and speculators**
- **Relatively low barriers to entry**
- **Set of consistent rules and contracts**



What is a Forward Market ?

- **A forward contract is a bilateral agreement between a buyer and seller to execute a trade at some date in the future**
- **Buyer and seller agree on the quantity and price of the commodity or instrument to be traded**
- **Difference between a forward and spot transaction concerns the timing of the trade**
- **Forward markets have been around for centuries and many basic sales agreements can be viewed as types of forward agreements**
- **Forward contracts are fundamental to financial markets**



Why is a Forward (and Futures) Market Important?

- Price and volume risk management
- Credit risk management
- Transparent price signals
- Appropriate long-term investment



Challenges with Electricity

Issue	In Financial Markets	In Energy Markets
Maturity of market	Several decades	Relatively new
Fundamental price drivers	Few, simple	Many, complex
Impact of economic cycles	High	Low
Frequency of events	Low	High
Impact of storage and deliver; the convenience yield	None	Significant
Correlation between short and long term pricing	High	Low, 'split personality'
Seasonality	None	Key to natural gas and electricity
Regulation	Little	Varies from little to very high
Market activity ('liquidity')	High	Low
Market centralization	Centralized	Decentralized
Complexity of derivative contracts	Majority of contracts are relatively simple	Majority of contracts are relatively complex



Price Forecasts v Forward Markets

- Under regulated regimes, all price forecasting was cost forecasting
- In electricity markets it is less clear what is meant by a forward curve
- Forecasting prices involves understanding the uncertainties surrounding the drivers of price e.g. fuel
- Forward curves are made up of forward prices which reflect what people are will to pay today for delivery in the future.
- The two concepts have and continue to be confused



Price forecasts v forward markets

Forward curve

A snapshot of where market participants are currently willing to transact

Either market-observed or derived based on arbitrage relationships between prices and rationality bounds.

The market is always right. The whole exercise of the forward curve is to portray where the market is.

Price forecast

A prediction of what might happen in the future

Based on economic/engineering analyses of future supply and demand, regulatory and technological trends, etc.

The market can be wrong.

Used for marking positions to market and determining liquidation value.

Forward prices can be locked in today.

Can be used for deal pricing, to the extent that one expects to offset exposure in the open market.

Uniform for all market participants.

Should not be used for mark-to-market purposes.

Price forecasts may not be locked in today.

Can be used for deal pricing, to the extent that one does not look for an offset but uses the transaction as a bet on future prices.

Each market participant may have a different forecast.



