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Electricity Industry Restructuring and its Implementation in Australia

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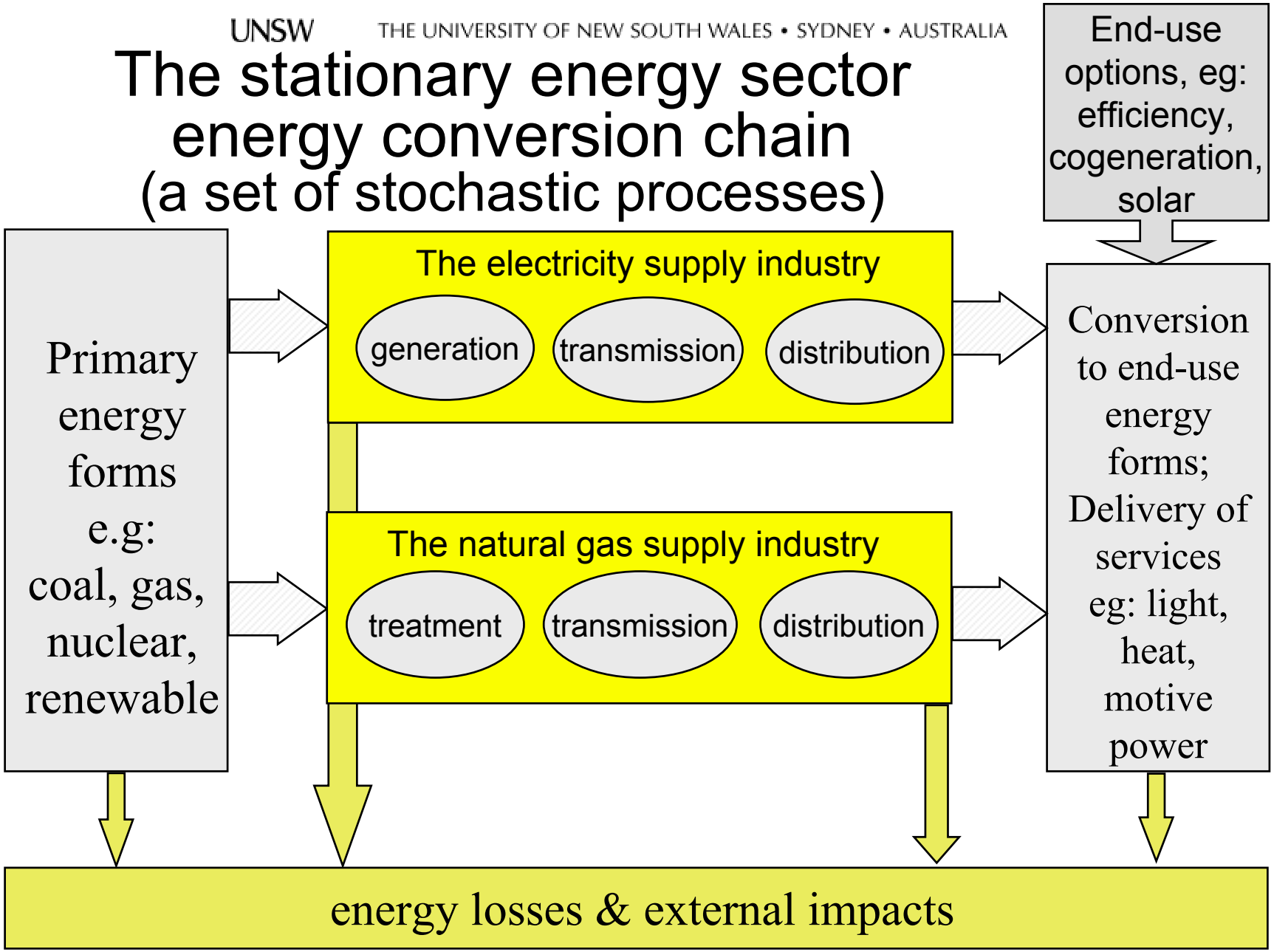
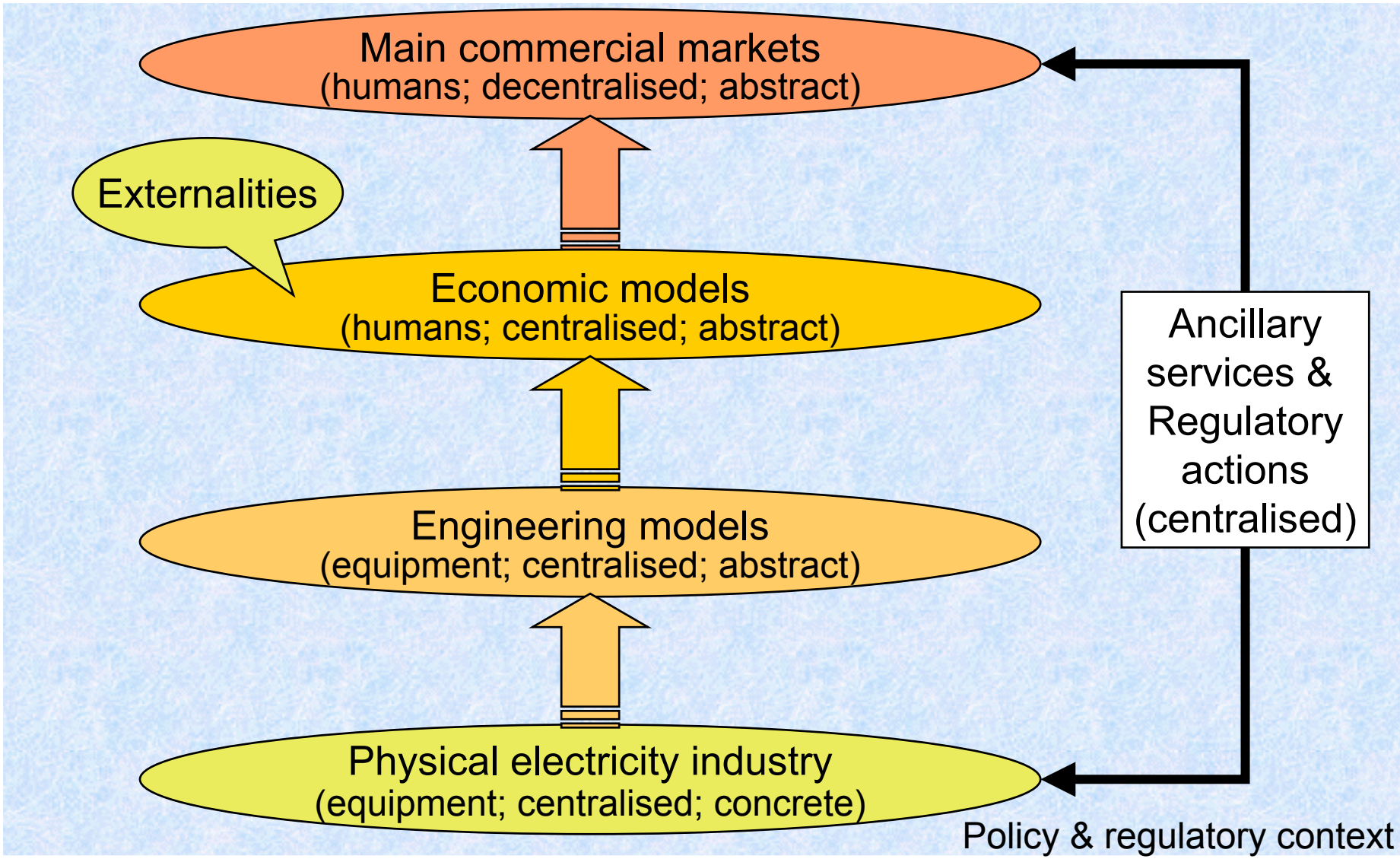
The stationary energy sector energy conversion chain
(a set of stochastic processes)



