



# The Australian National Electricity Market: current status + developments

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*IIT Seminar*  
*Madrid, May 2008*

## CEEM established ...

- *to formalise* growing shared research interests + interactions
  - Faculties of Engineering, Business (Economics and Management), Arts and Social Sciences, Science, Institute for Environmental Studies...
- *through UNSW Centre*
  - aiming to provide Australian research leadership in interdisciplinary analysis + design of energy and environmental markets
- *Current research efforts (grant and consultancy funding)*
  - Facilitating wind integration in the NEM
  - Renewable energy policy support options in restructured industries
  - Market design for restructured electricity industries – new focus on retail mkts
  - Emissions Trading Schemes + options for Australia
    - Interactions between emissions trading and the Australian NEM
  - Technology assessment for sustainable energy options
    - including energy efficiency, cleaner fossil fuels, renewables, nuclear & **CCS**
  - Sustainable energy services delivery in developing countries
  - Economic modelling of Distributed Energy – demand-side participation & DG
  - Energy efficiency policy – regulation, financial mechanisms

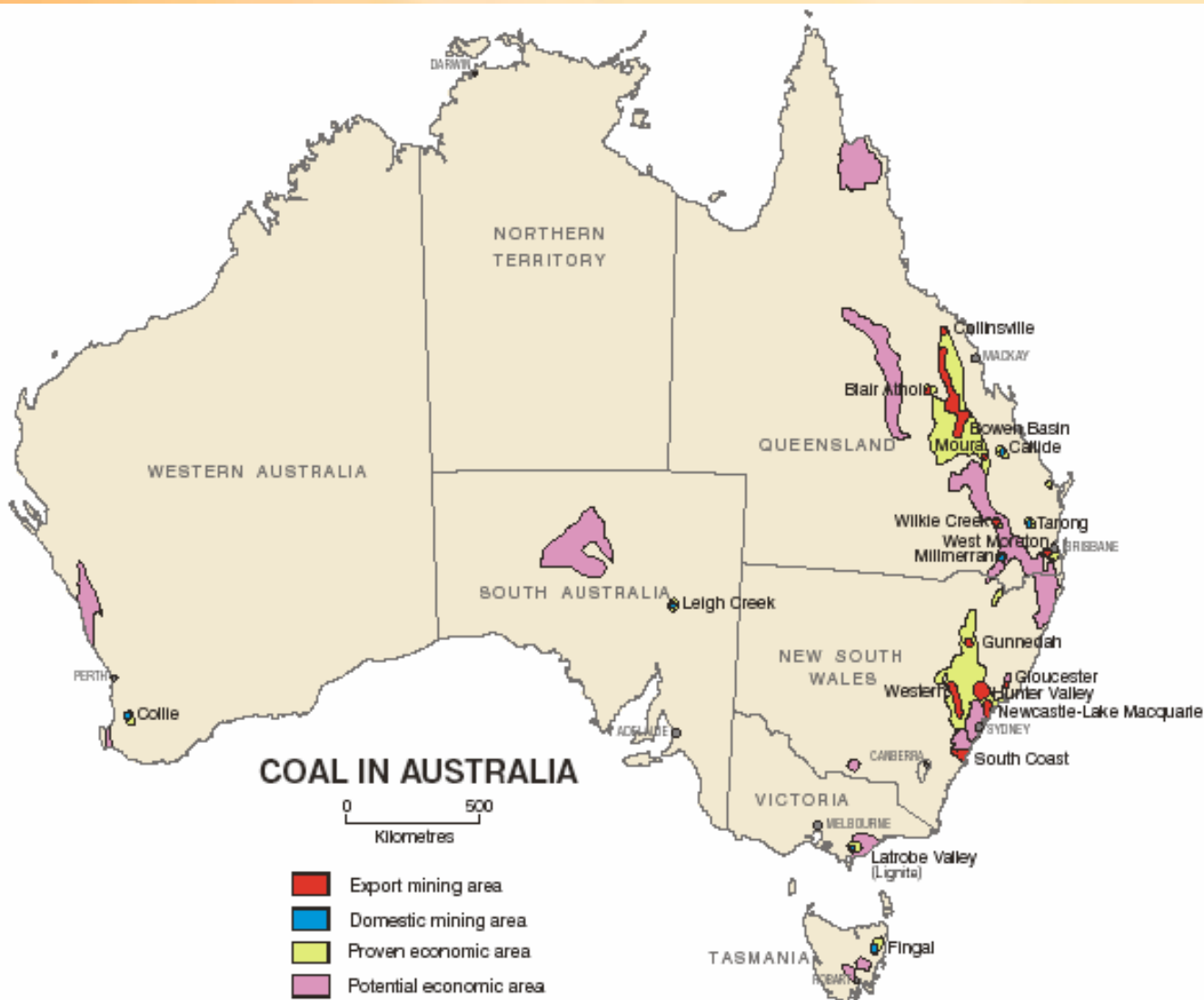
# The Australian energy context

- Large, low cost + high quality coal, gas and U reserves
- Major energy exporter – World #1 Coal, #2 Uranium, #5 LNG
- An energy intensive economy c.f. other industrialised nations
- Amongst the world's highest per-capita greenhouse emissions

<b>% of Global...</b>	Population	GDP	Energy Production	Energy Consumption	Fossil-fuel GHG emissions
<i>Australia</i>	0.3	1.3	2.3	1.0	1.3
China	21	5.4	14	15	18
India	17	1.7	4.2	5.1	4.1
United States	4.6	31	15	21	22
Japan	2.0	14	0.9	4.8	4.6
Korea	0.8	1.8	0.3	1.9	1.7
Germany	1.3	5.6	1.2	3.1	3.2

(IEA, *World Energy Statistics 2006*)

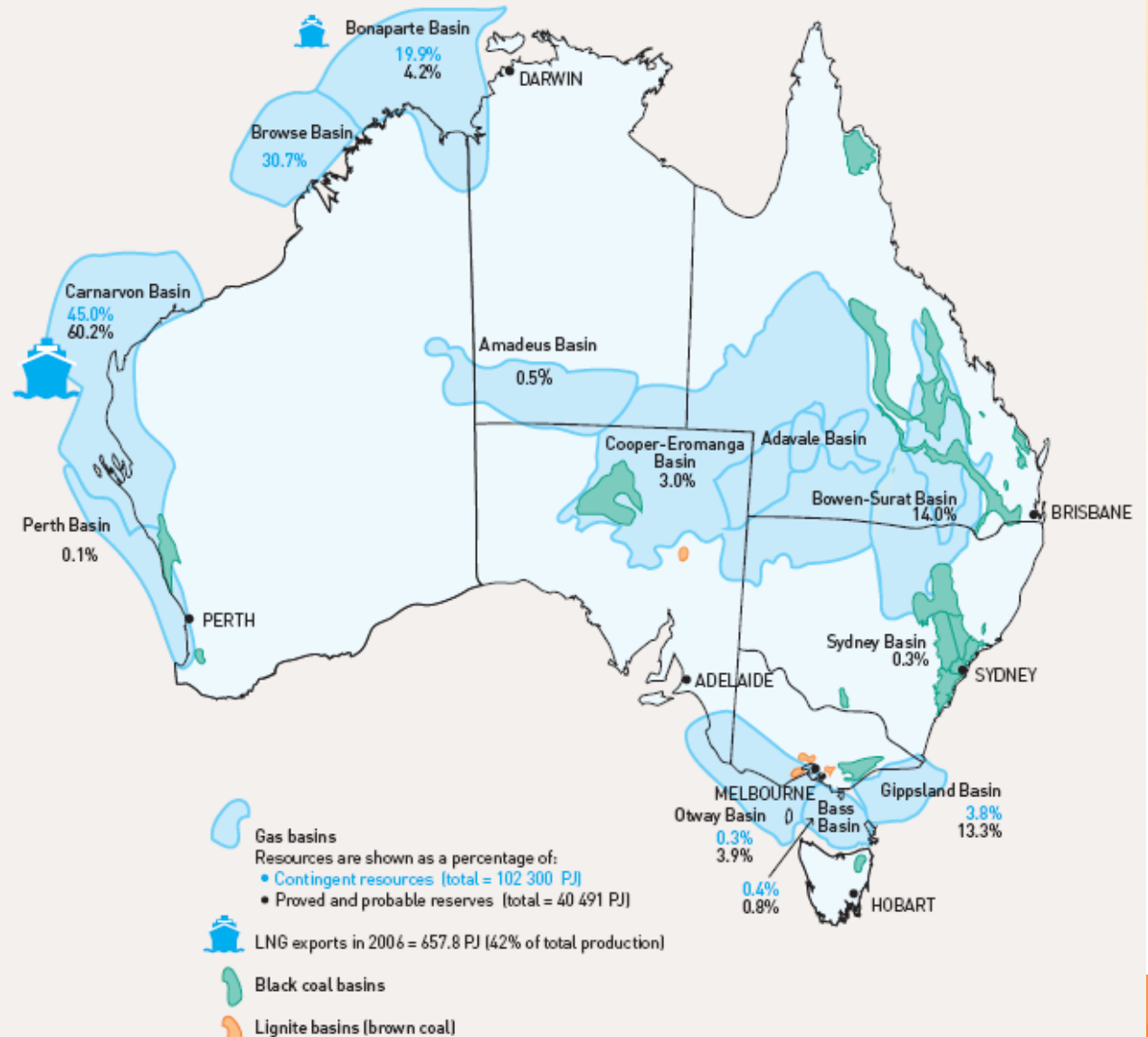
# Australia's coal resources



# Australian gas resources

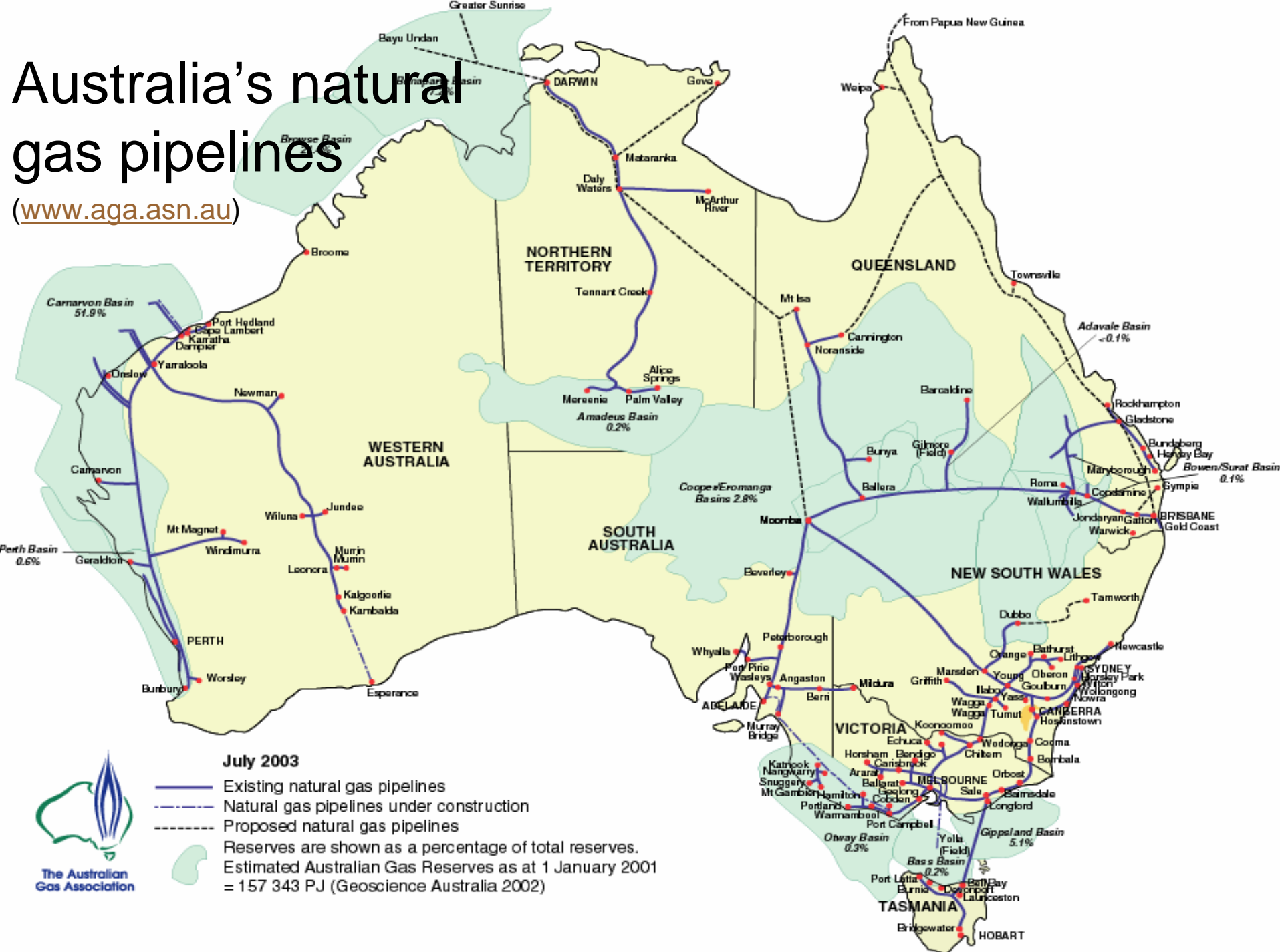
Australia's natural gas reserves

(AER, *State of the Energy Market 2007*)



# Australia's natural gas pipelines

([www.aga.asn.au](http://www.aga.asn.au))

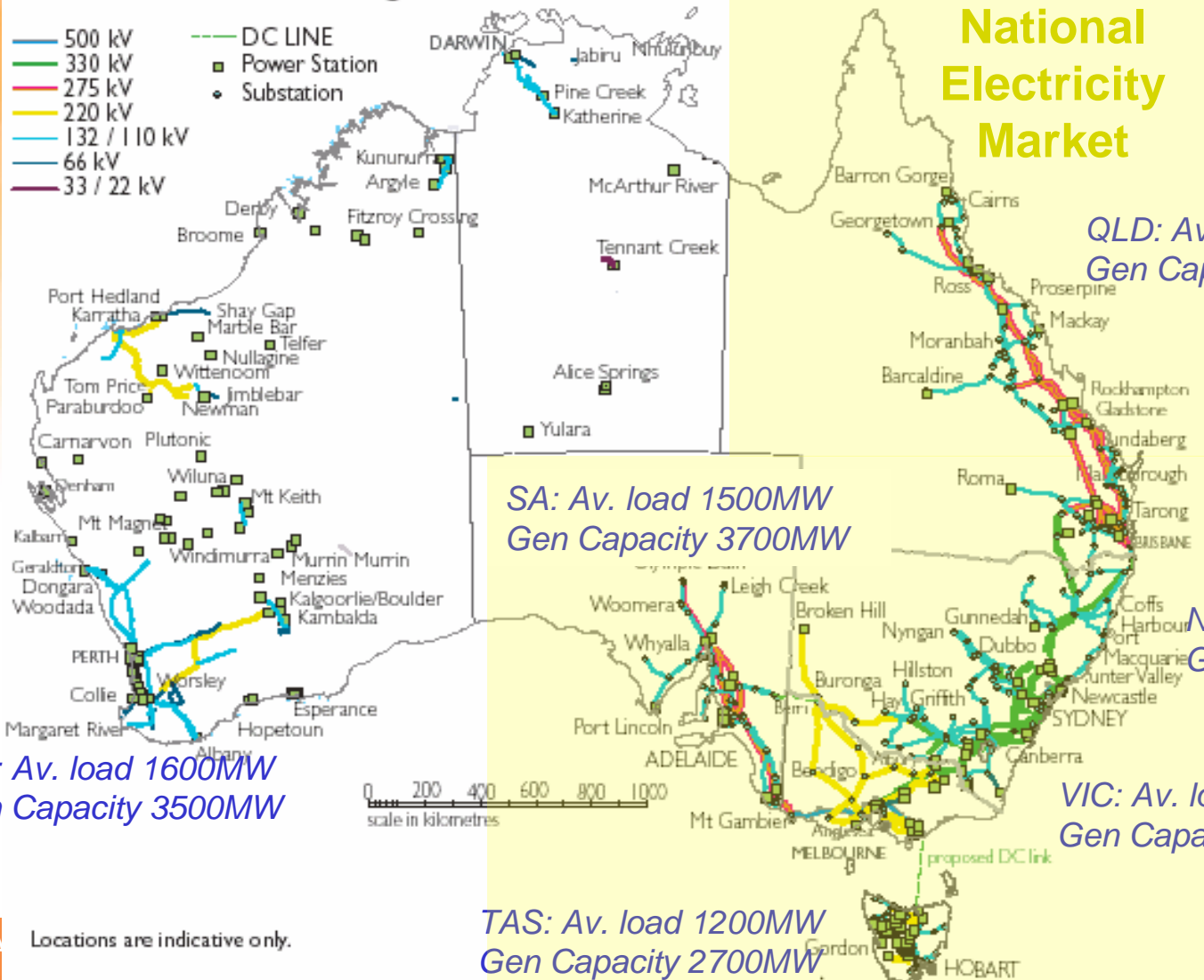


The Australian Gas Association

# Electricity demand, Tx and generation

## Transmission lines and generators

- 500 kV
- 330 kV
- 275 kV
- 220 kV
- 132 / 110 kV
- 66 kV
- 33 / 22 kV
- DC LINE
- Power Station
- ◆ Substation