Forward Markets v Price Forecasts

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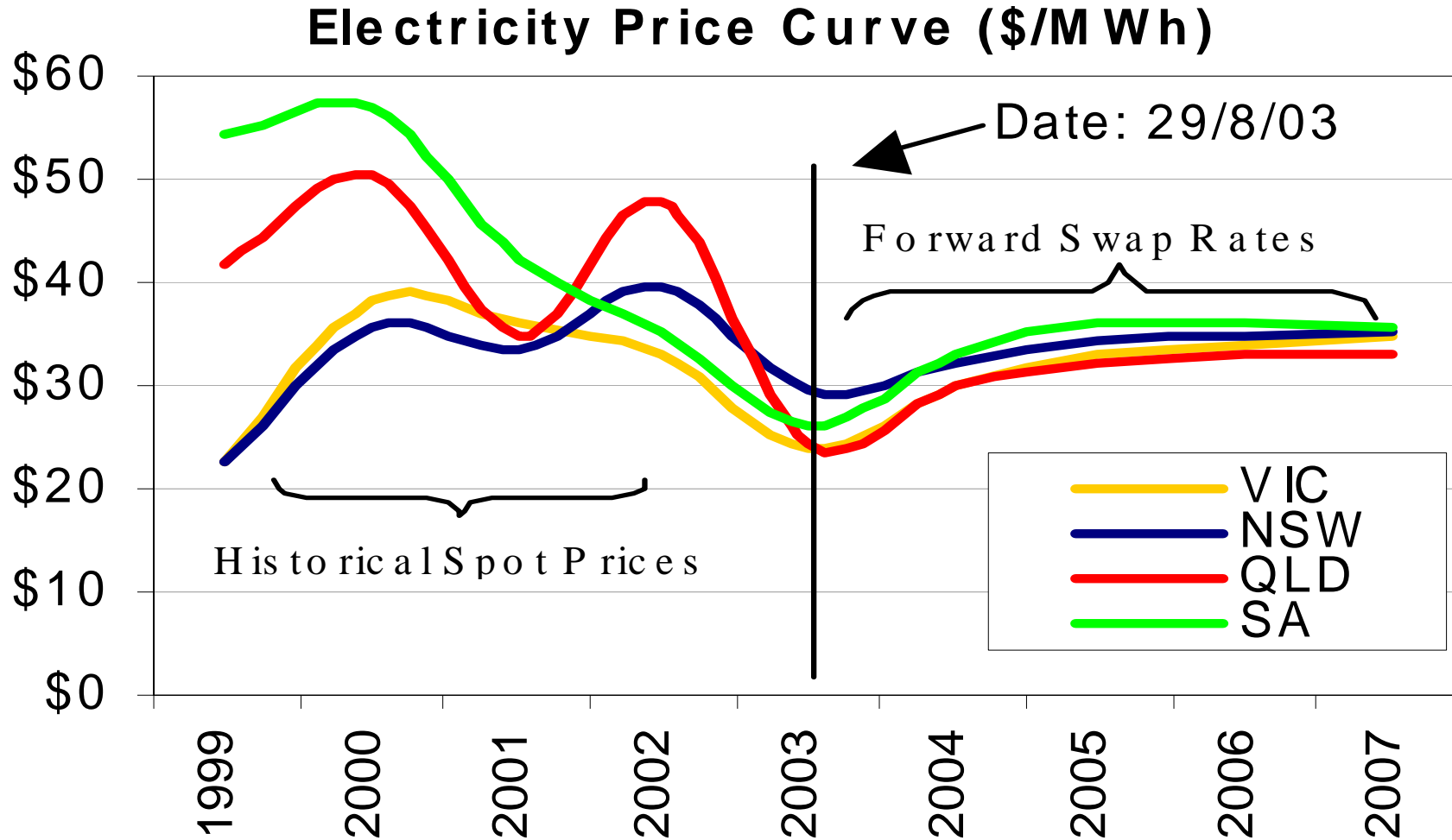
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The Australian Forward Market