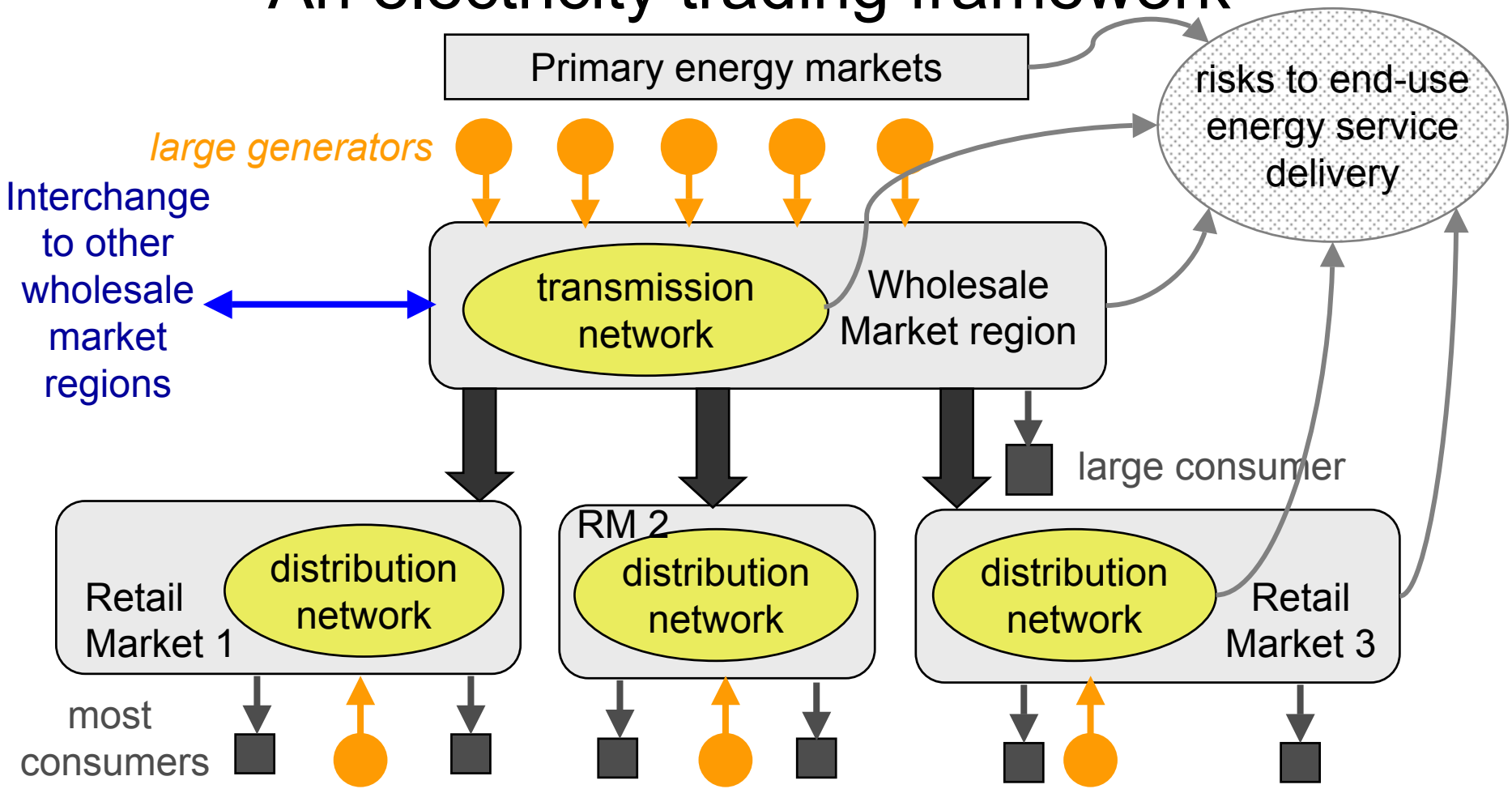
The electricity industry restructuring process

Issue	**Transition**	**Key challenges**
Industry structure	Monopoly *to* Competing firms	Cultural change; adequacy of competition
Commercial framework	Cost recovery *to* market prices	Market power; market realism
Industry regulation	Rate of return *to* Incentive reg'n	Objectives; measurement

Trading in electricity:- an abstraction from reality



An electricity trading framework



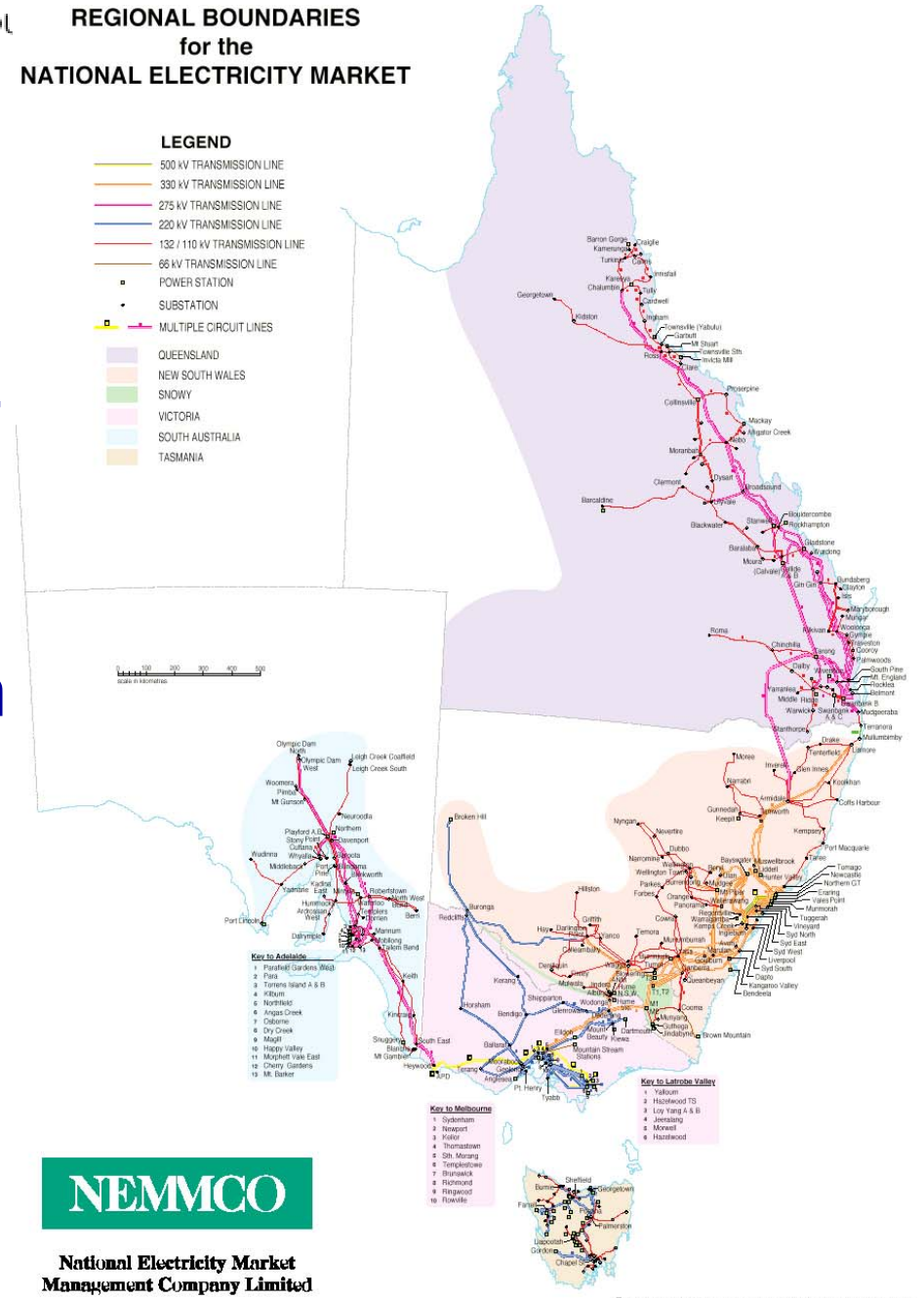
- *Small consumers, embedded generators & storage should be supported by energy service advisers*

- *Wholesale & retail market designs should be compatible*
  - *Both should include network models*

Scope of the NEM

- Queensland
- New South Wales & ACT
- Victoria
- South Australia
- Tasmania (on connection to the mainland)