## The Australian National Electricity Market

QLD: Av. load 5600MW  
Gen Capacity 11,300MW

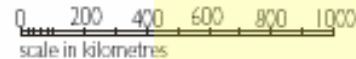
SA: Av. load 1500MW  
Gen Capacity 3700MW

NSW: Av. load 8500MW  
Gen Capacity 12,500MW

VIC: Av. load 5700MW  
Gen Capacity 8800MW

WA: Av. load 1600MW  
Gen Capacity 3500MW

TAS: Av. load 1200MW  
Gen Capacity 2700MW



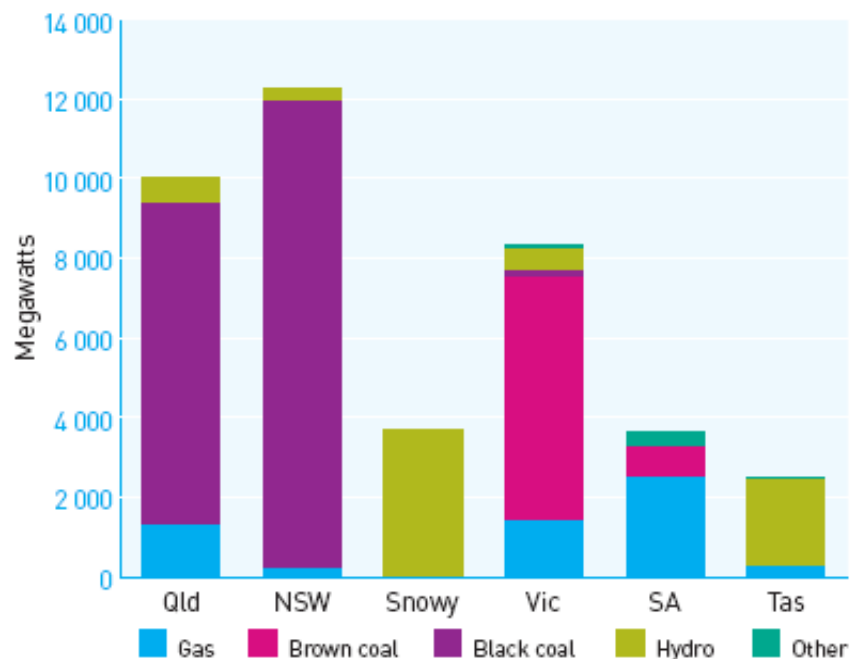


# NEM in summary...

(AER, *State of the Energy Market 2007*)

Figure 1.7

Regional generation capacity by fuel source, 2007



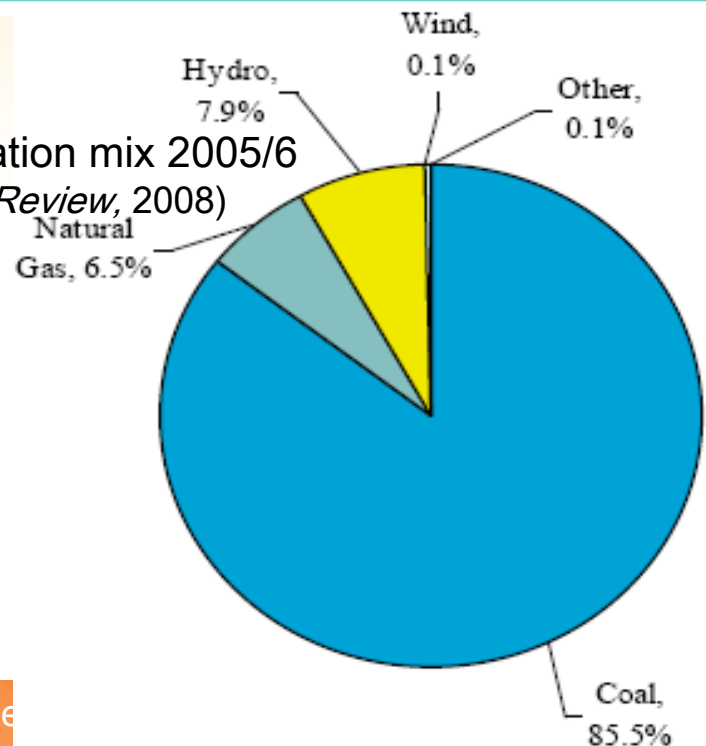
Note: Excludes power stations not managed through central dispatch.

Data source: NEMMCO

Table 2.1 NEM at a glance

Participating jurisdictions	NSW, Qld, Vic, SA, ACT, Tas
NEM regions	NSW, Qld, Vic, SA, Snowy, Tas
Registered capacity	43 130 MW
Number of registered generators	263
Number of customers	7.7 million
NEM turnover 2006-07	\$13 billion
Total energy generated 2006-07	206 TWh
National max winter demand 2006-07 (21 June 2007)	32 688 MW
National max summer demand 2006-07 (5 February 2007)	31 796 MW

NEM Generation mix 2005/6  
(NECA, *NEM Review, 2008*)





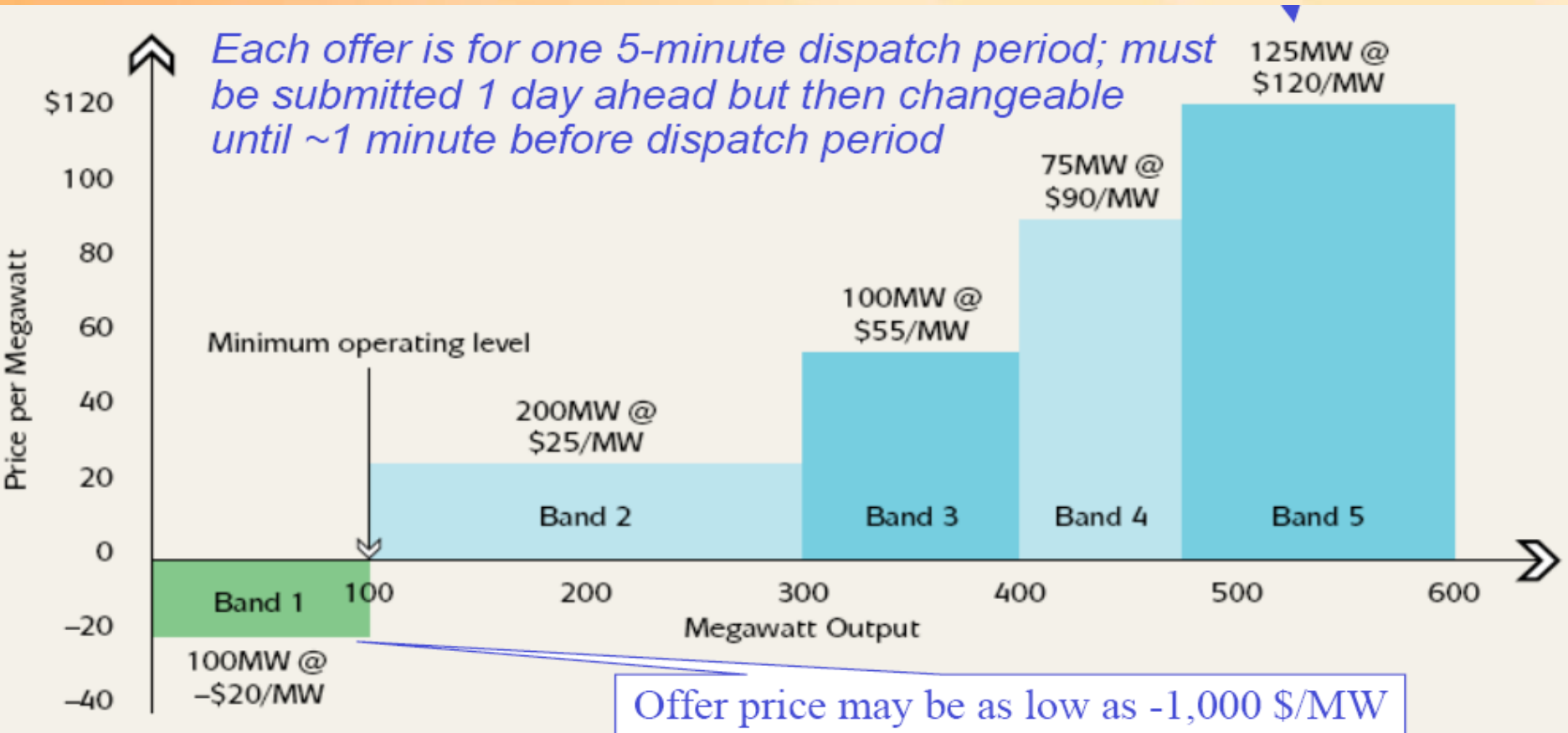
# Features of National Electricity Rules (NER)

- NEM covers all participating states:
  - A multi-region gross pool with intra-regional loss factors
  - Spot market hybrid 5/30 min (dispatch/commercial)
  - 8 Frequency Control Ancillary Services markets for < 5min
  - No capacity market or equivalent; participants determine unit commitment through energy spot market bidding strategy
  - Centralised projections – day ahead, 1 week (STPASA), 2 years (MTPASA) and 10 years (Statement of Opportunities)
  - Operated by NEMMCO (owned by states)
- Compulsory participants in NEM:
  - All dispatchable generators & links > 30 MW (unless intermittent)
  - Network service providers & retailers
- Networks
  - Regulated monopoly NSPs obliged to provide non-discriminatory access; technical connection standards, ‘shallow’ connection costs
- Outside formal NEM rules + arrangements...
  - Range of OTC + exchange derivative markets used to manage spot price risk + underpin investment

# Spot market operation

- Scheduled generators
  - offer Price-Quantity curve (<11 pairs) for each half hour day ahead
  - Can be changed (rebid) right up to dispatch (<1min ‘gate closure’)
  - Can also bid in ancillary service capabilities into FCAS regulation + contingency markets
- Retailers, large customers + storage can choose to bid
  - ...but very little load formally participates
  - NEMMCO unscheduled demand forecast ‘bid in’ at \$10000/MWH
- Bids & offers ranked to give dispatch stack:
  - Considering loss factors & inter-tie constraints
  - ... and co-optimised with ancillary service enablement dispatch
  - 5min dispatch for scheduled generation + loads, + prices for each region (spot + FCAS) averaged to 30min for commercial exchange
  - *Note that only commercially accountable price in spot market operation is 5/30 min (day-ahead pre-dispatch prices advisory only)*

# Typical bidding

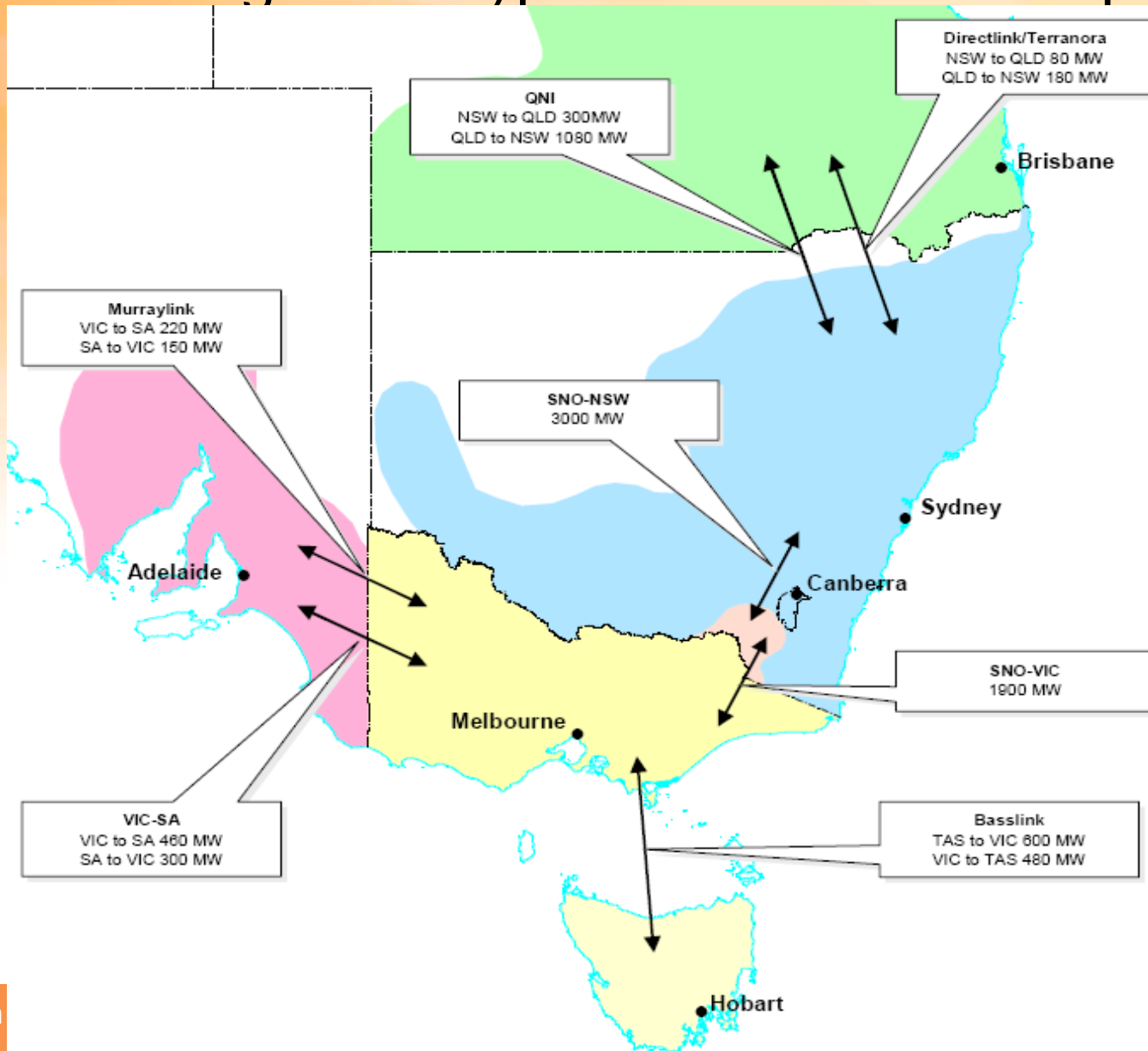


A simplified representation of bids from a 600 MW generating unit that indicates the capacity the generator is willing to offer to the NEM at a range of prices.