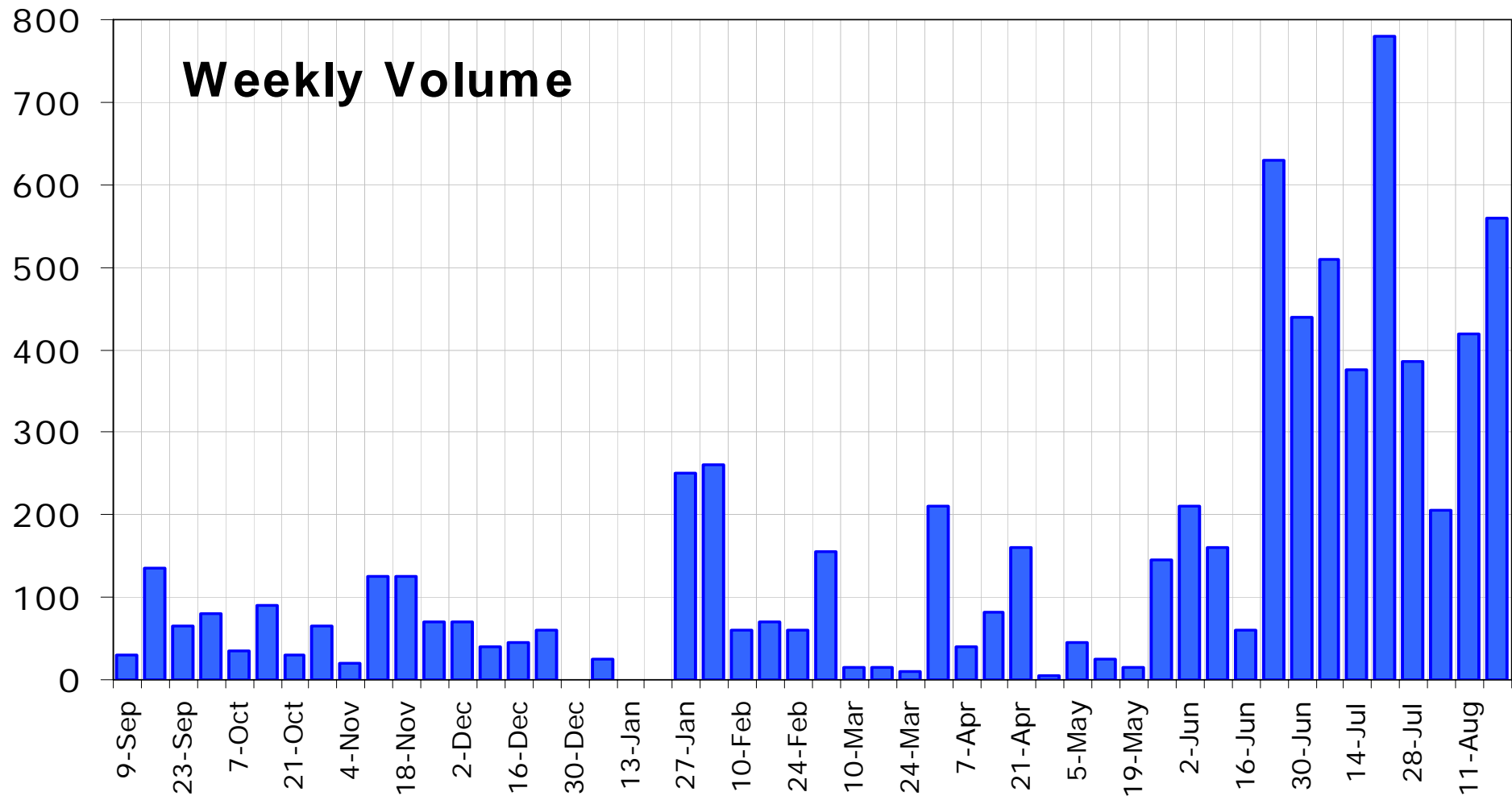


Australian Electricity Trading Activity

- 168TWh traded; 30 players including two intermediaries
- Trading activity obscured by large volume of un-reported direct deals
- Major concerns cited for illiquidity include:
 - Credit
 - Legal (mainly ISDA)
 - Regulatory Risk
- However, volumes are increasing in the forward markets