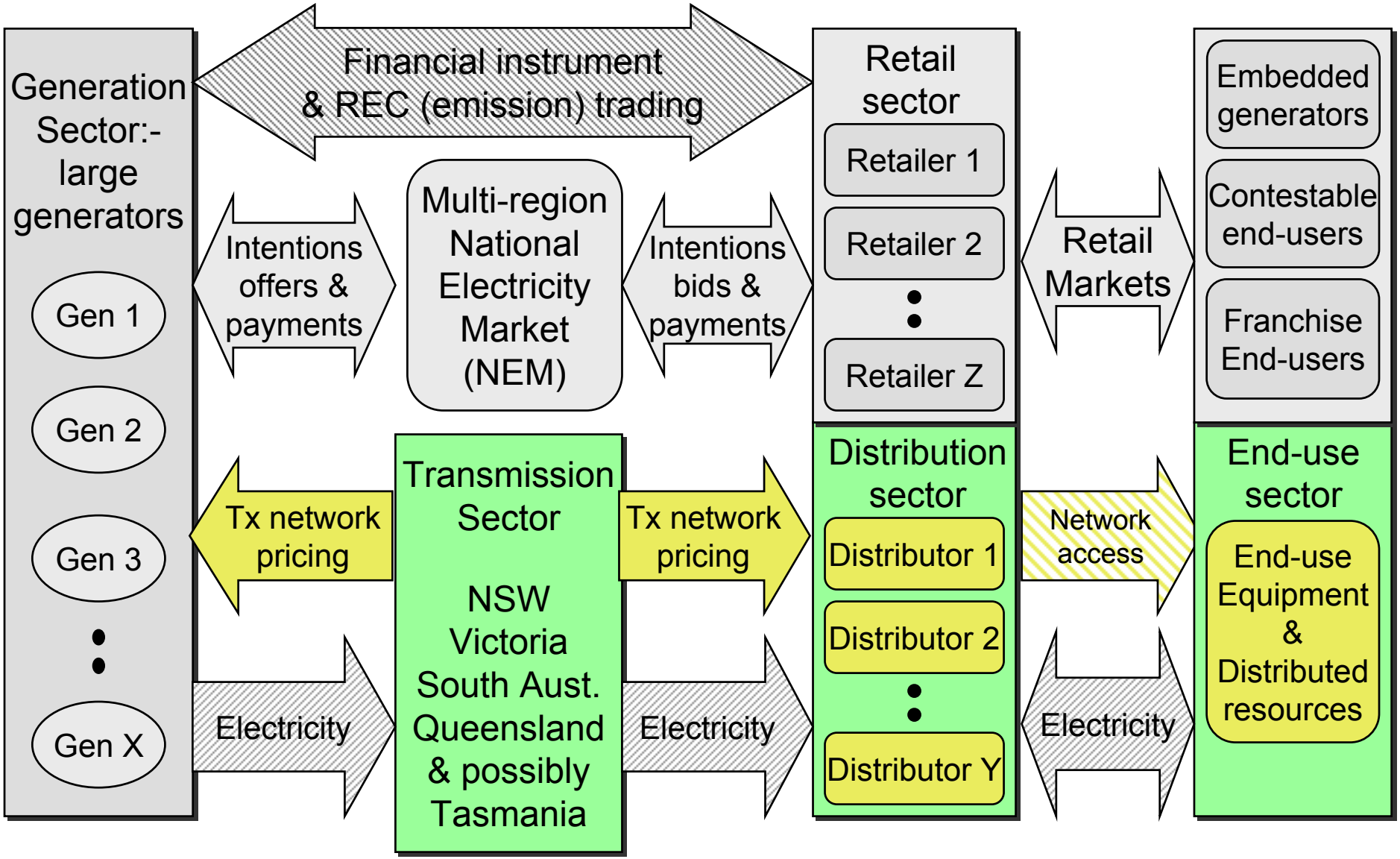
NEM regions are indicated, and their boundaries need not be on state borders (e.g. two regions in NSW)



Key NEM features

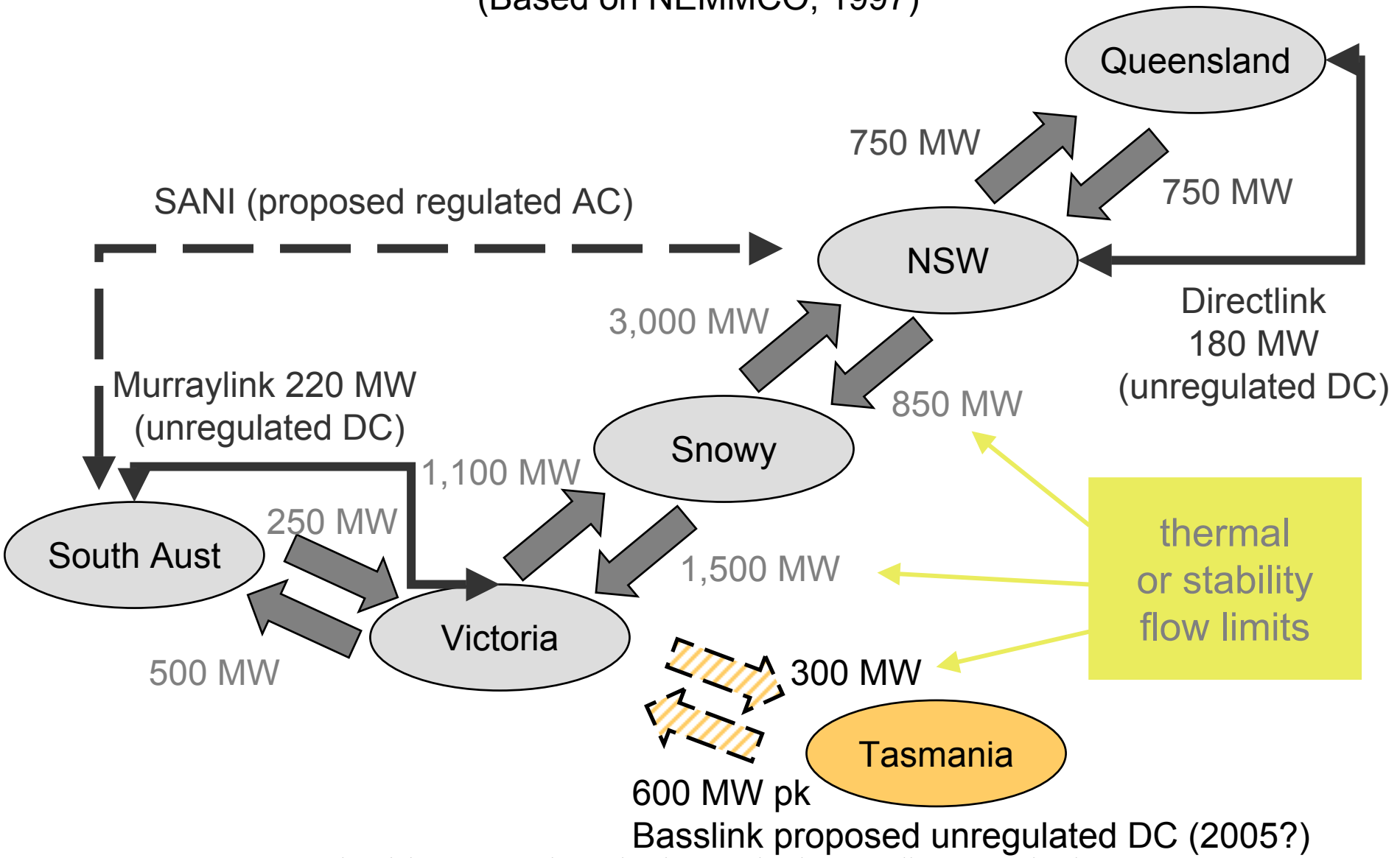
- NEM covers all participating states:
  - A multi-region pool with intra-regional loss factors
  - Ancillary services, spot market & projections
  - Auctions of inter-regional settlement residues
  - Operated by NEMMCO (owned by states)
- Compulsory participants in NEM:
  - All dispatchable generators & links > 30 MW
  - Network service providers & retailers
- Contestable consumers may buy from NEM