(NEMMCO, Market Briefing, 2005)

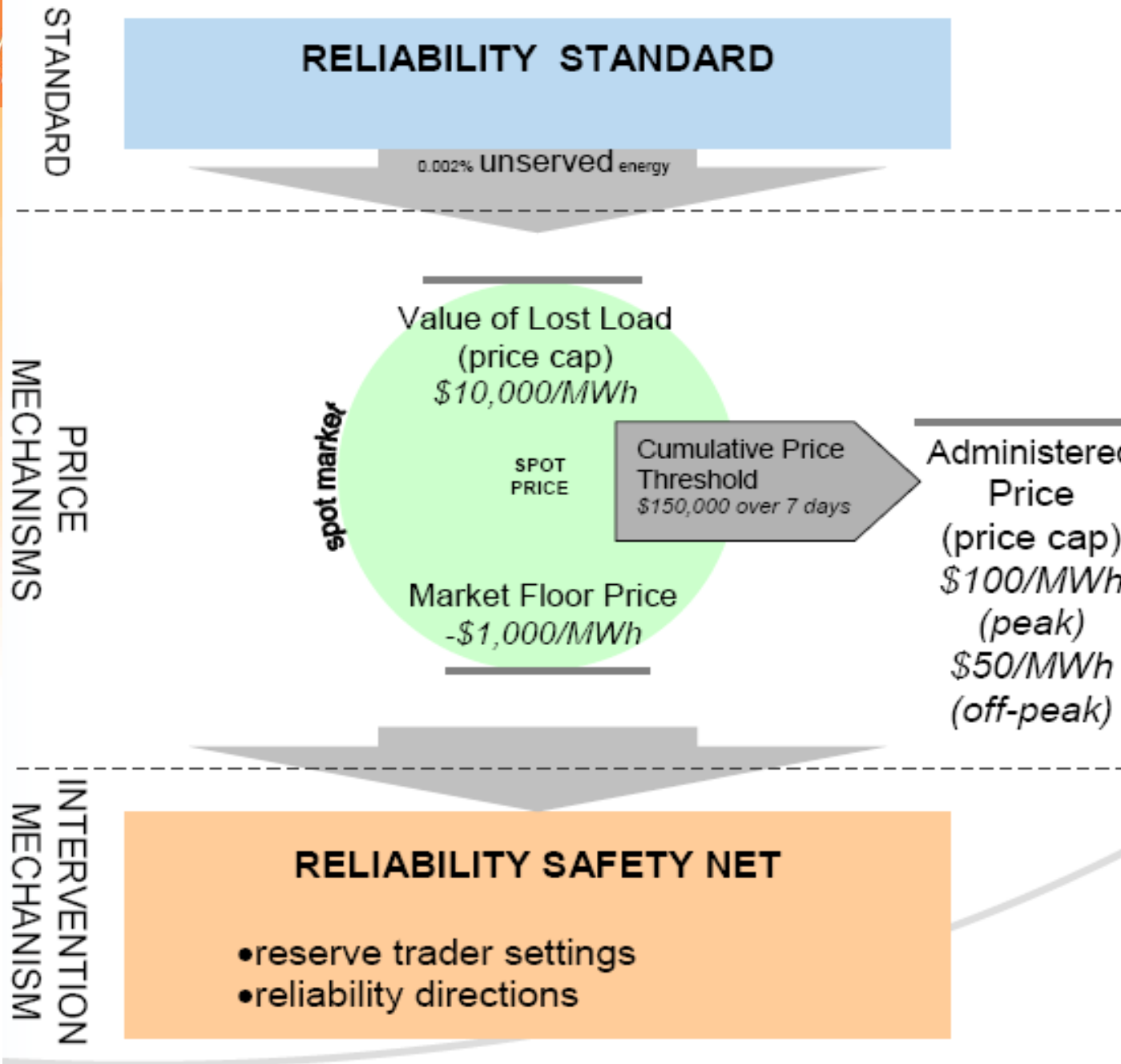
# Present NEM regions + typical interconnect capacities

(NECA, 2008)

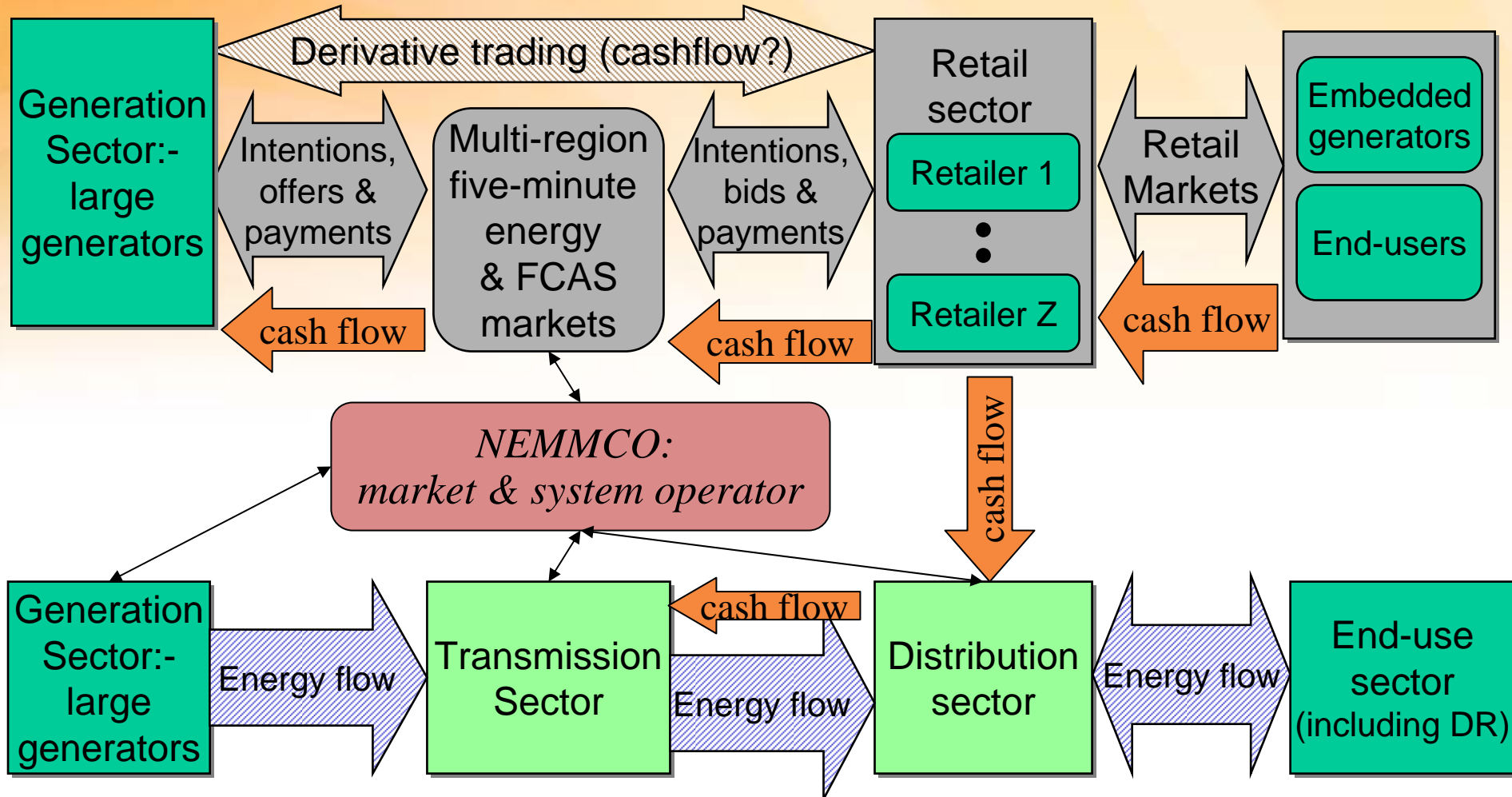




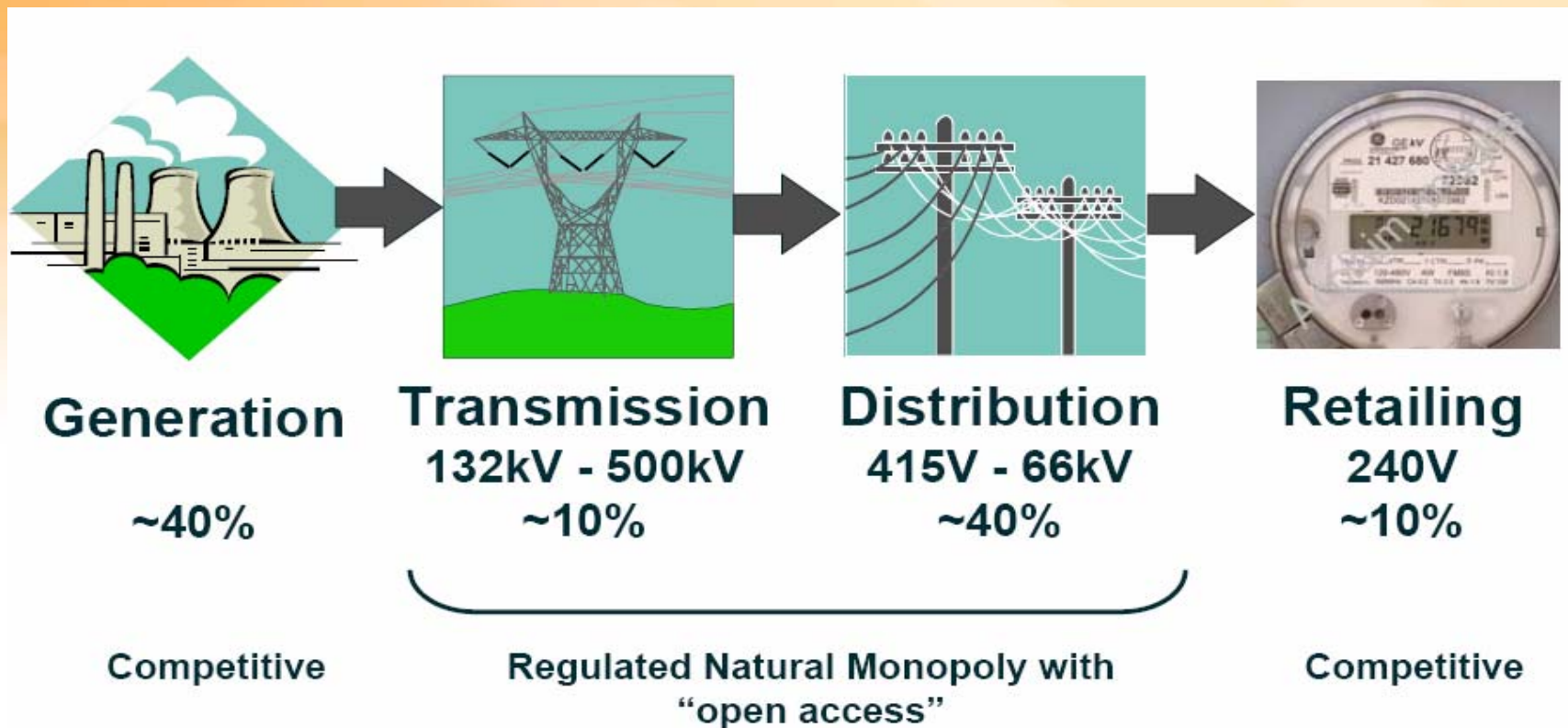
NEM Tx level  
reliability  
target, spot  
market mechs  
& intervention  
to meet it  
(AEMC Reliability  
Review, 2006)



# Industry structure & decision-making in the NEM



# NEM value chain



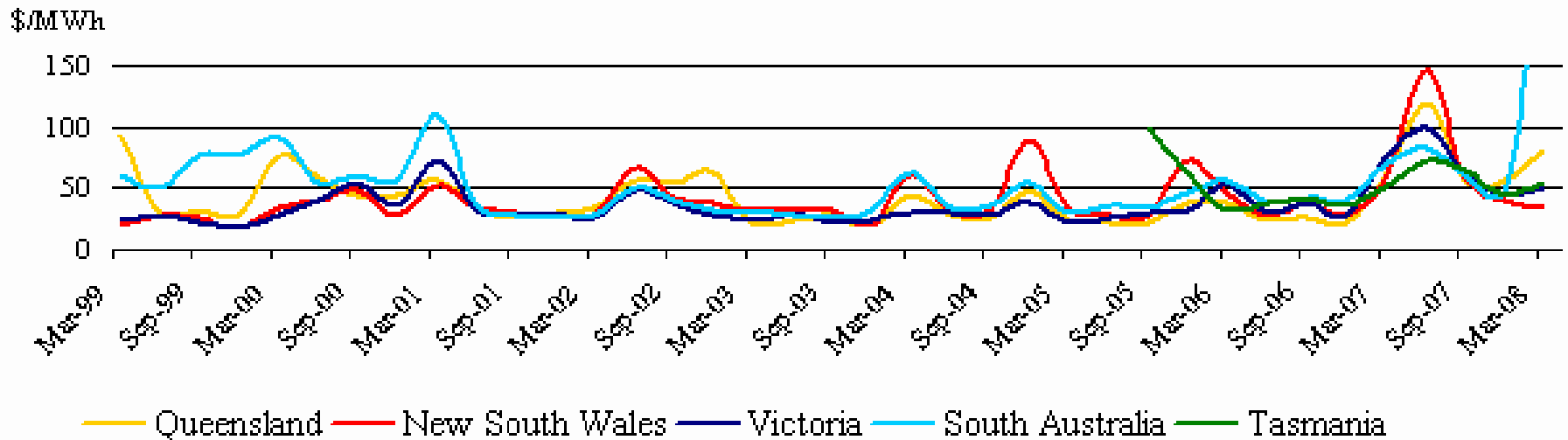
(TRUenergy, *Market Briefing 2006*)

# Governance arrangements

- Council of Australian Governments (COAG):
  - Ministerial Council on Energy (MCE) develops & submits proposals to COAG for approval ([www.coag.gov.au](http://www.coag.gov.au); [www.mce.gov.au](http://www.mce.gov.au))
- Australian Energy Regulator ([www.aer.gov.au](http://www.aer.gov.au)):
  - Monitors energy markets & regulates Network Service Providers
- Australian Energy Market Commission ([www.aemc.gov.au](http://www.aemc.gov.au)):
  - Manages rule change for electricity & gas markets
  - Undertakes investigations for MCE
- **Forthcoming Australian Energy Market Organisation (AEMO) bringing together**
  - **NEMMCO**
  - **A Gas Market Operator**
  - **A National Transmission Planner**



# NEM spot prices (Quarterly volume weighted, [www.aer.gov.au](http://www.aer.gov.au))



Average yearly regional spot price, 2002 to 2008 (\$/MWh)

(NECA, 2008)

Year	NSW	Qld	SA	Snowy	Tas	Vic
2002	40	48	35	36		33
2003	26	23	27	24		23
2004	45	35	42	41		30
2005	36	25	34	28	101	26
2006	31	26	39	31	36	34
2007	67	67	58	64	57	63
2008 (Jan – Feb)	31	88	123	38	52	39

Source: NERA analysis – annual average taken from average daily; NEMMCO data.