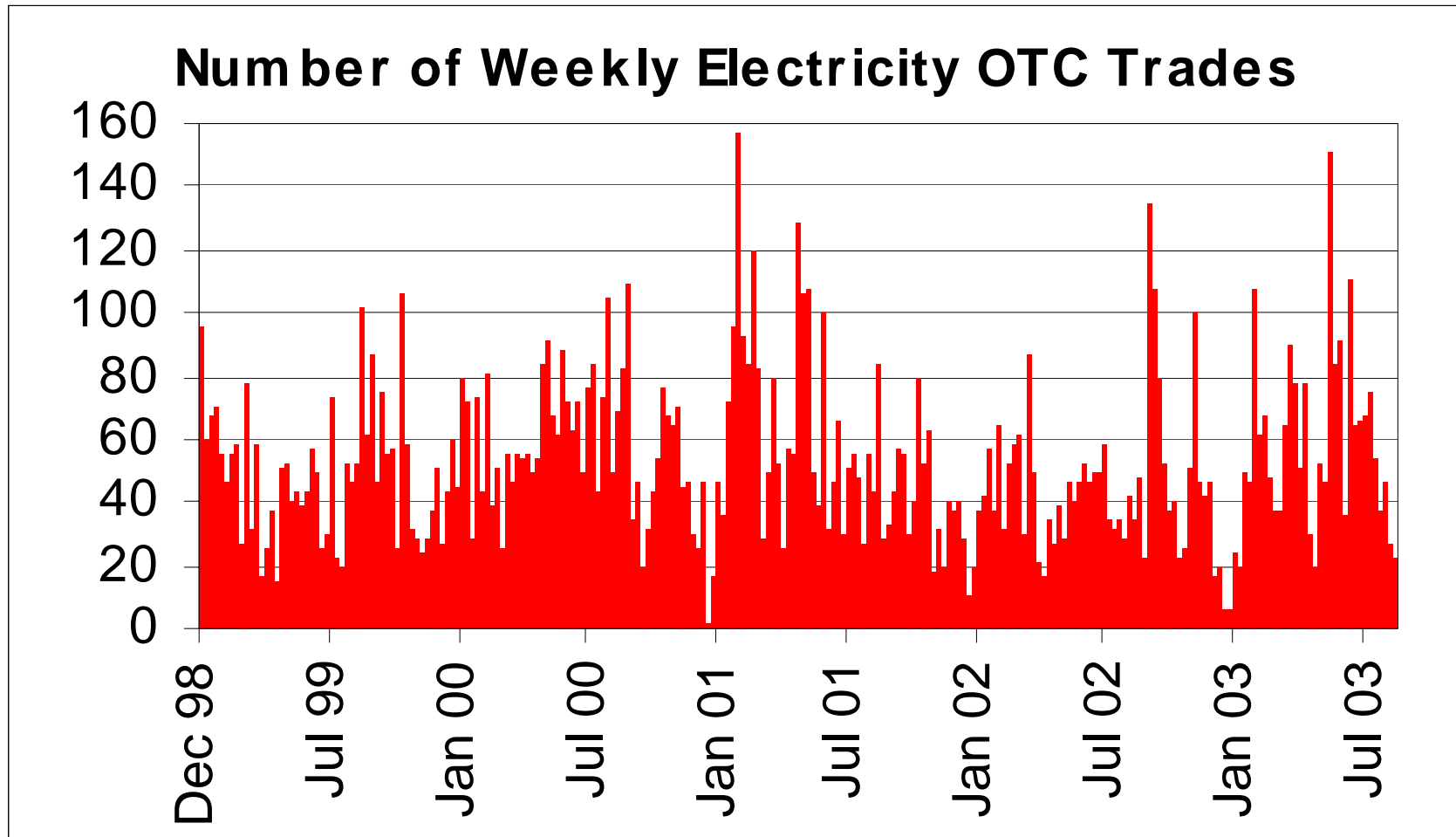
Trading Activity – SFE Electricity Futures