Electricity industry structure in SE Australia

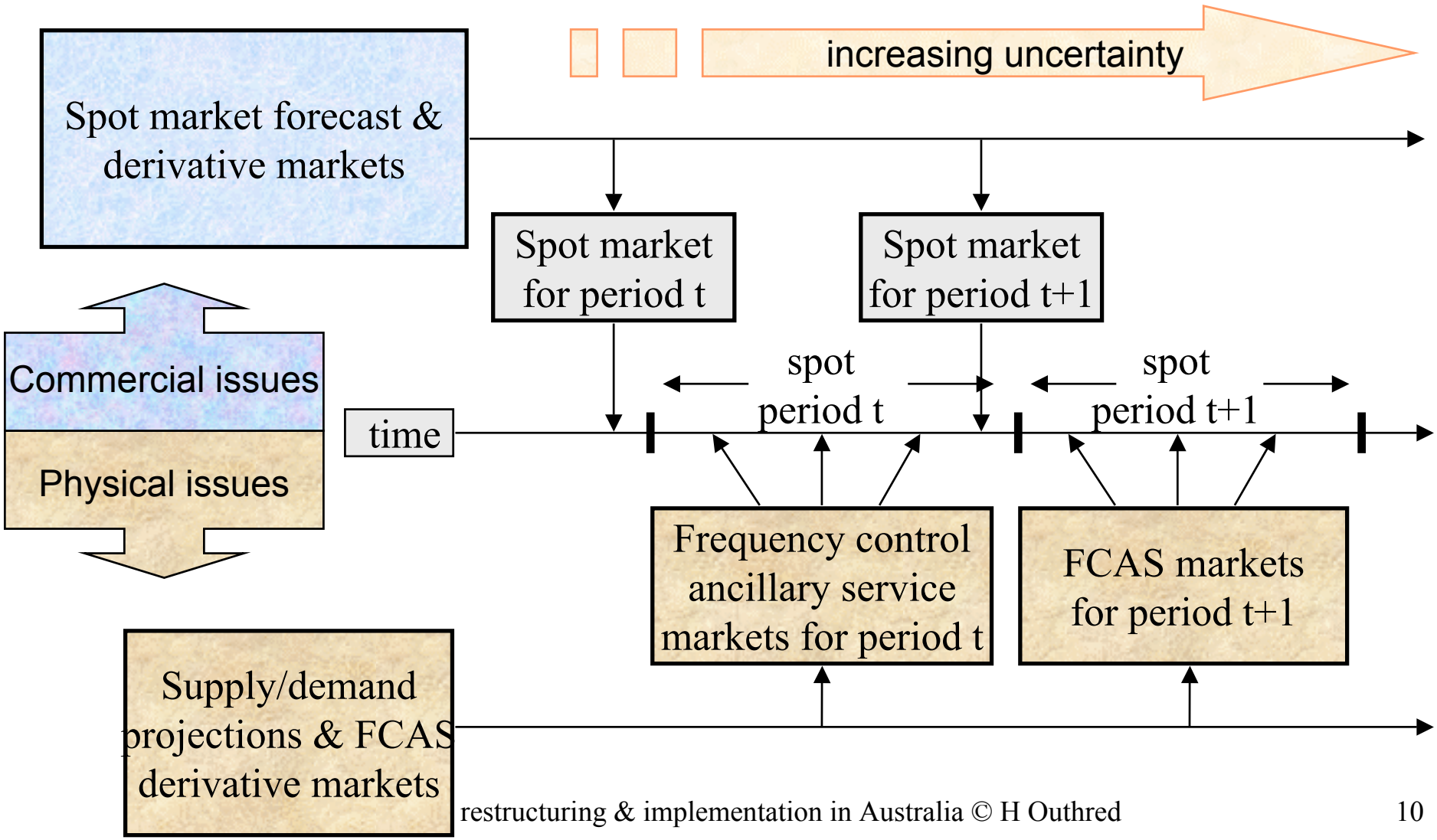


NEM regional spot market model

(Based on NEMMCO, 1997)

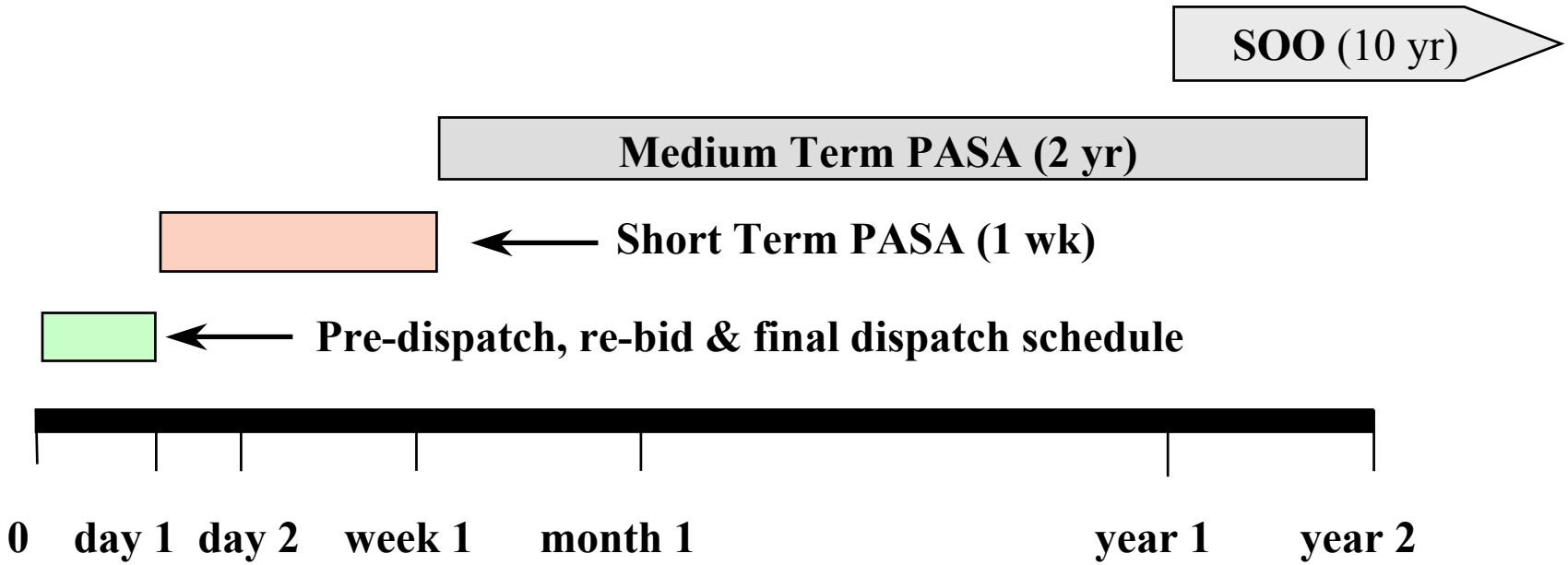


Managing supply-demand balance in Australian NEM



Dispatch, Pre-dispatch, PASA & SOO

(source: NEMMCO)



Statement of opportunities (SOO) is intended to inform generation and network investment decisions (10 year horizon, yearly update)

MT Projection of System Adequacy (PASA) is intended to inform near-term reliability assessment and reserve trader processes (2 year horizon, weekly update)

Key derivative markets

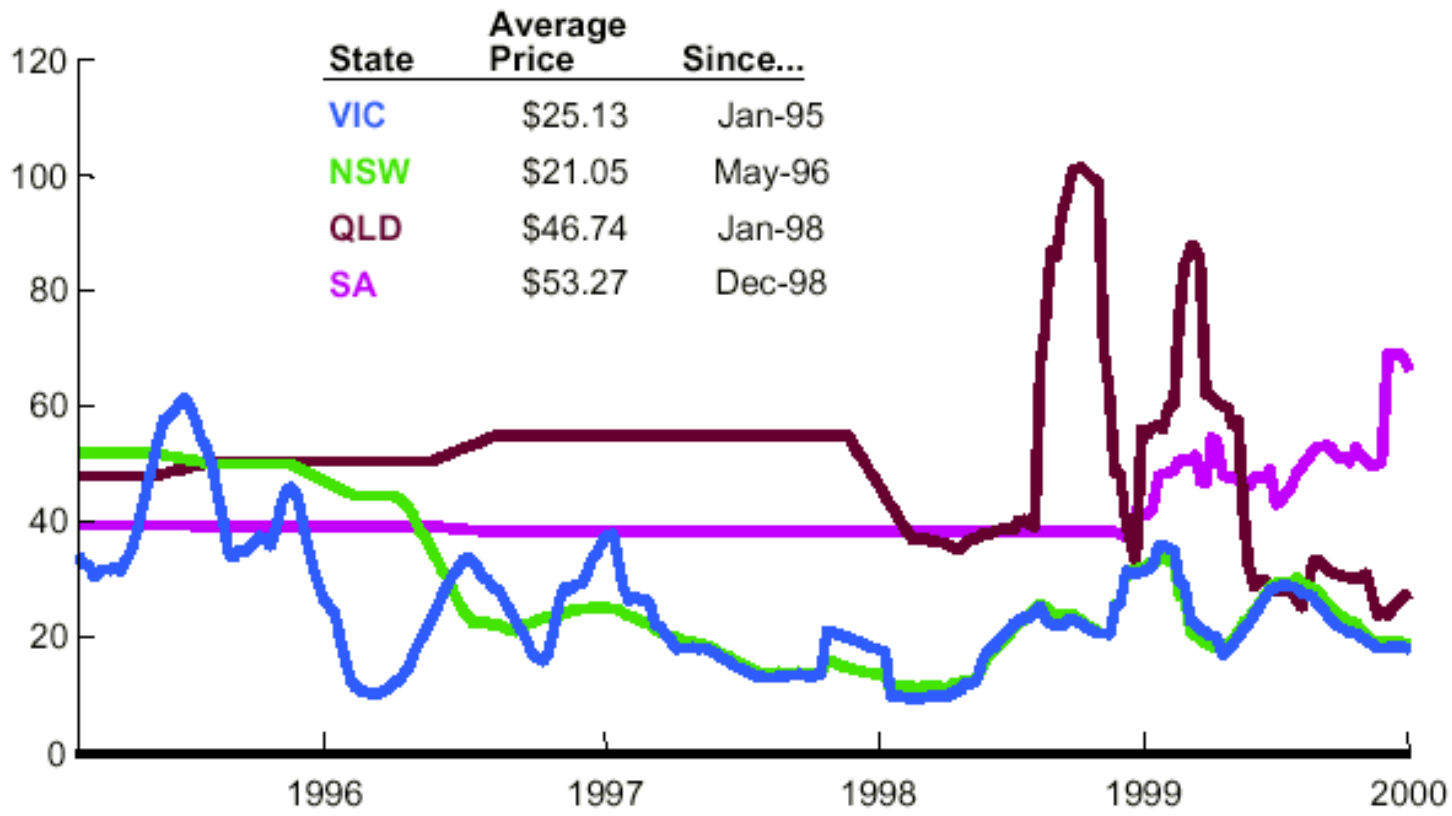
- Forward contracts (futures)
  - Expected spot price for a defined load shape & period (eg flat annual demand)
  - Either OTC or exchange traded
- Call options
- Renewable energy certificates
  - Available to qualifying generators
  - Increasing to 9,500 GWH pa at 2010 then constant to 2020