## Interconnector capacity and throughput (GWh) (NECA, 2008)

Interconnector	Capacity (MW)	2003/2004	2004/2005	2005/2006
<b><i>New South Wales to Queensland (QNI)</i></b>				
New South Wales to Queensland	589	85	68	64
Queensland to New South Wales	1078	4013	4609	5562
<b><i>New South Wales to Queensland (Terranora)<sup>35</sup></i></b>				
New South Wales to Queensland	30			0
Queensland to New South Wales	234			258
<b><i>New South Wales to Snowy</i></b>				
New South Wales to Snowy	1150	285	240	491
Snowy to New South Wales	3559	3735	4167	3898
<b><i>Victoria to Snowy</i></b>				
Victoria to Snowy	1313	2121	1878	1507
Snowy to Victoria	1842	2200	1800	3048
<b><i>South Australia to Victoria (Heywood)</i></b>				
South Australia to Victoria	300	31	59	38
Victoria to South Australia	460	2502	2170	2325
<b><i>South Australia to Victoria (Murraylink)</i></b>				
South Australia to Victoria	214	72	44	32
Victoria to South Australia	220	222	310	276
<b><i>Tasmania to Victoria (Basslink)<sup>36</sup></i></b>				
Tasmania to Victoria	600			152
Victoria to Tasmania	480			133

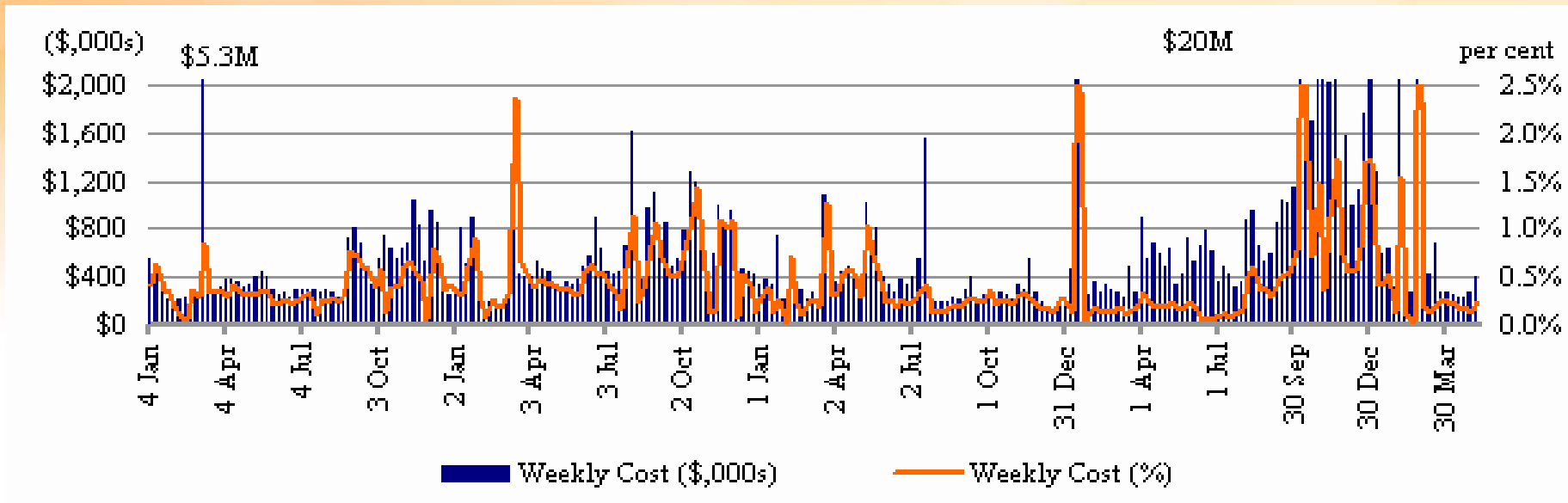
Source: Australian Electricity Market Study 2020 Outlook (2007), Core Collaborative, p.7-7 and Electricity Gas Australia (2007), ESAA

## Hours of system normal binding constraints (NECA, 2008)

<b>Interconnector</b>	<b>Avg limit when constrained (MW)</b>	<b>Hours of constrained flow</b>
<i><b>New South Wales to Queensland (QNI)</b></i>		
New South Wales to Queensland	372	19
Queensland to New South Wales	1037	162
<i><b>New South Wales to Queensland (Terranora)</b></i>		
New South Wales to Queensland	-81	28
Queensland to New South Wales	186	19
<i><b>New South Wales to Snowy</b></i>		
New South Wales to Snowy	-195	24
Snowy to New South Wales	2336	37
<i><b>Victoria to Snowy</b></i>		
Victoria to Snowy	772	8
Snowy to Victoria	1314	50
<i><b>South Australia to Victoria (Heywood)</b></i>		
South Australia to Victoria	291	12
Victoria to South Australia	451	273
<i><b>South Australia to Victoria (Murraylink)</b></i>		
South Australia to Victoria	-6	21
Victoria to South Australia	175	24
<i><b>Tasmania to Victoria (Basslink)</b></i>		
Tasmania to Victoria	-118	52
Victoria to Tasmania	-120	134

# NEM frequency control ancillary services prices

(Quarterly volume weighted, [www.aer.gov.au](http://www.aer.gov.au))

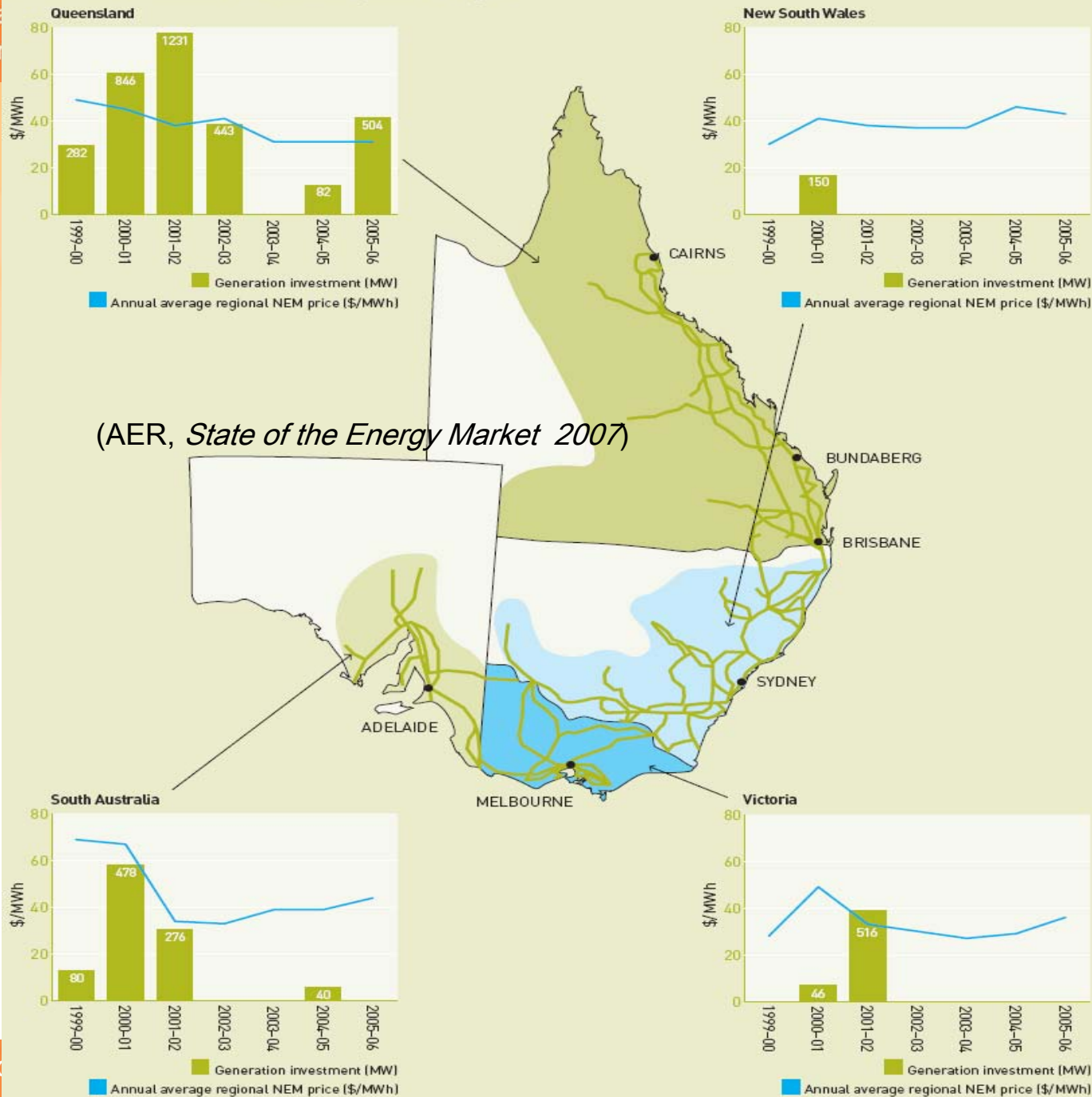




# New generation investment

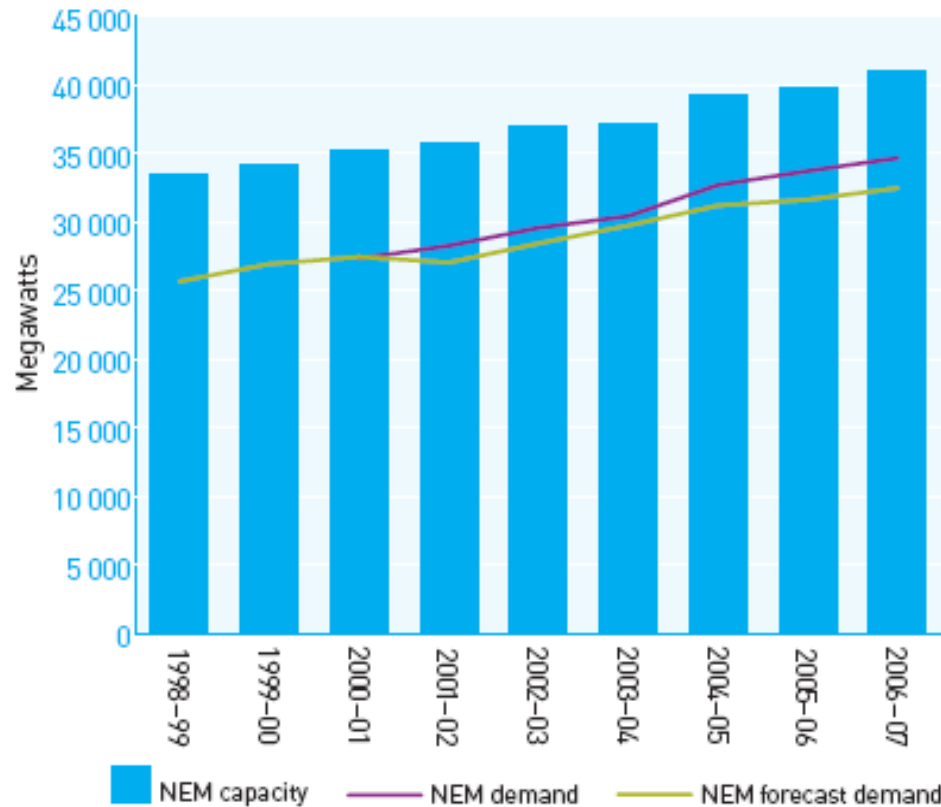
Figure A.5

Generation investment and electricity prices by region

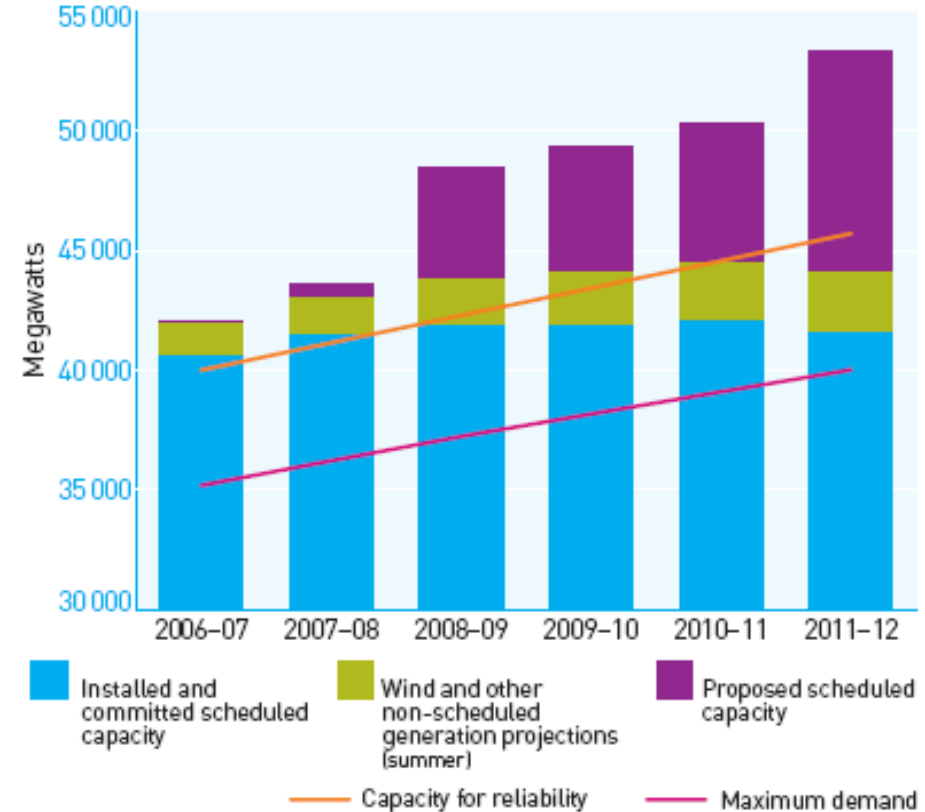


# NEM demand vs capacity – past & projected

**Figure 1.12**  
NEM peak demand and generation capacity



**Figure 1.13**  
Demand and capacity outlook to 2011-12



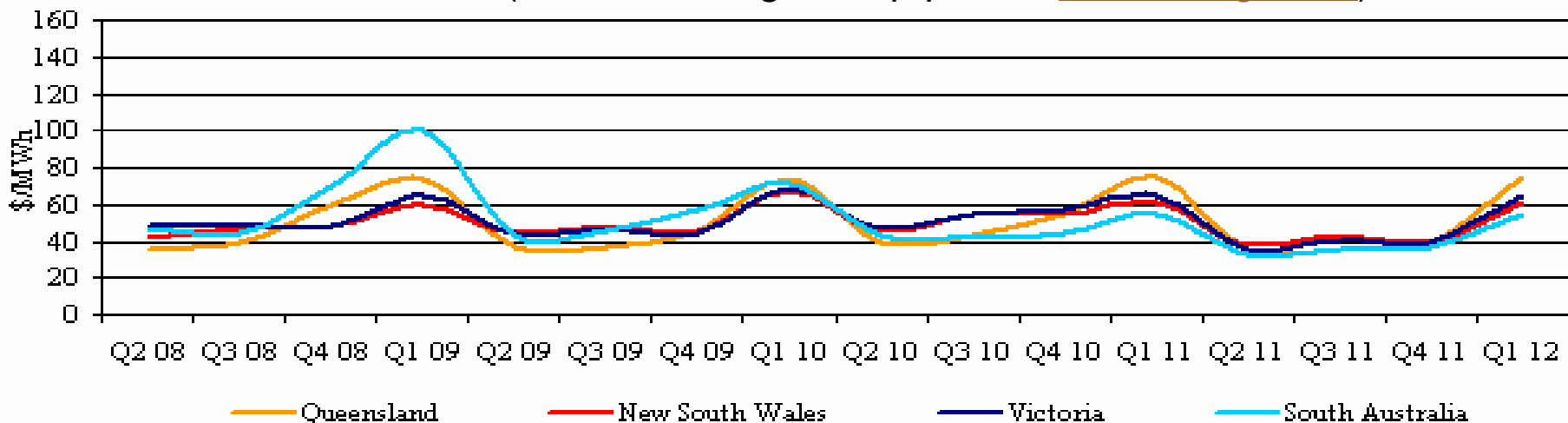
(AER, *State of the Energy Market 2007*)

# Recent developments

- Evolving derivative markets
- Energy constraints in hydro & thermal plant due to drought
- Renewed focus on retail markets
- Some progress with emerging gas market(s)
- Structural reaggregation of retailing & generation by private 'gentailers'
- New challenges for integration of variable & somewhat unpredictable renewable energy
- Forthcoming emissions trading
- Proposed privatisation of state-owned NSW retailers + generators

# NEM derivative markets

(Base exchange swap prices, [www.aer.gov.au](http://www.aer.gov.au))



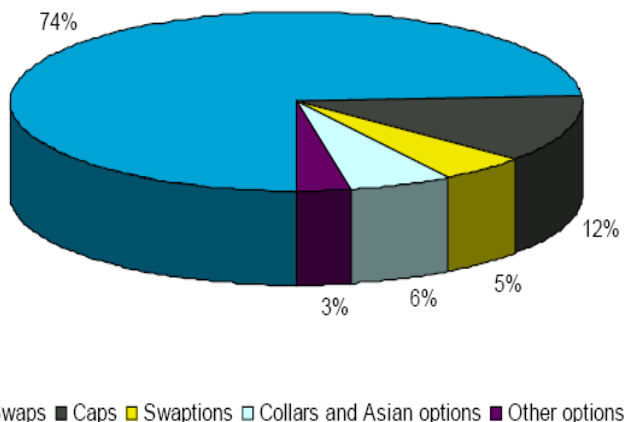
OTC instruments<sup>189</sup>

## NEM Demand vs trading volume<sup>203</sup>

(NECA, 2008)

	2003/04	2004/05	2005/06
SFE & Broker volume (TWh)	122.8	144.1	157.9
Total NEM demand (TWh)	184.4	186.7	187.9
NSW NEM demand	73.7	74.4	75.1
ETEF as % NSW NEM demand	30%	26%	24%
ETEF demand (TWh)	22.1	19.4	18.0
SFE & Broker volume % of Total NEM demand	67%	77%	84%

Source: NGF and ERAA.