Trends and Developments



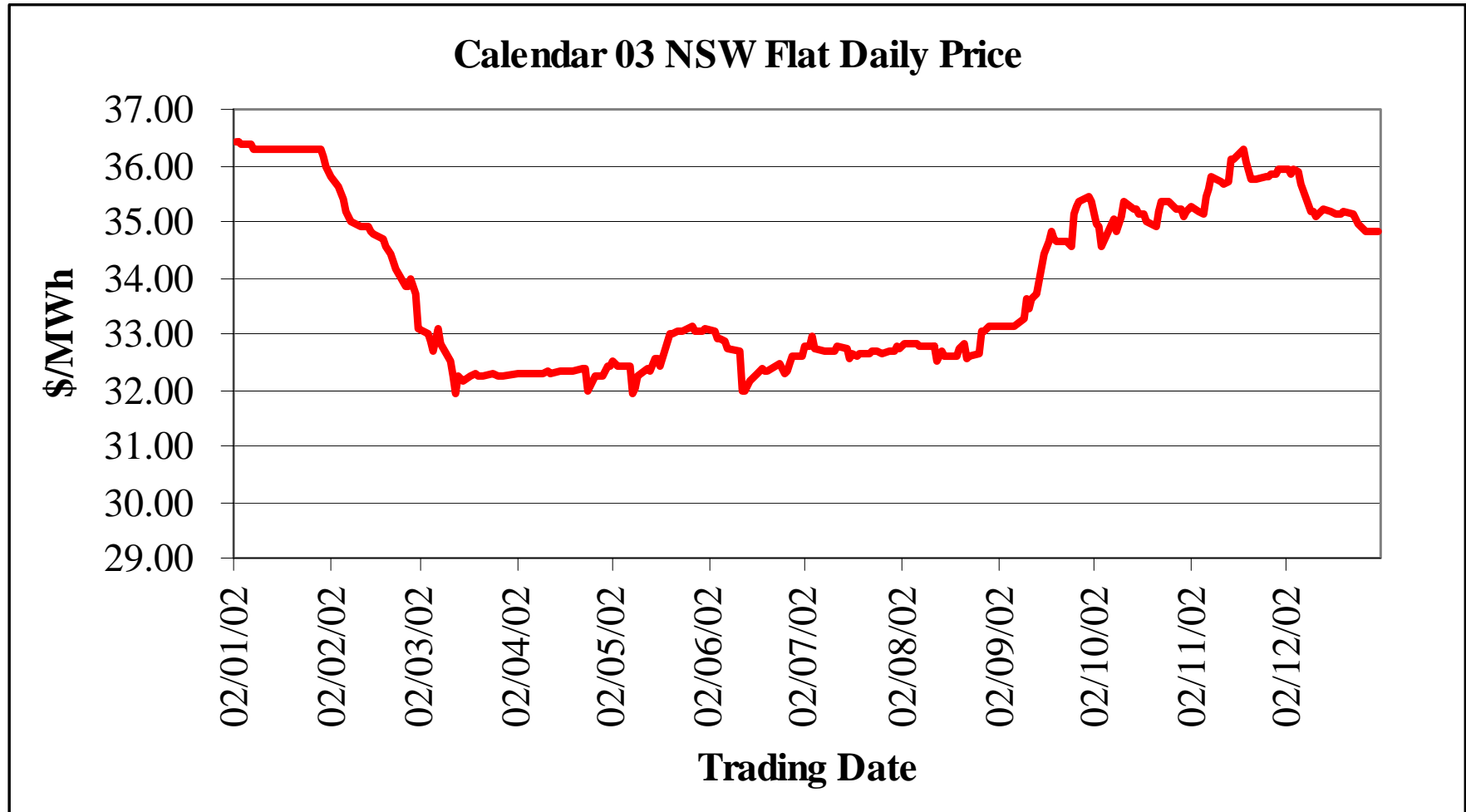
Trading Activity – Reuters



Source: Energy Bank Link, Reuters