Price history for NEM & its precursors

(Business Council of Australia, 2000)

NEM ELECTRICITY POOL PRICES*

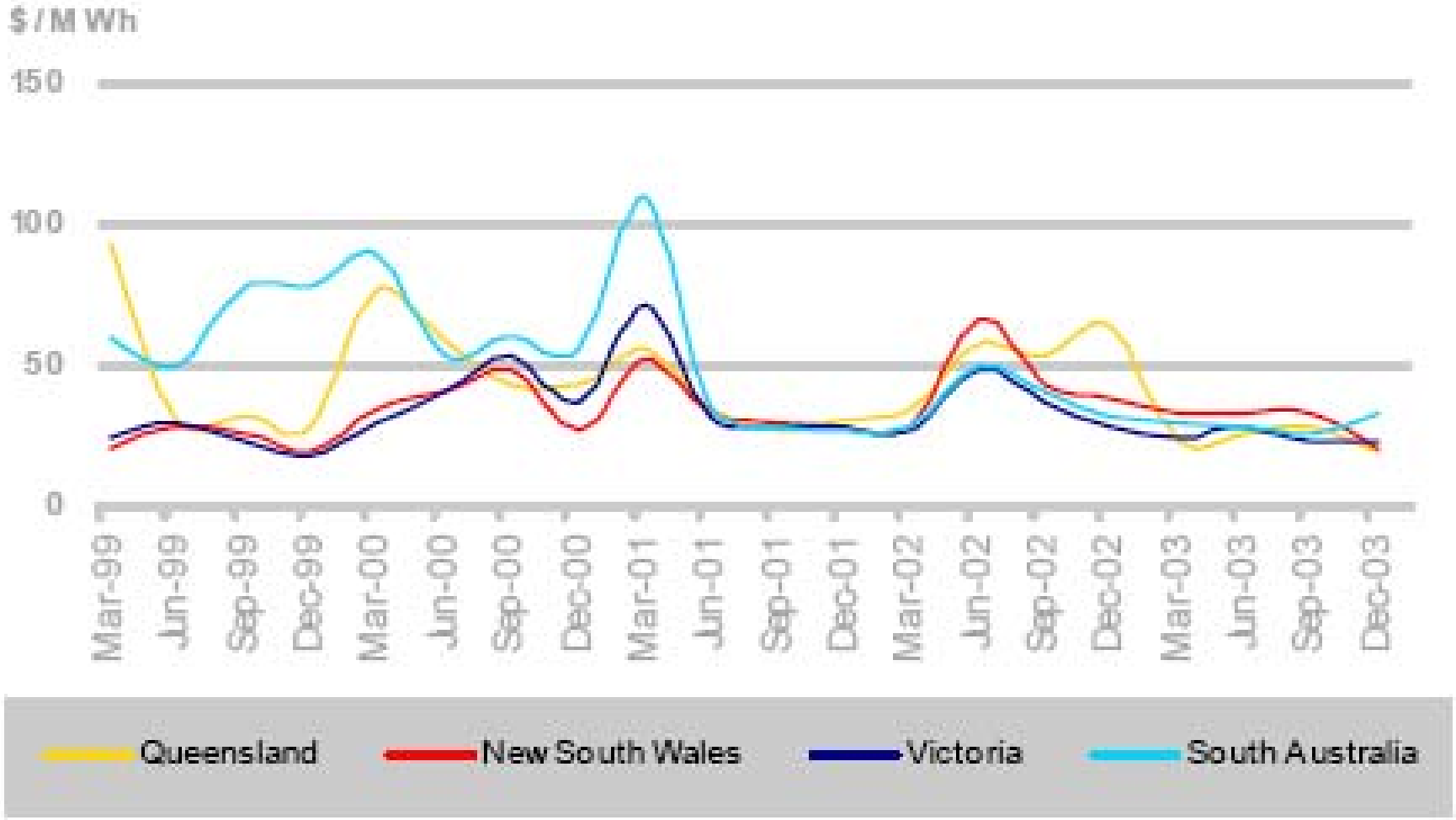
$/MWh



* Three month moving averages. For years prior to market operation the prices are the result of dividing generation revenues by energy produced

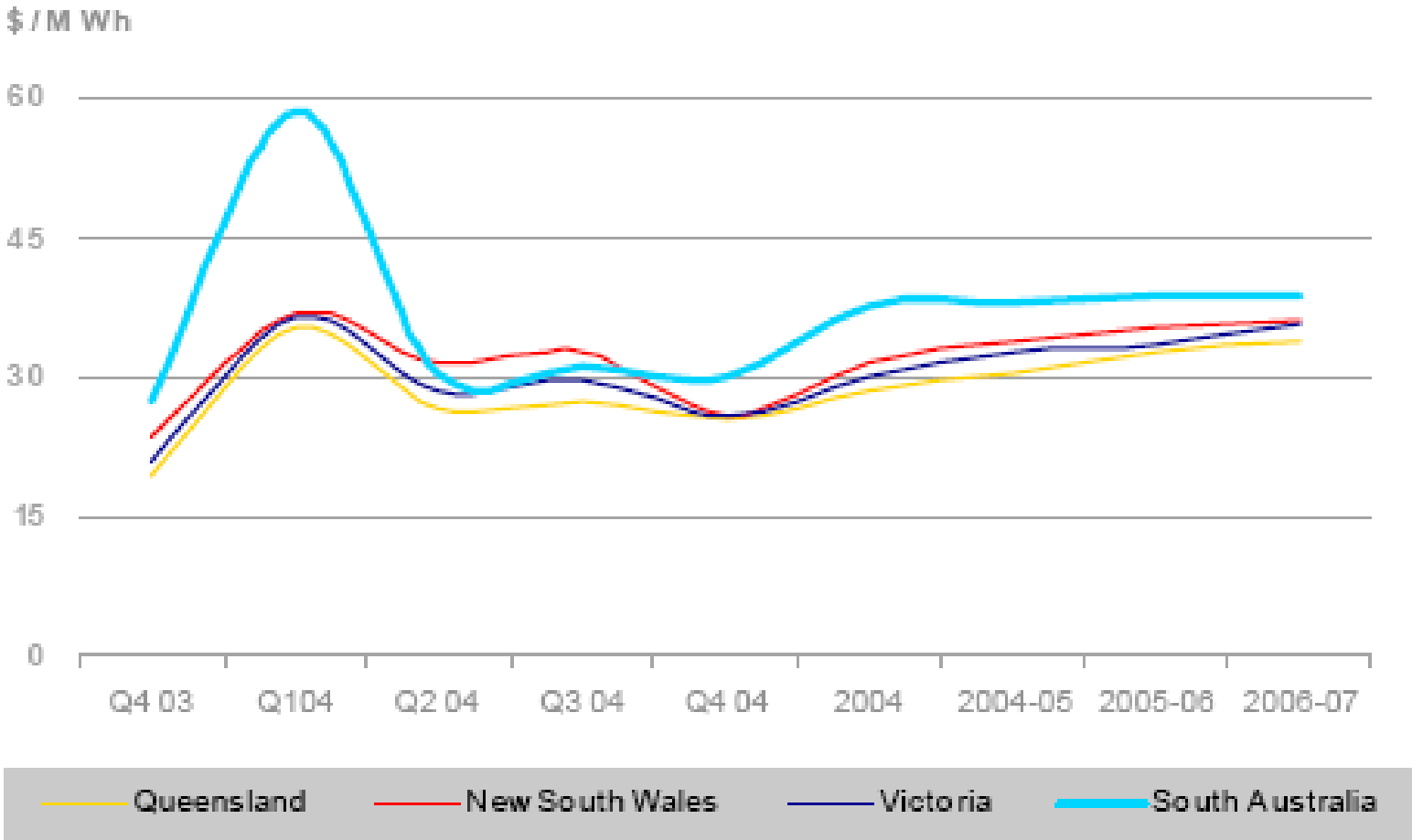
Source: Bardak (extracted from NEMMCO data and Annual Reports)

Smoothed NEM Regional Ref Prices (RRPs) since market inception (NECA, 03Q4 Stats, 2004)