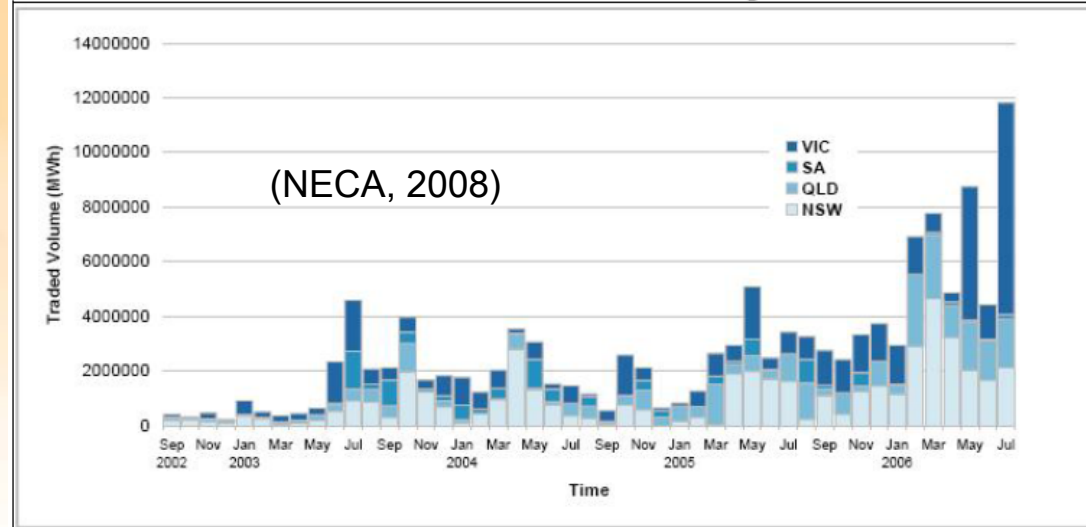




# Derivative markets

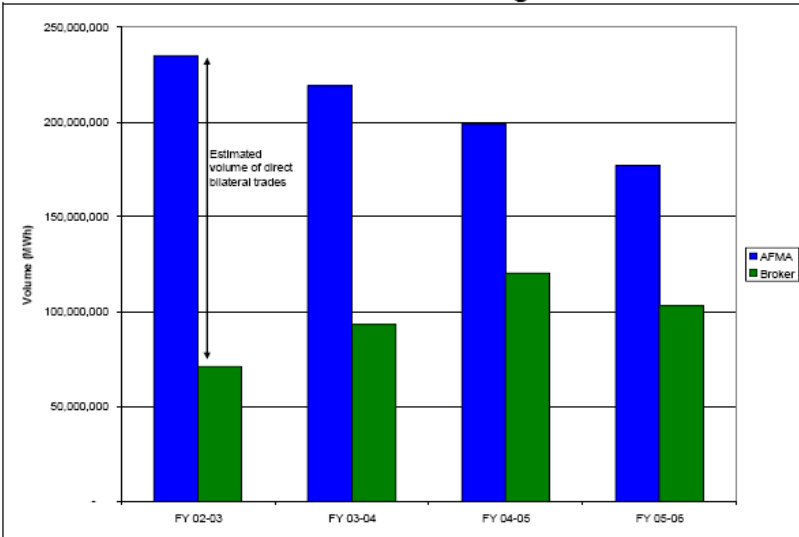
- Increasing activity, particularly exchange traded
- Sufficient for risk management in some states but more liquidity desirable
- Little liquidity beyond 3 years – investment?
  - (ERIG, 2006)

Volume of derivatives traded through SFE



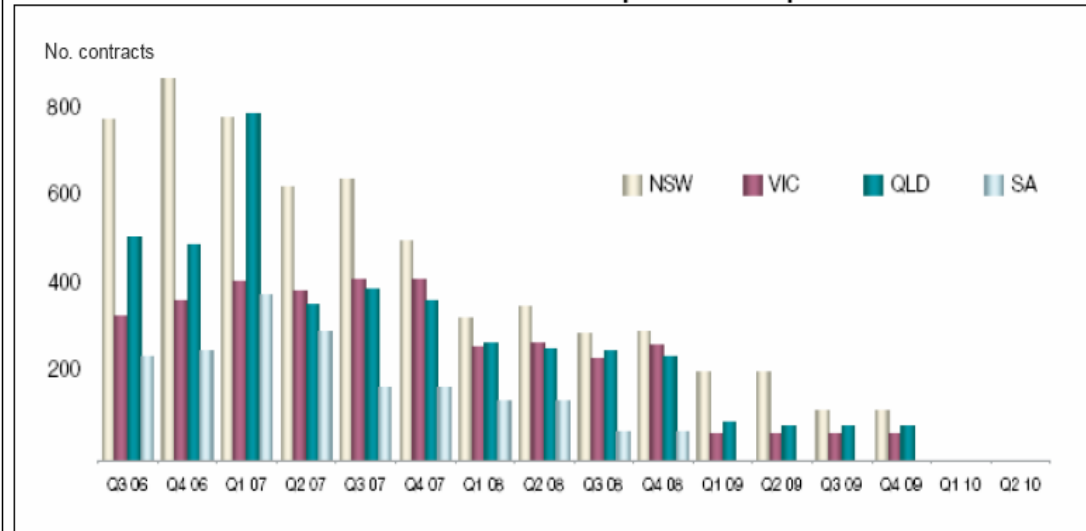
Source: NGF and ERAA.

Estimated derivative trading volumes

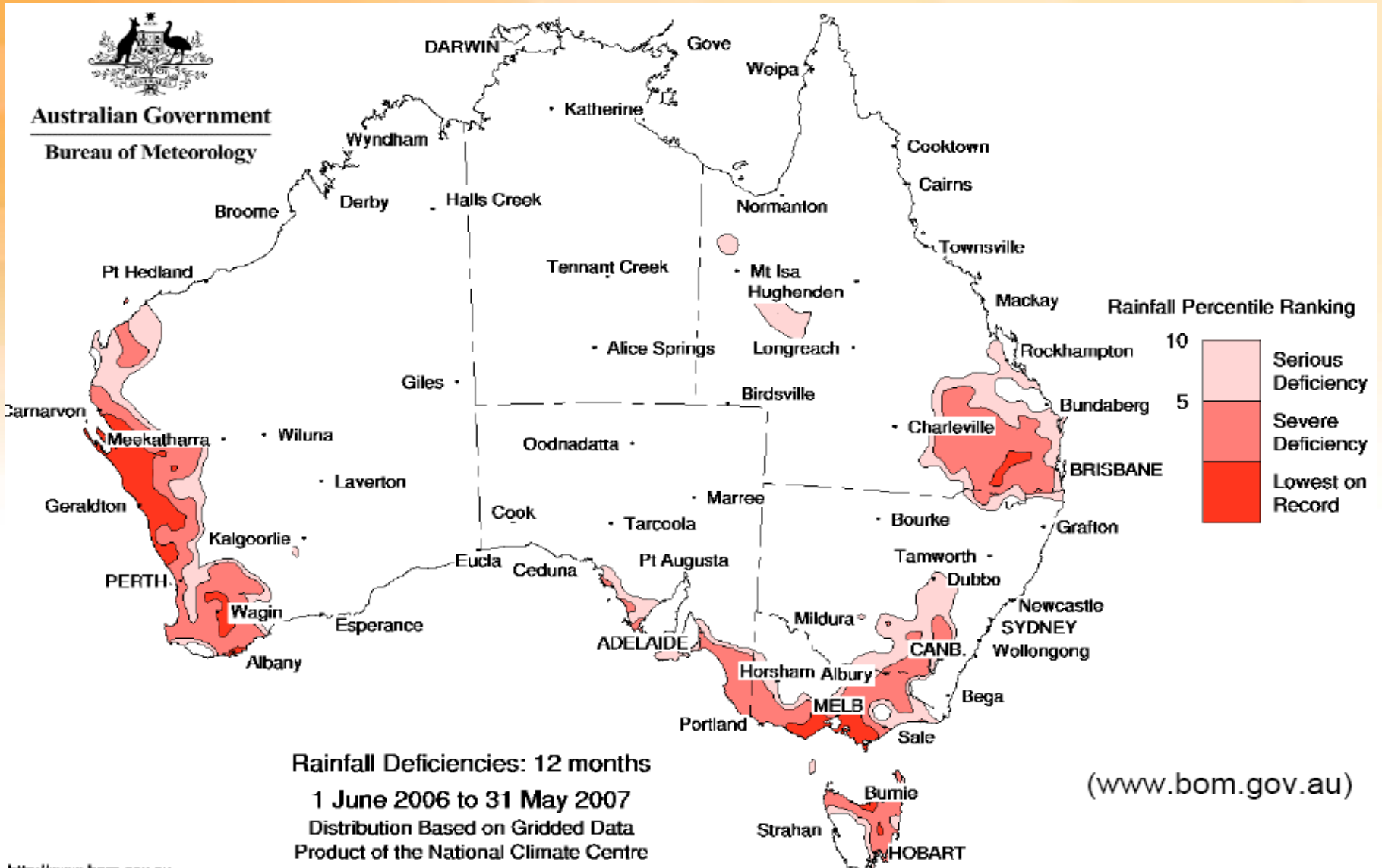


Source: AFMA.

Volume of futures contract open at 25 Sep 2006

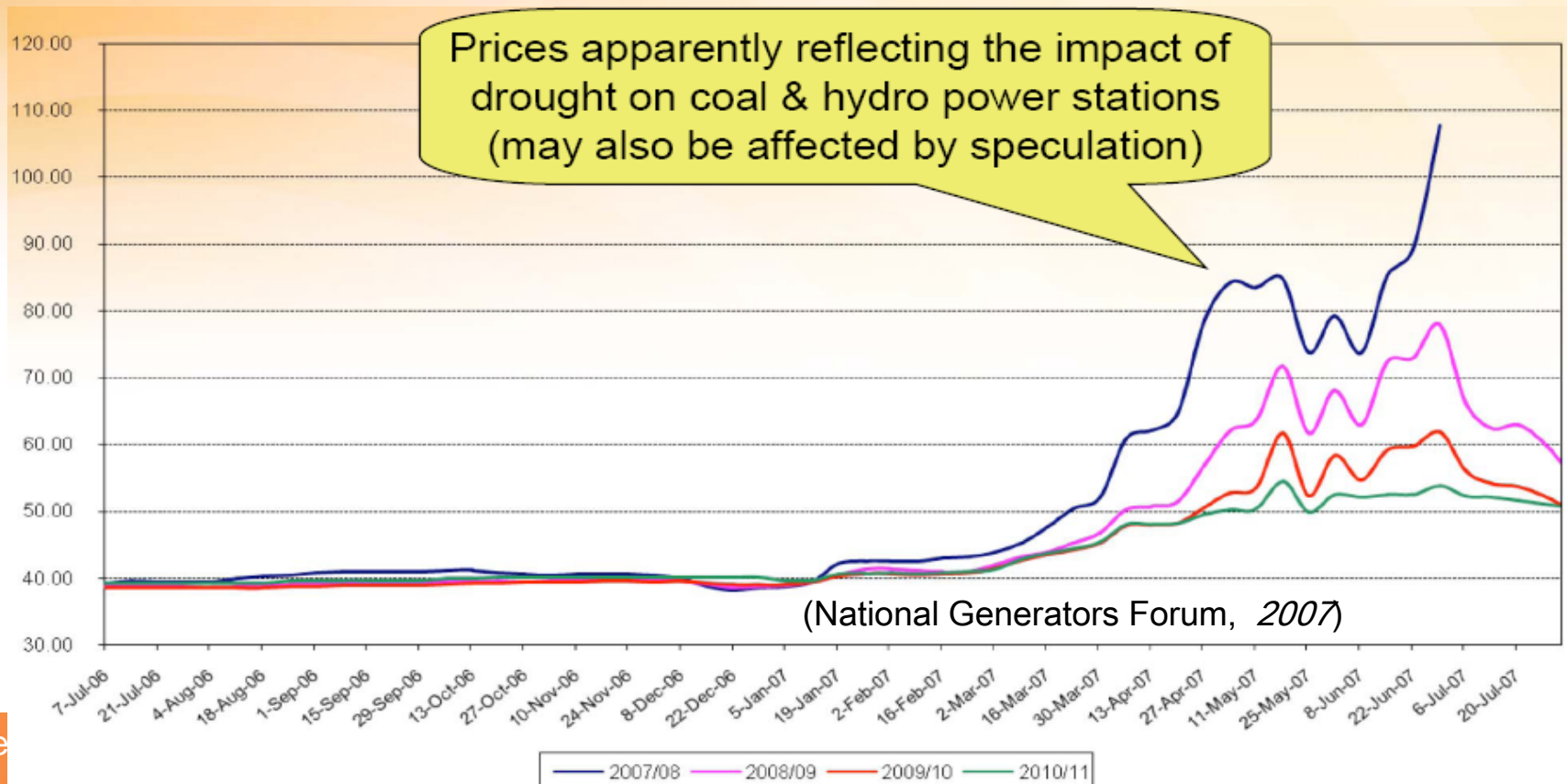


Source: ERIG.