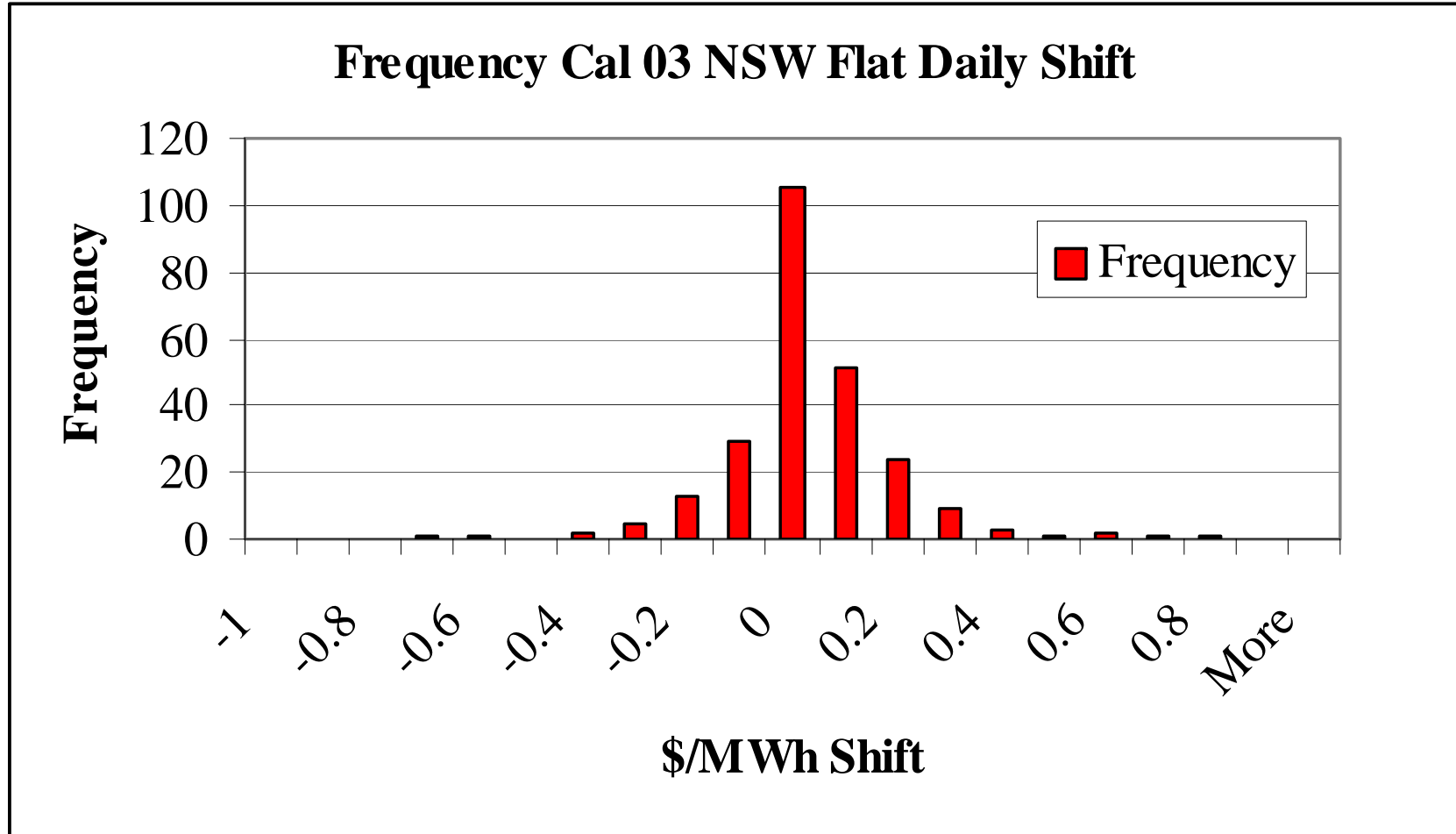


The NSW Forward Market



NSW Forward Market Price Change

■ Daily step changes:

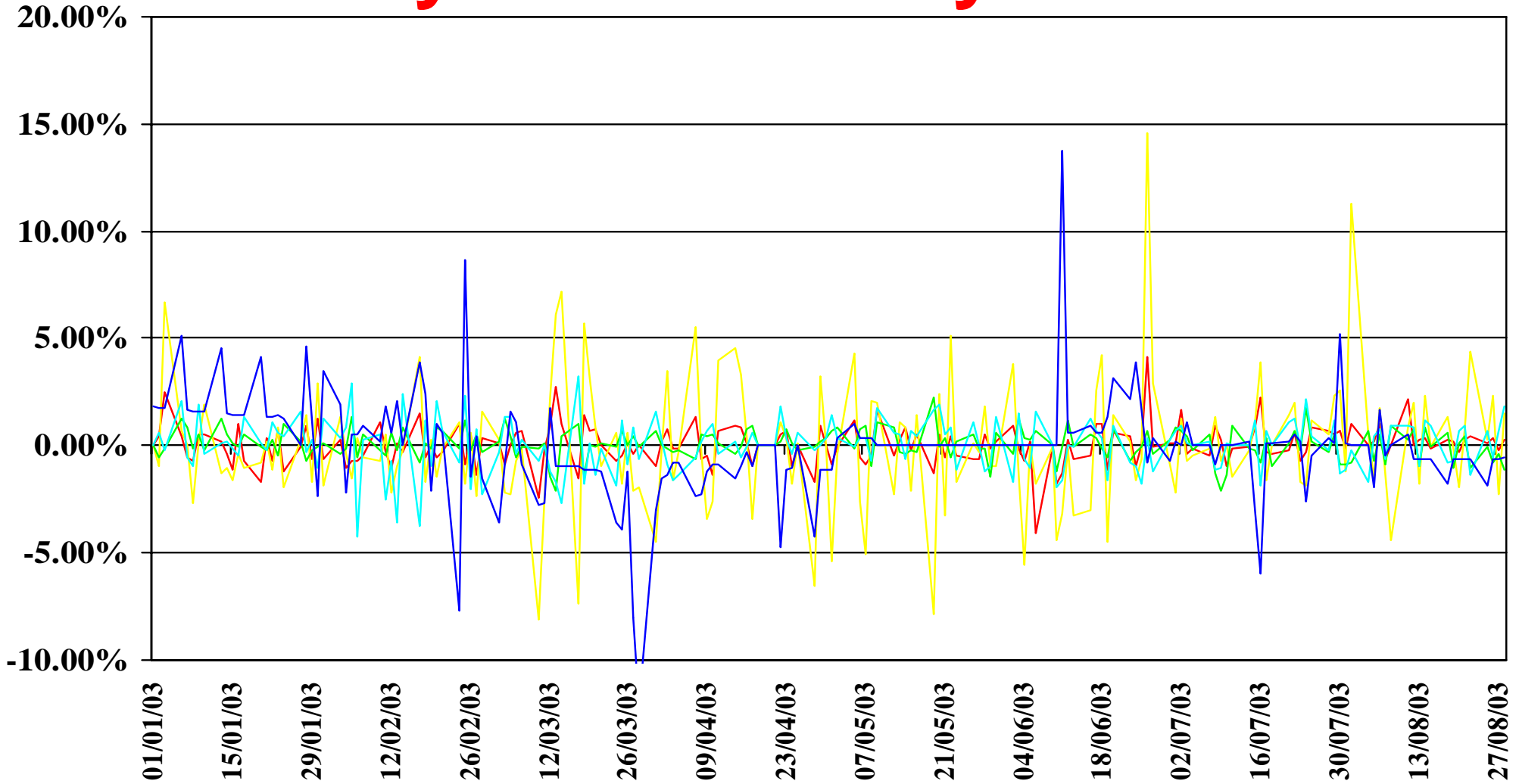


Market Volatility

- **Not such a volatile forward market**
 - **12 month swaptions trading at 5%-7% volatility**
 - **Lower volatility than interest rates and selected equity markets**
 - **Volatility only seems extreme if you only see a price every 3 years**
 - **Price changes normally distributed**
 - **Most price spreads between 1-5%**



YTD Daily Return on 1 yr Forward



— AUD Int Rate — USD Int Rate — AUD/USD — Gold/USD — NSW Elec



2003 YTD 1 yr Forward- Volatility Comparison

	AUD Int	USD Int	AUD/USD	Gold/USD	NSW Elec Flat
Volatility: 2003 YTD	17.39%	41.82%	10.15%	14.49%	29.59%



Products Used in the Market

How is wholesale risk managed in the market?

- **Swaps (70%) – fixed price/volume contracts**
- **Swaptions (8%) – options on swaps**
- **Caps/Floors (10 %) – half-hourly options**
- **Asian Options (2 %) – option over a period**
- **Exotics – (1%) – weather/demand/AS**
- **Compliance products – (1%) – REC's, NGAC's**
- **Exchange Traded Products (8%) - futures**



But Isn't New Zealand's Different?

- Hydro based, low storage capacity, long skinny transmission system, fuel supply issues
- Is relatively small (37TWh pa)
- Significant vertical integration and concentrated (no independent retailers)
- Majority owned by the state
- A “gross” pool-based spot market
- No real OTC activity
- No futures market
- No price transparency
- No medium or long term price signals
- No new entrants
- Vertical integration



So why Bother with Financial Energy Markets

- Inability to manage and price risk for all participants
- Excessive transaction costs and margins
- Inappropriate / incorrect investment decisions
- Non-competitive behaviour
- Vertical integration
- Government intervention and re-regulation



Challenges for New Zealand

- **Stabilise the regulatory environment**
- **Create changes to market rules which encourage trading activity and transparency**
- **Create incentives for participation**
- **Explore disincentives for anti-market behaviour**
- **Participate and embrace the financial market...liquidity is self reinforcing**



“...significant attention has been given to the role of regulators in mitigating excessive price levels in electricity markets...a quantitative analysis of the long-term effects of regulatory intervention through the use of price caps....[shows] how such short term fixes can lead to long term deficits in the available generation capacity, and ultimately to market failures...”

Skantze and Ilic, ‘Valuation, Hedging and Speculation in Competitive Electricity Markets: A Fundamental Approach’



Market Model