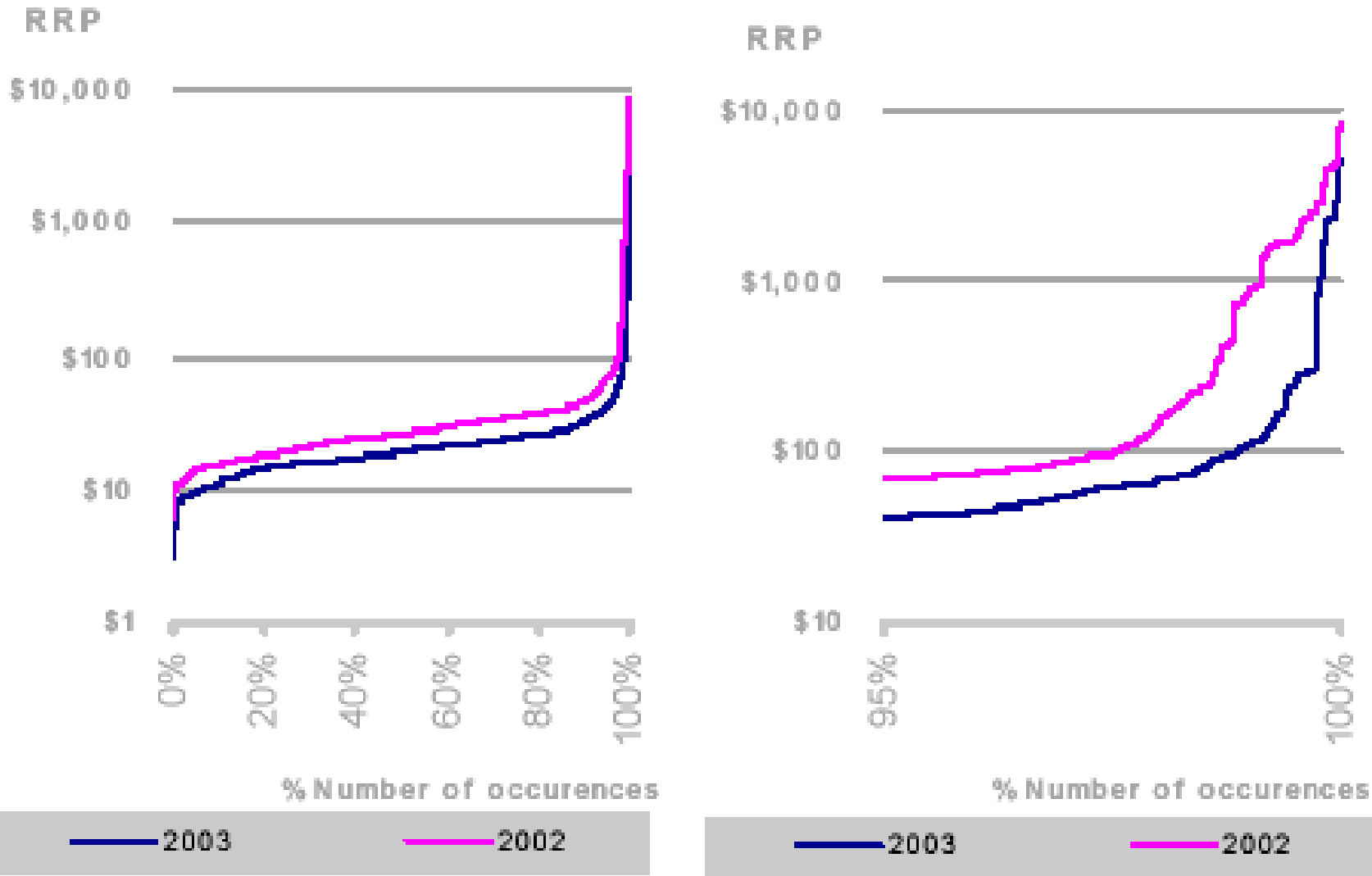


Annual average RRP flat contract prices

(NECA, 03Q4 Stats, 2004)

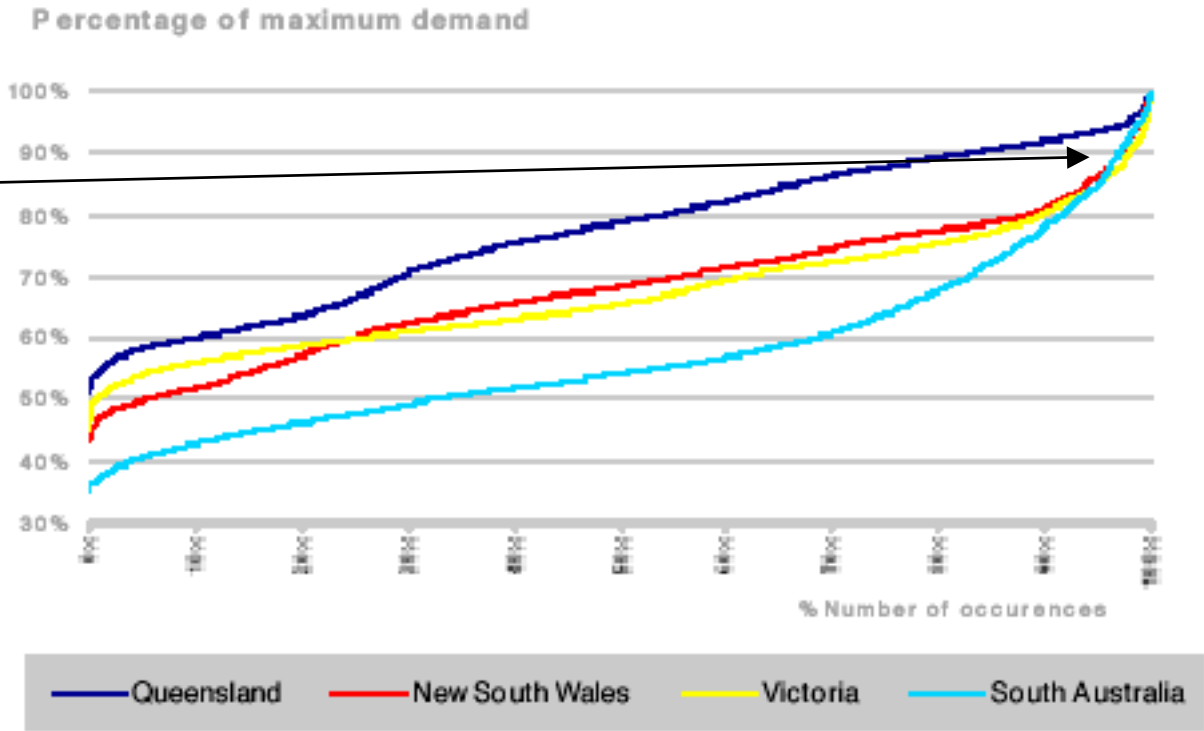


RRP duration curve for NSW Region Jan-Mar 2003 (NECA, 03Q1 Stats, 2003)

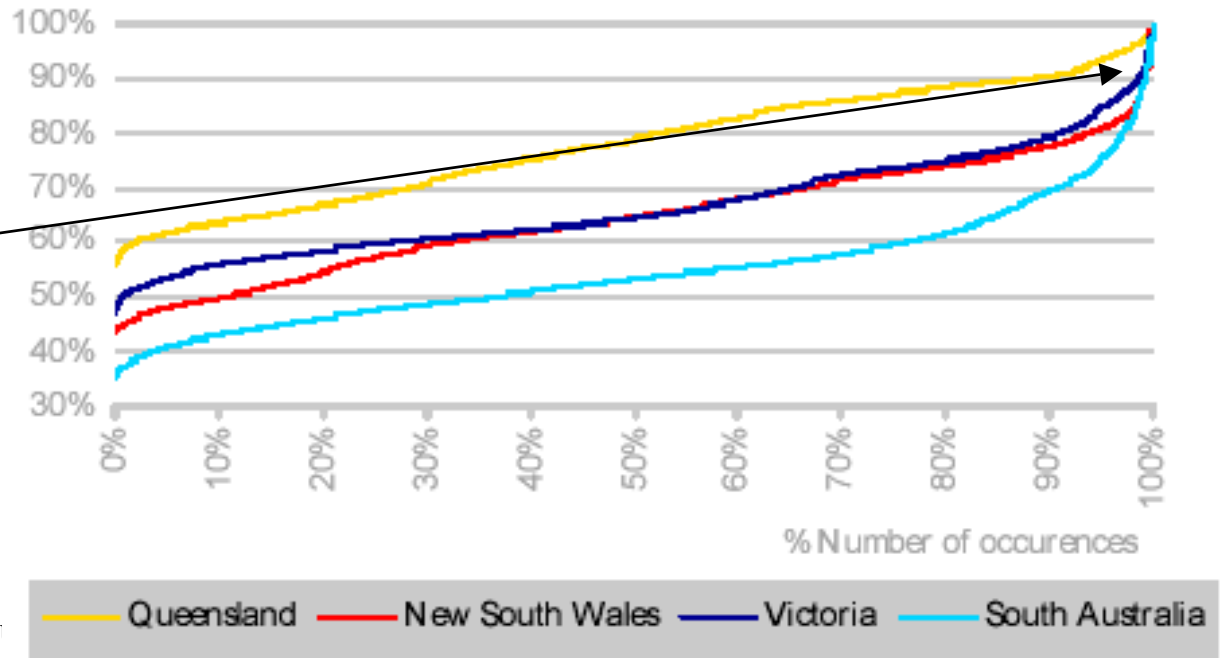


In 2001 NSW load >90% peak for ~5% of time

NEM load duration curves, January-March 2001 & 2003 (NECA quarterly Market Statistics)