# Managing potential energy constraints

- Derivative mkts responded to drought however little foresight
- Current PASA projects capacity, not energy constraints
  - eg. Hydro, cooling water for thermal plant
  - NEMMCO to now provide energy adequacy projections



# Present retail market design in Australia

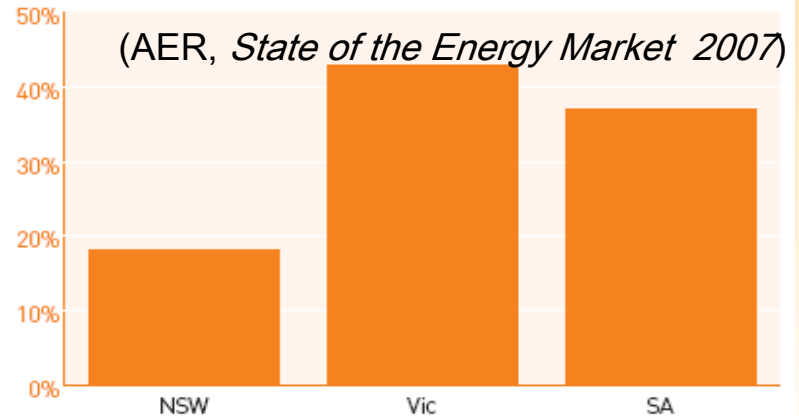
- Retail market design for large end-users:
  - Competitive retail market (not yet mature)
  - Regulated network pricing (not yet mature)
- Retail market design for small end-users:
  - Regulated or partially competitive retail market
  - Simplified tariff structure; immature metering; profiling
  - Network charges usually passed through retailer
  - Little support for informed end-user decision making
- Some social policy objectives internalised
- Some environmental objectives internalised
- Limited opportunities for embedded generation

# Typical measures of competition

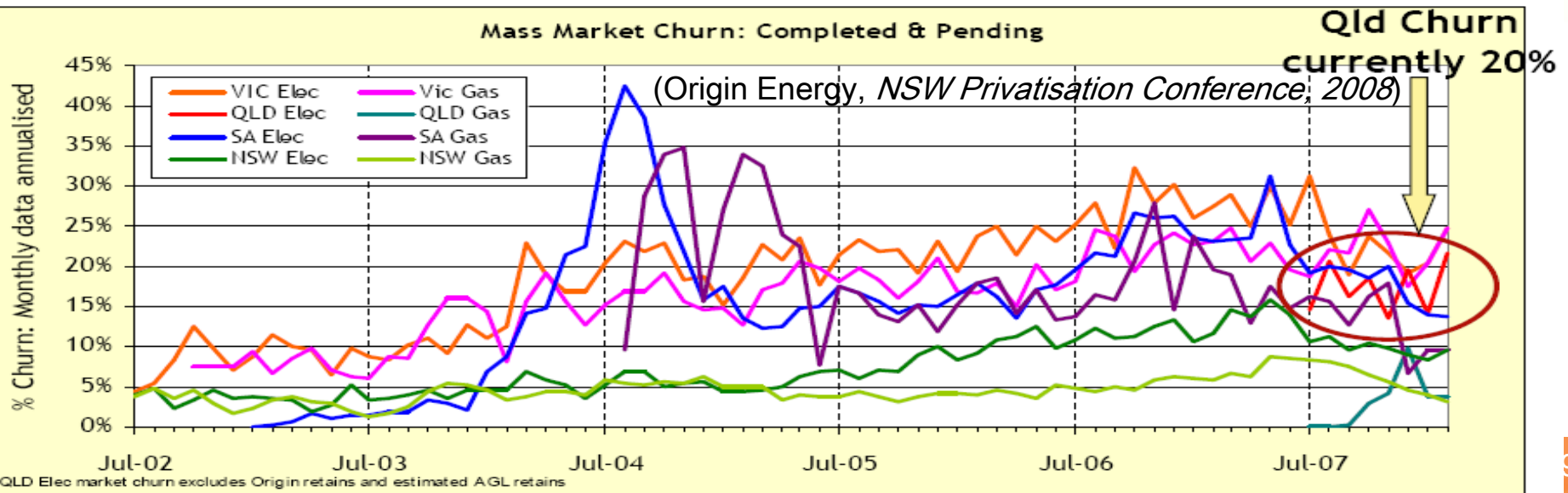
- Retail transfers?
  - Data limitations, relevance
- Price spreads?
  - Can mean competition, or mkt failure
- .... an important reason there is effective competition ... is “Because the provision of energy is viewed as a homogenous, low engagement service... “ AEMC, *Effectiveness of Competition in Vic.*, 2008

Figure 6.9

Customers not with their host retailer at 31 December 2006—New South Wales, Victoria and South Australia

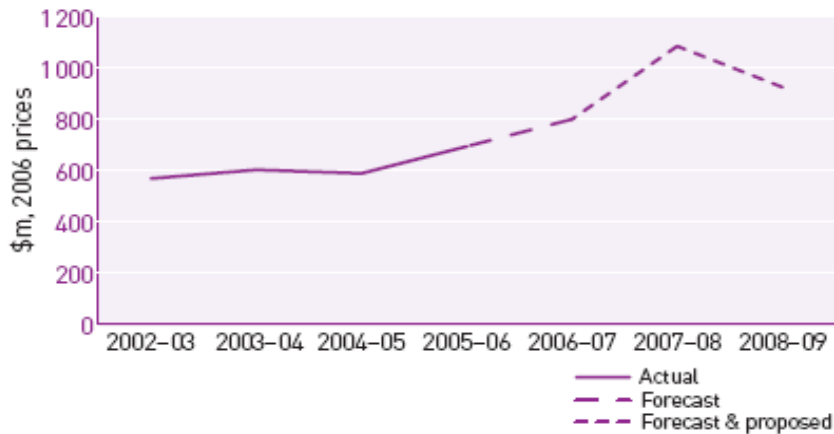


Sources for table 6.5 and figures 6.8–9:



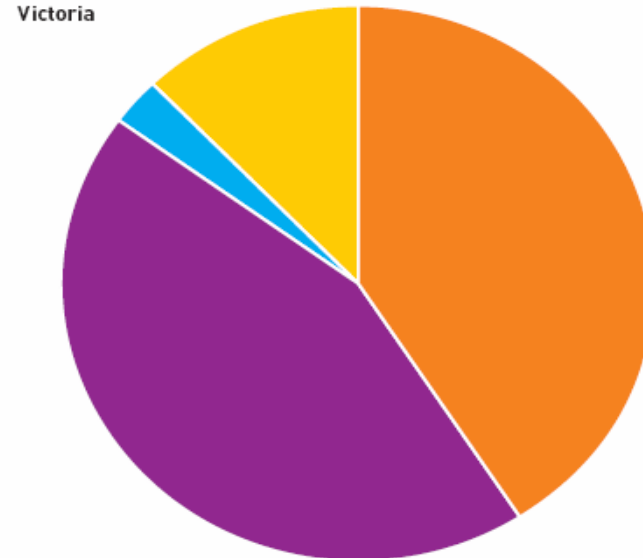
# Load growth + hence network investment

**Figure 4.9**  
NEM-wide transmission investment



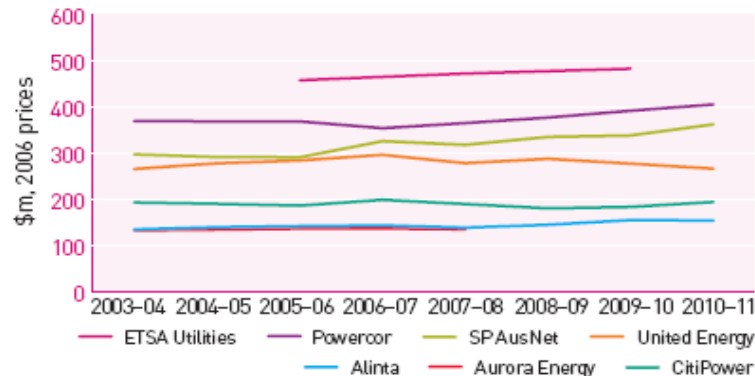
(AER, *State of the Energy Market 2007*)

**Figure 6.13**  
Composition of a residential electricity bill  
Victoria

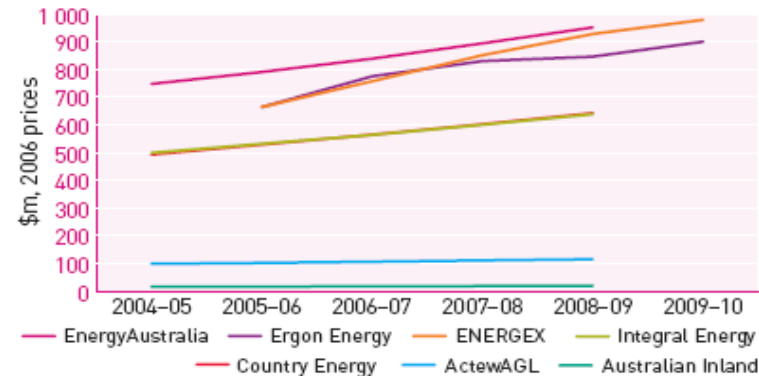


Wholesale electricity costs 41%    Network costs 44%  
NEMMCO charges 3%    Retail operating costs 12%

**Figure 5.3a**  
Allowed revenues — Victoria, South Australia and Tasmania



**Figure 5.3**  
Allowed revenues — New South Wales, the Australian Capital Territory and Queensland



# Current developments

- **Advanced Metering Infrastructure (AMI) rollout**
  - Including 2-way communications, direct load control options, quality of supply measurement, DG connection support
- **Network investment**
  - Arrangements to test augmentation options against possible DE options
- **Forthcoming removal of retail price regulation**
  - Subject to jurisdictions and likely sequentially

# Immature gas markets

- Questions of long-term reserves for NEM however major CSM coming on line
- Little transparency in gas prices – most traded via confidential long-term contracts
- New gas gen raising challenges
  - Scale & peakiness with OCGT

Figure 2.3: Composition of gas demand

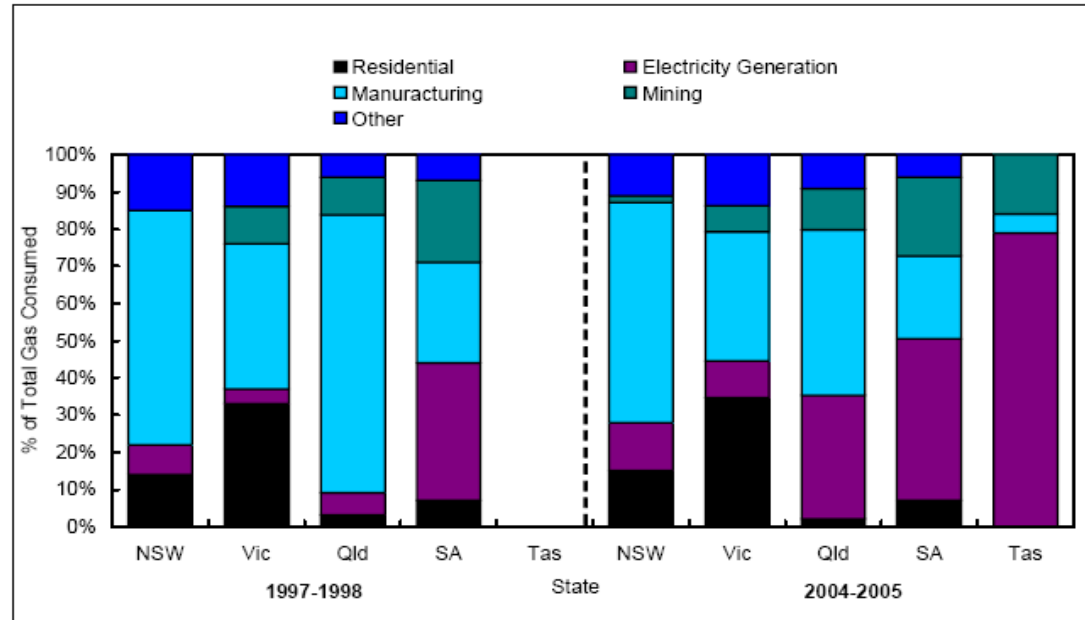
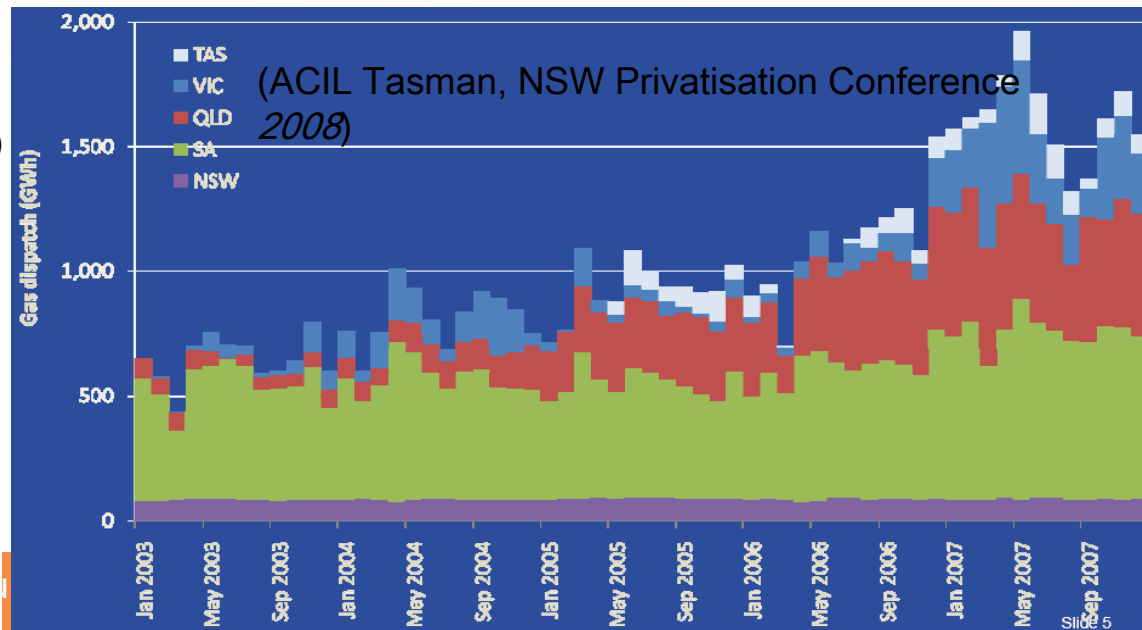
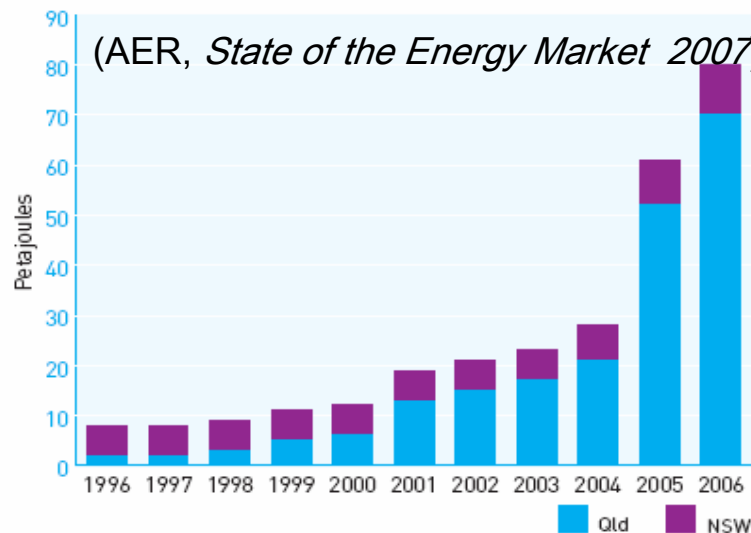


Figure 8.5  
Coal seam methane production 1996–2006





# Some cost estimates for the NEM



(Acil Tasman, *Report for NEMMCO, 2007*)