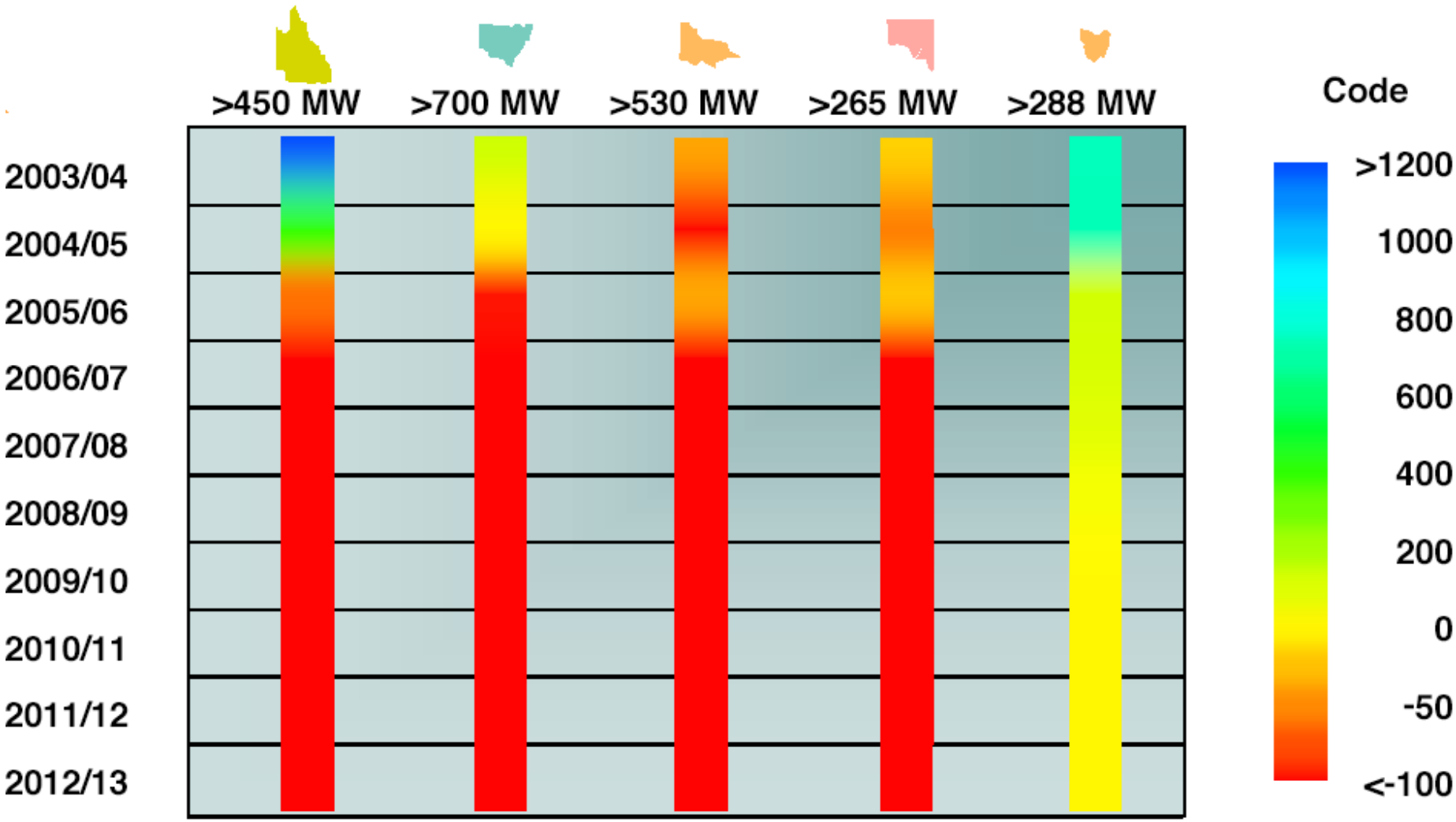


In 2003 NSW load >90% peak for <2% of time

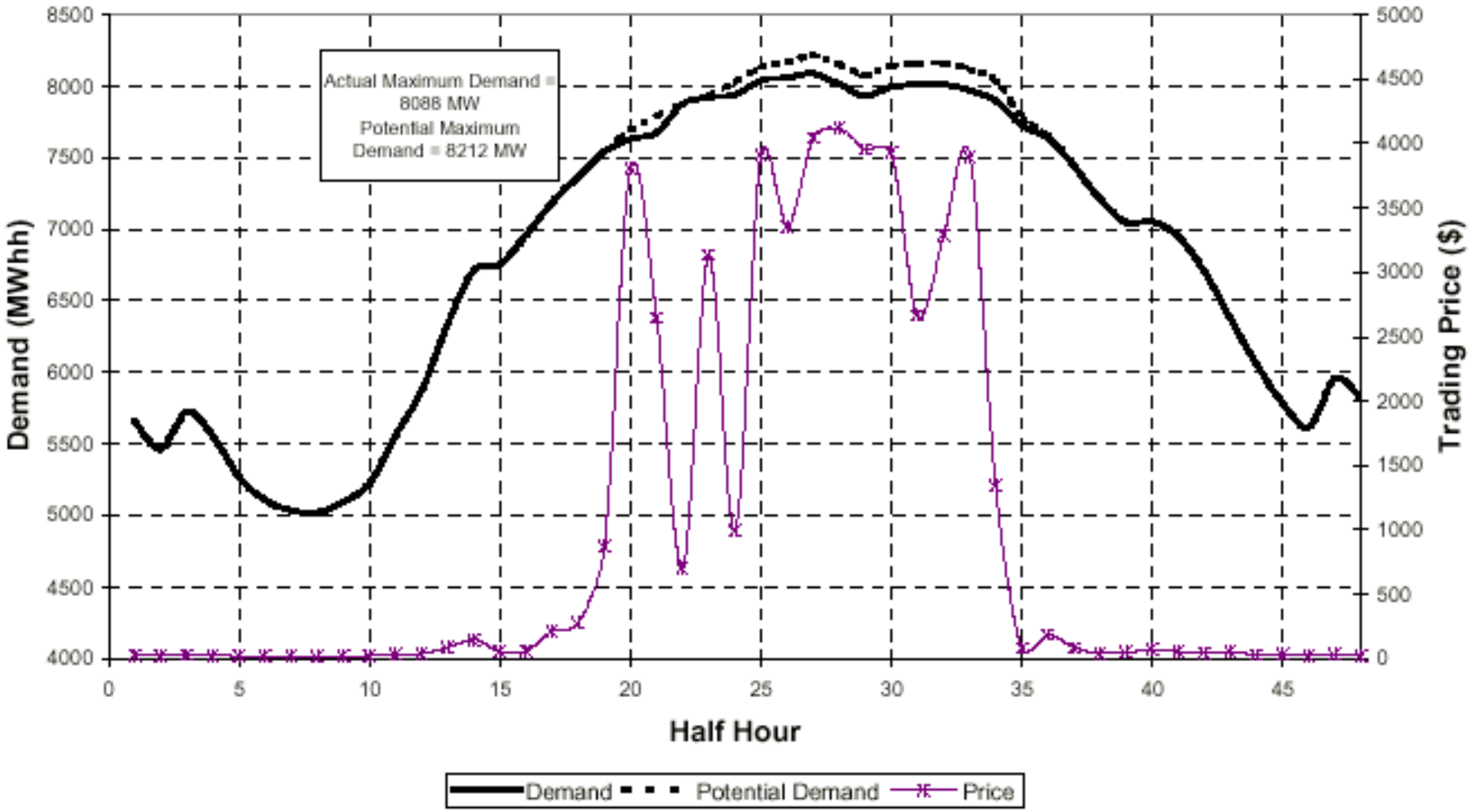


Forecast surplus reserves for NEM Jurisdictions

(Medium growth + extreme (10% POE) weather, NEMMCO SOO, July 03)