Description	Black Coal Fired in Queensland	Black Coal Fired in NSW	Brown Coal Fired in Victoria	Combined Cycle Gas in Queensland	Combined Cycle Gas in Victoria	Combined Cycle Gas in NSW	Combined Cycle Gas in SA	Open Cycle Gas with 5% Capacity factor	Open Cycle Gas with 10% Capacity factor
	Underlying Assumptions								
Installed capacity (MW)	450	500	500	385	385	385	385	100	100
Electricity Sent out (GWh)	3099	3241	3646	2304	2304	2304	2469	44	87
Auxiliary Requirements	7.5%	7.5%	7.5%	2.4%	2.4%	2.4%	2.4%	0.5%	0.5%
Capacity factor	85%	80%	90%	70%	70%	70%	75%	5%	10%
Total Capital Cost (\$million)	\$630	\$700	\$900	\$385	\$385	\$385	\$385	\$50	\$50
Heat Rate (MJ/MWh sent out)	8999	8999	12856	7346	7346	7346	7346	12413	12413
Cost of Fuel (\$/GJ)	\$0.75	\$1.00	\$0.38	\$2.90	\$3.15	\$3.20	\$3.55	\$5.00	\$5.00
O&M (\$m / year)	\$20	\$21	\$25	\$14	\$14	\$14	\$14	\$1	\$1
Economic Life (years)	30	30	30	30	30	30	30	30	30
WACC (real post-tax)	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
	Summary of Average Life Cycle Costs								
Fuel costs (\$/MWhr sent out)	\$6.78	\$9.03	\$4.87	\$21.30	\$23.14	\$23.51	\$26.08	\$62.06	\$62.06
O&M costs (\$/MWhr sent out)	\$6.58	\$6.44	\$6.80	\$6.28	\$6.28	\$6.28	\$5.86	\$22.91	\$15.46
Capital costs (\$/MWhr sent out)	\$15.77	\$16.75	\$19.15	\$12.58	\$12.58	\$12.58	\$11.74	\$86.35	\$43.17
Tax costs (\$/MWhr sent out)	\$2.29	\$2.43	\$2.78	\$1.77	\$1.77	\$1.77	\$1.65	\$12.14	\$6.07
<b>Total Cost (\$/MWh sent out)</b>	<b>\$31.42</b>	<b>\$34.66</b>	<b>\$33.60</b>	<b>\$41.93</b>	<b>\$43.77</b>	<b>\$44.14</b>	<b>\$45.33</b>	<b>\$183.47</b>	<b>\$126.77</b>

# However, CSM may be changing the game

- Have also seen significant increases in estimated coal plant costs – worldwide phenomenon

(Acil Tasman, *NSW Privatisation Conference, 2008*)

<u>Well-head CCGT</u>	<u>Supercritical Coal</u>
CCGT capital cost: \$1,000-\$1,200/kW CSG field capex: \$500-\$700/kW Total capex: \$1,500-\$1,900/kW	Capital cost: \$1,800-\$2,000/kW
CSG operating costs: ~\$0.80-\$1.20/GJ	Coal costs: \$0.80-\$1.50/GJ
Sent-out efficiency (HHV): 46% - 52%	Sent-out efficiency (HHV): 38% - 42%
	
SRMC < \$10/MWh LRMC < \$40/MWh	SRMC > \$12/MWh LRMC > \$55/MWh

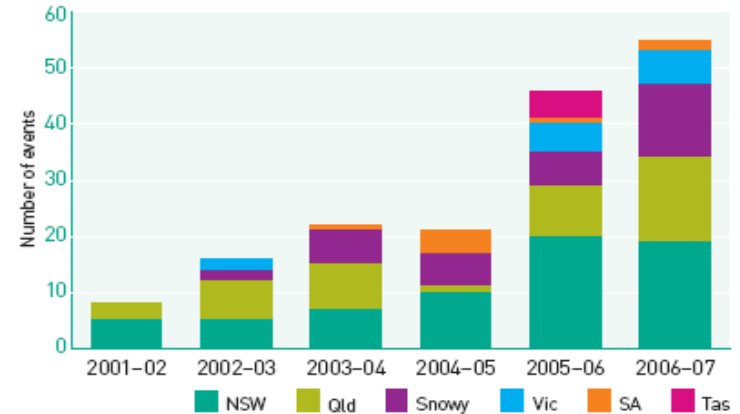
(AER, *State of the Energy Market 2007*)

# Structural & potential market power challenges

- Emerging trio of major gentailers
- Possible privatisation of NSW Govt. retailers & generators

Figure 2.11

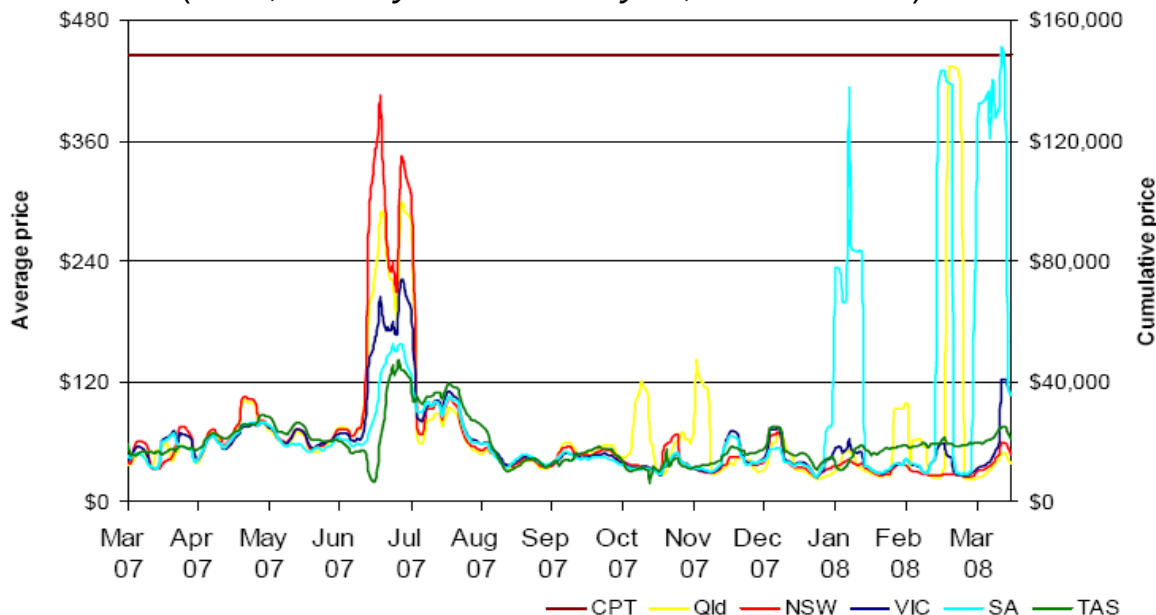
Number of price intervals above \$5000 a MWh



Data source: NEMMCO

Figure 2: 7 day rolling cumulative price and CPT

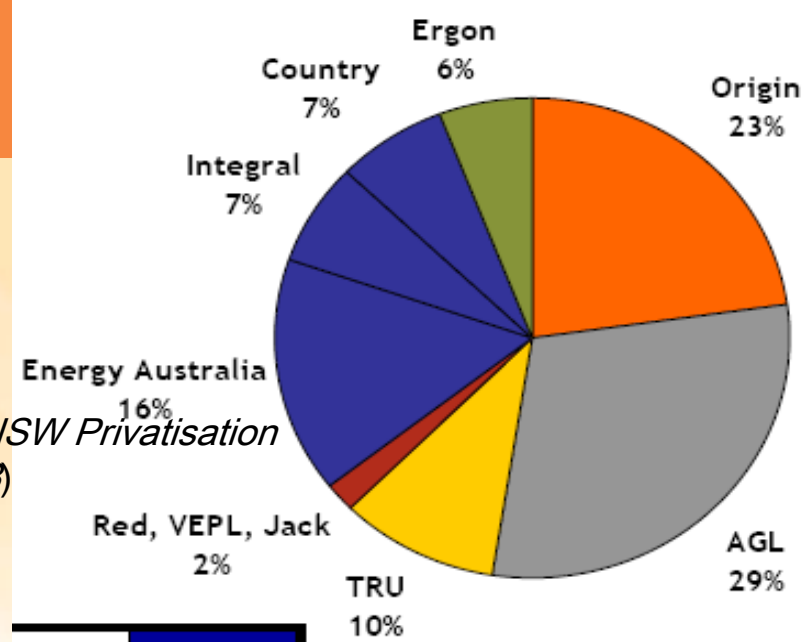
(AER, *Weekly Market Analysis, March 2007*)





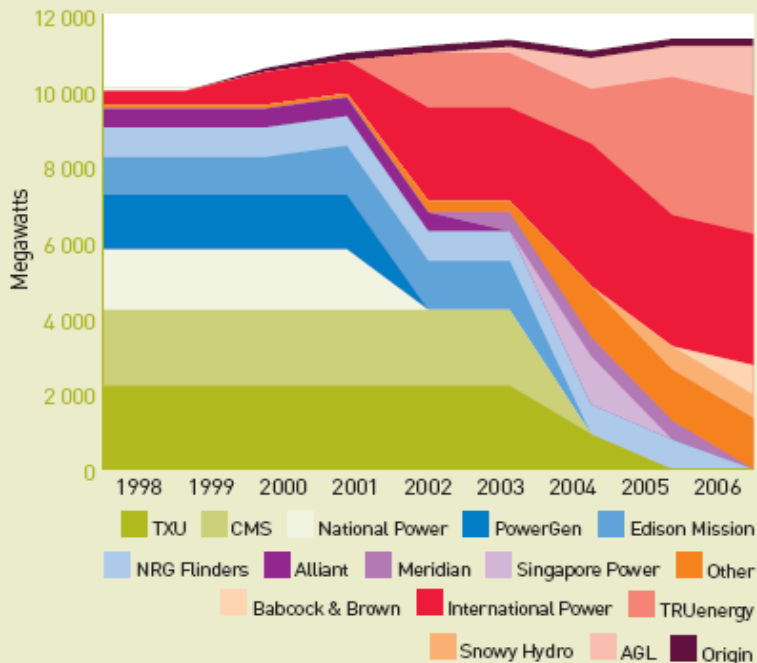
# Ownership changing rapidly

(Origin Energy, *NSW Privatisation Conference 2008*)

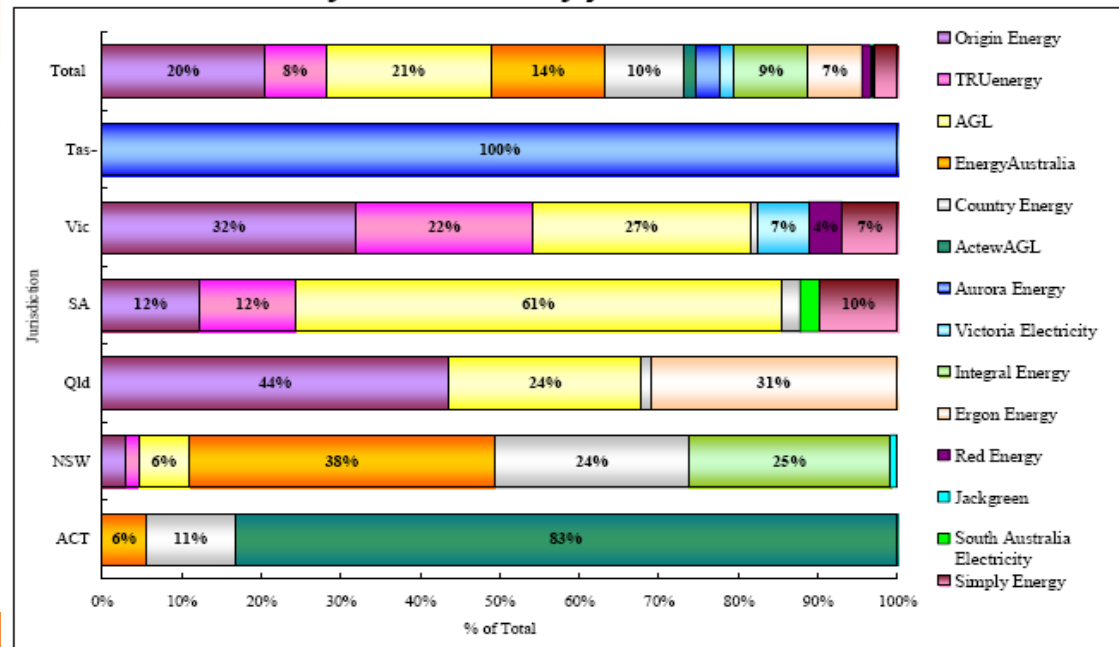


(AER, *State of the Energy Market 2007*)

Generation ownership in South Australia and Victoria by installed capacity to 2006



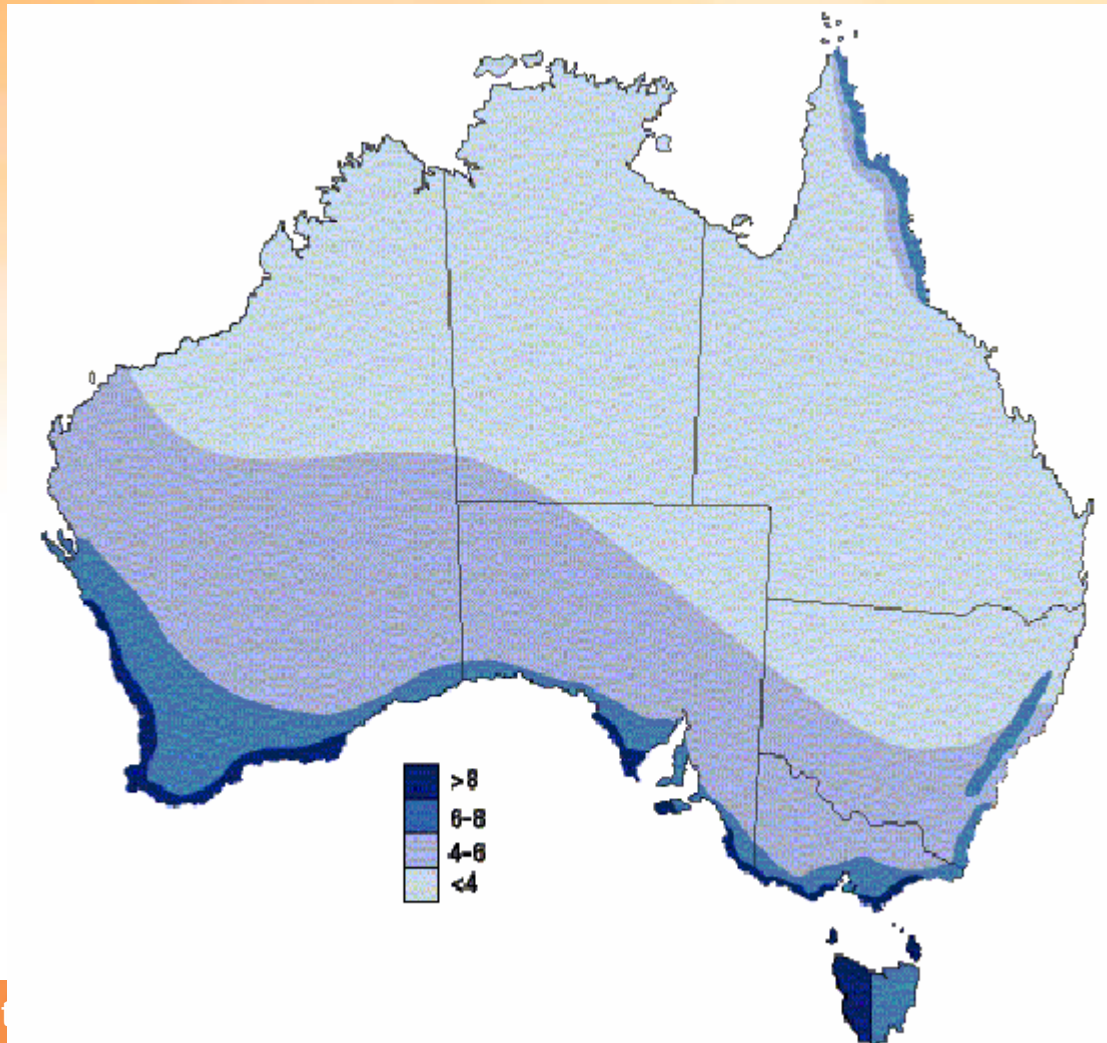
Electricity customers by jurisdiction and retailer



Source: UBS, Australian utilities structure 2007 (numbers may not add due to rounding).