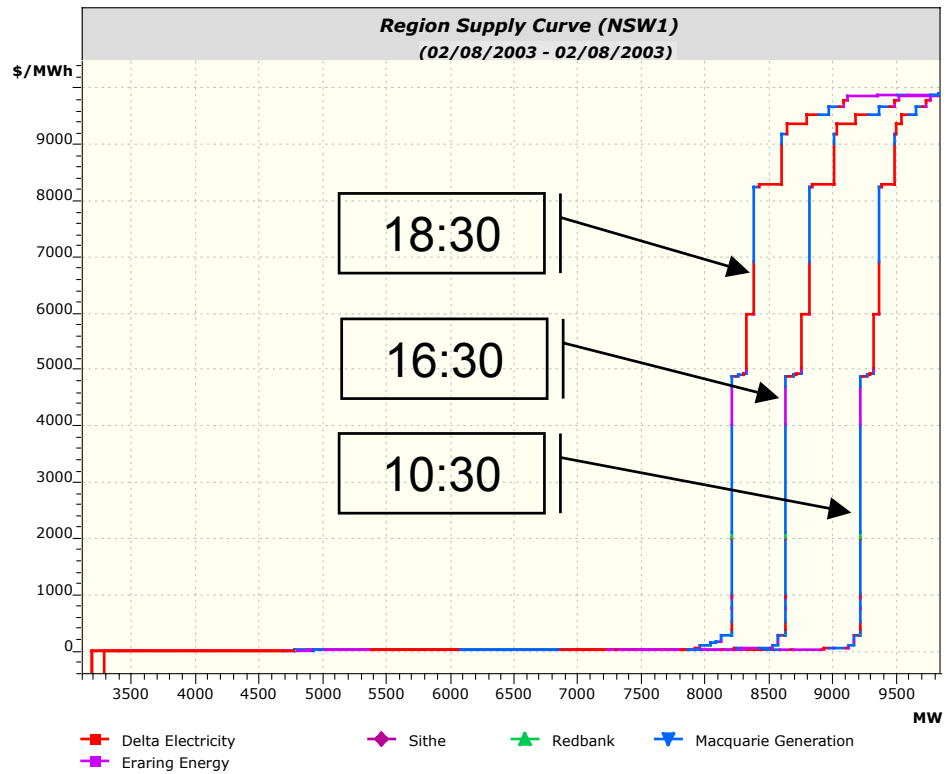


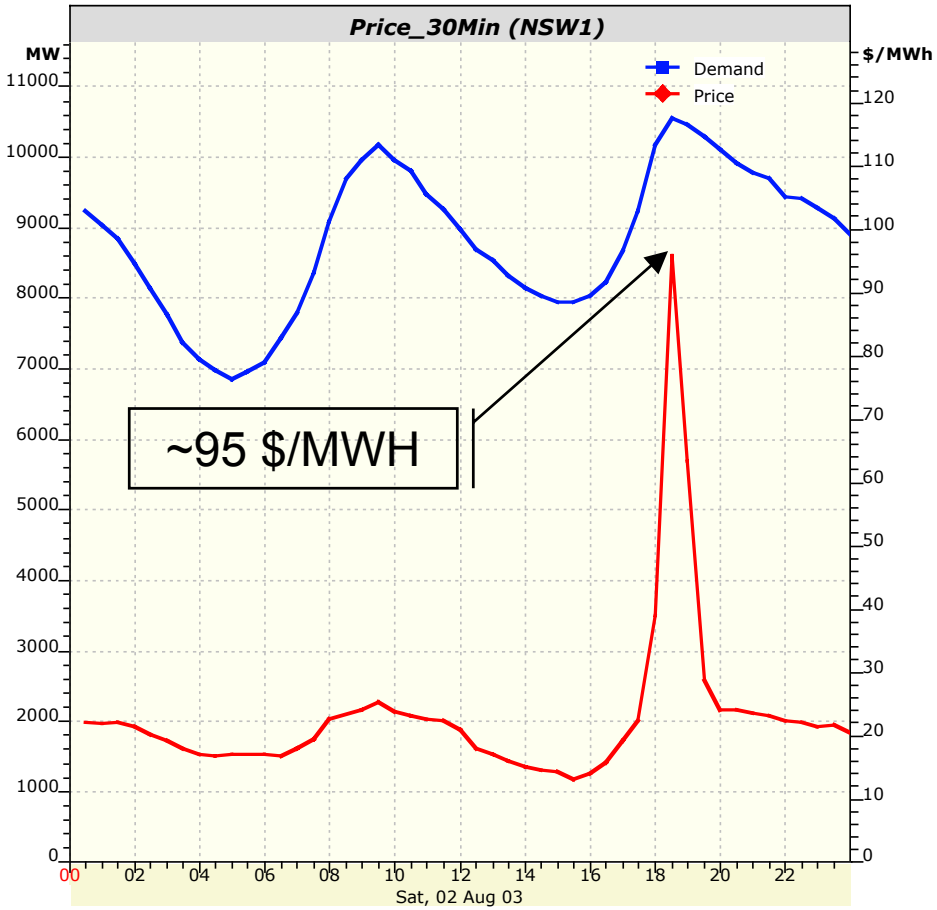
Evidence of demand side response: NEM Victorian region, 8/2/01 (NECA, 2001)



Changing generation offer to raise spot market price (2/8/03)

graph courtesy of Stuart Thorncraft &
Intelligent Energy Systems EMIS facility (www.iesys.com.au)
(possible demand-side responses: derivative contract or reduce demand)

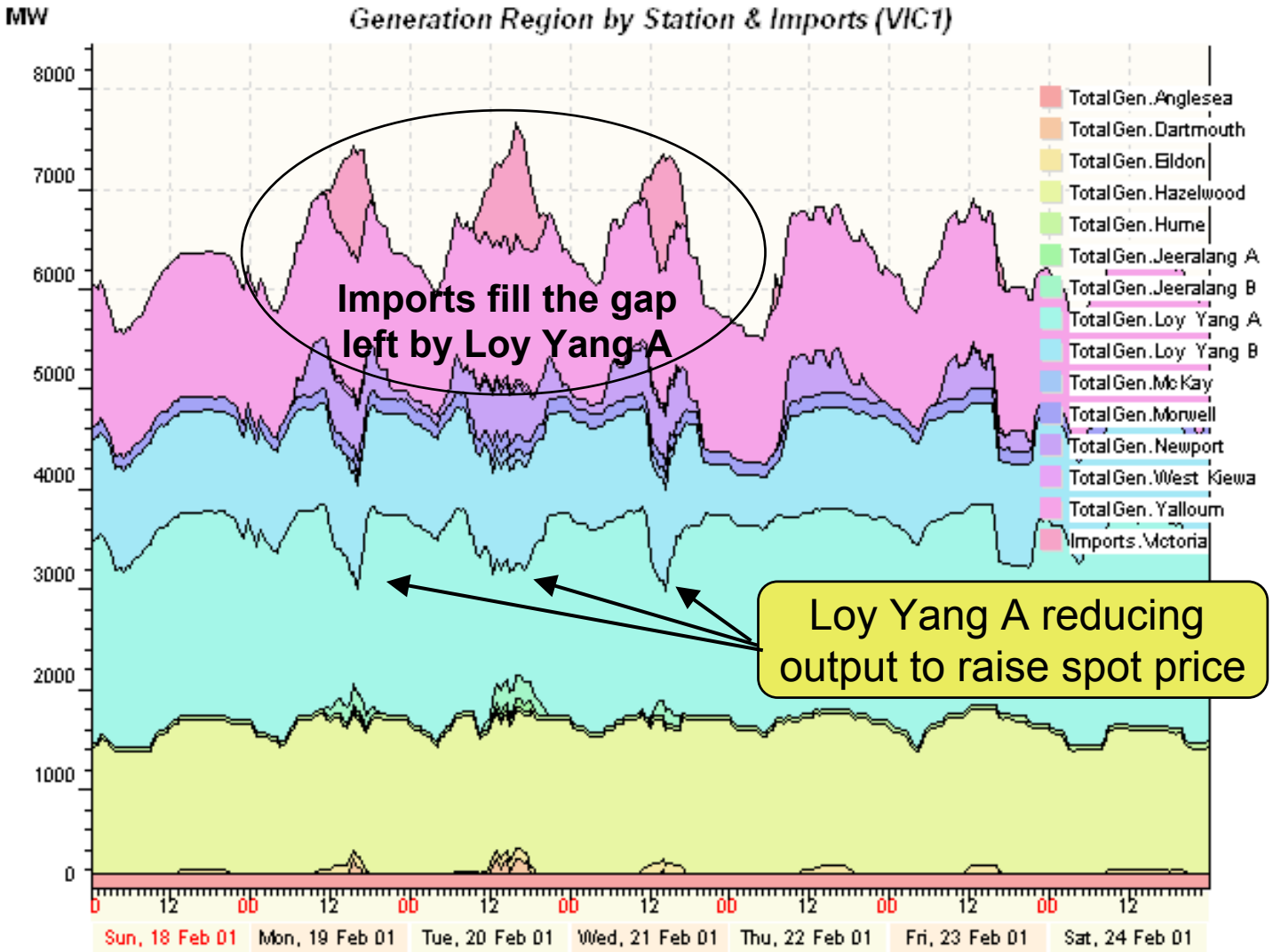




Reducing generation to raise spot market price

(graph courtesy of Intelligent Energy Systems EMIS facility)

(demand-side response: derivative contract or reduce demand)



Conclusions

- Electricity industry restructuring is a complex process that involves:
  - Substantial change in industry structure
  - The creation of an effective electricity trading regime
  - The creation of an efficient regulatory framework
- There are many risks in restructuring:
  - Inadequate competition resulting in high prices
  - Inadequate investment in new capacity
  - Increased environmental impacts
- Australia has been successful to date but future success cannot be guaranteed