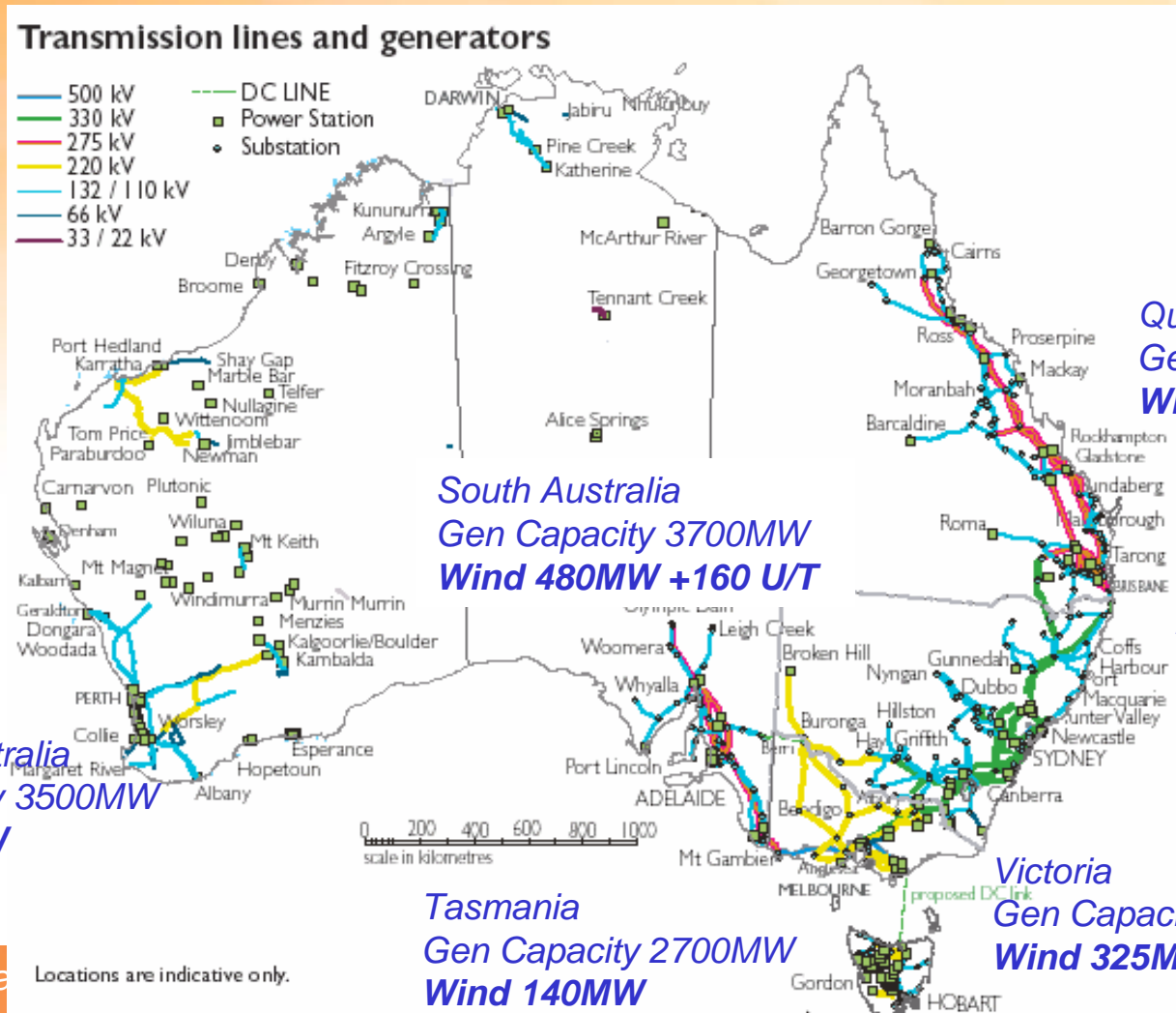
# The Australian wind resource

(Simple estimates of background wind – Australian Greenhouse Office)



# Current status of Australian wind generation

Recent estimates of state average load, total installed generation capacity and wind installed or under construction (ausWEA, ESAA)



*Queensland*  
Gen Capacity 11,300MW  
Wind 12MW

*South Australia*  
Gen Capacity 3700MW  
Wind 480MW +160 U/T

*New South Wales*  
Gen Capacity 12,500MW  
Wind 17MW

*Western Australia*  
Gen Capacity 3500MW  
Wind 200MW

*Tasmania*  
Gen Capacity 2700MW  
Wind 140MW

*Victoria*  
Gen Capacity 8800MW  
Wind 325MW +165 U/T

Locations are indicative only.

# Mandatory Renewable Energy Target

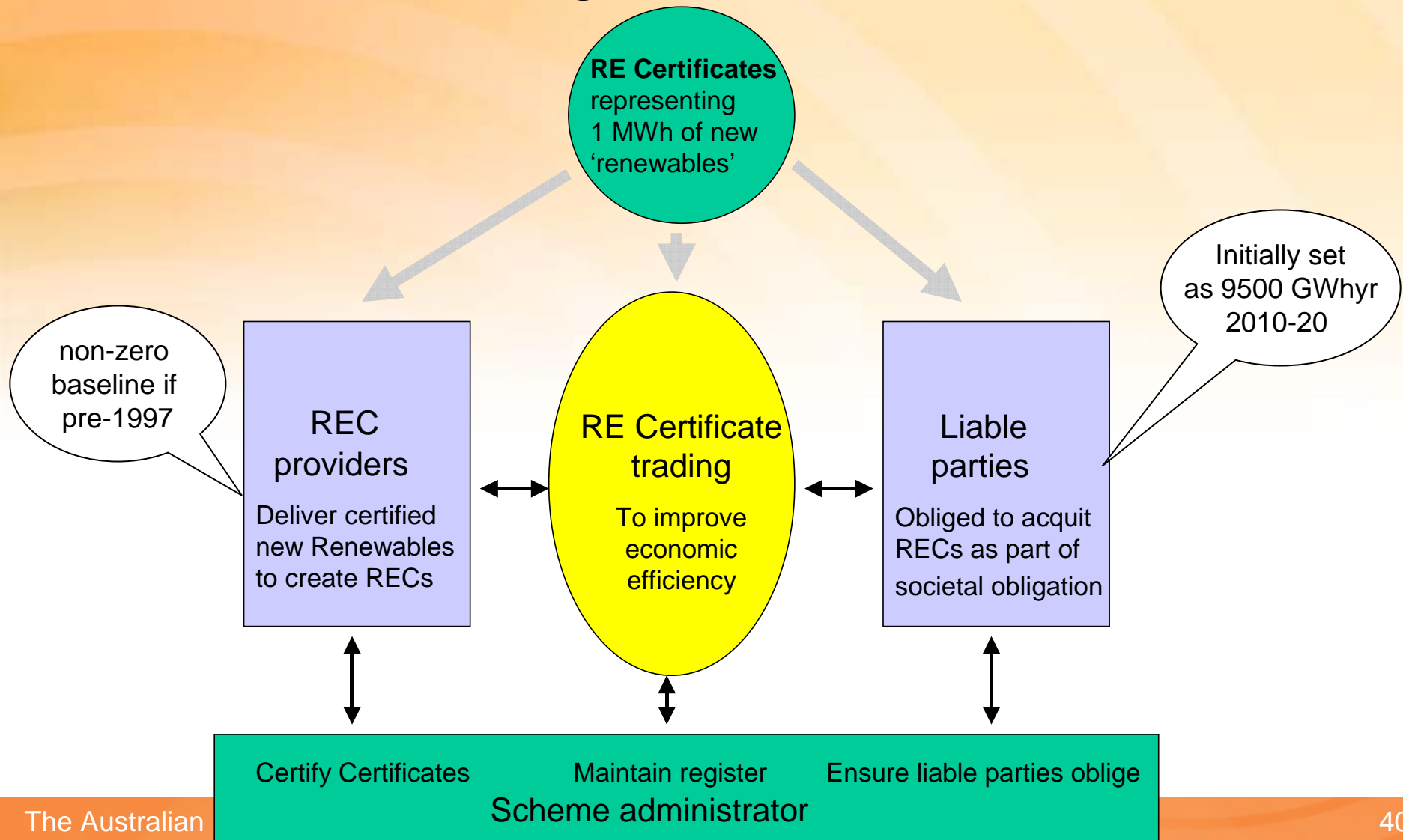


## Renewable Energy (Electricity) Act 2000

The objects of this Act are:

- (a) to encourage the additional generation of electricity from renewable sources; and
- (b) to reduce emissions of greenhouse gases; and
- (c) to ensure that renewable energy sources are ecologically sustainable.

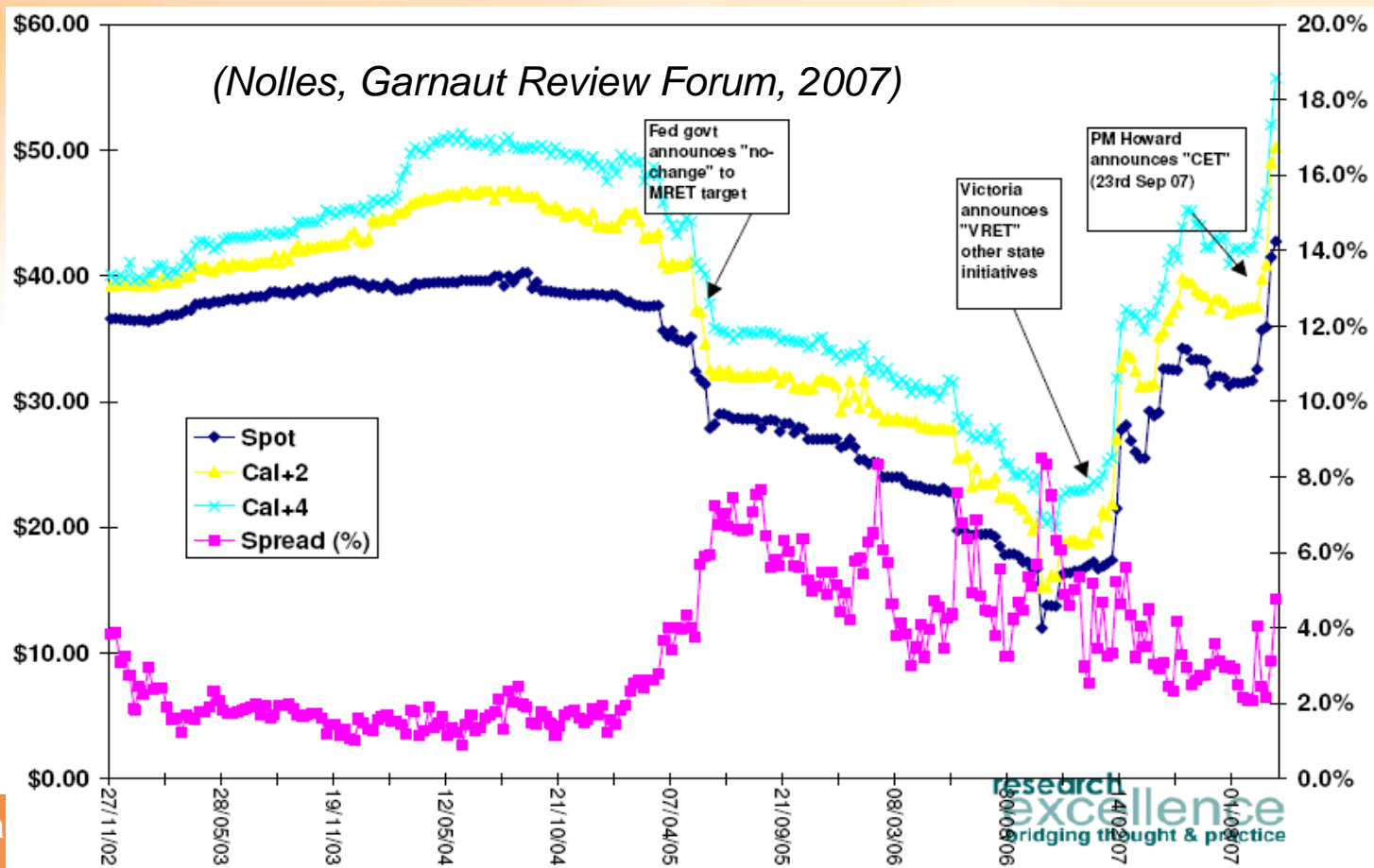
# MRET – a ‘designer’ market





# The REC market

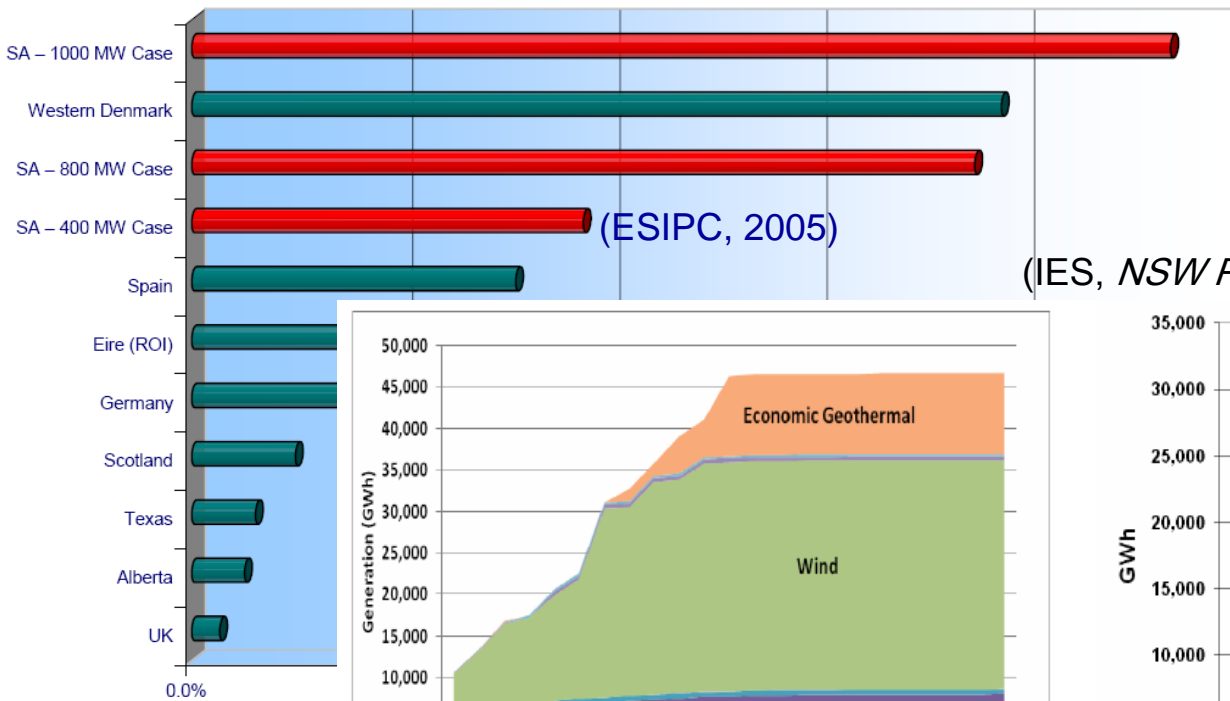
- Little liquidity (+ hence price discovery) for forward prices through trading
  - Most projects financed via PPAs or other direct contracts
- Prices vulnerable to regulatory change
  - => *potential challenges in driving investment & industry development*



# Now, wind penetrations set to rise significantly

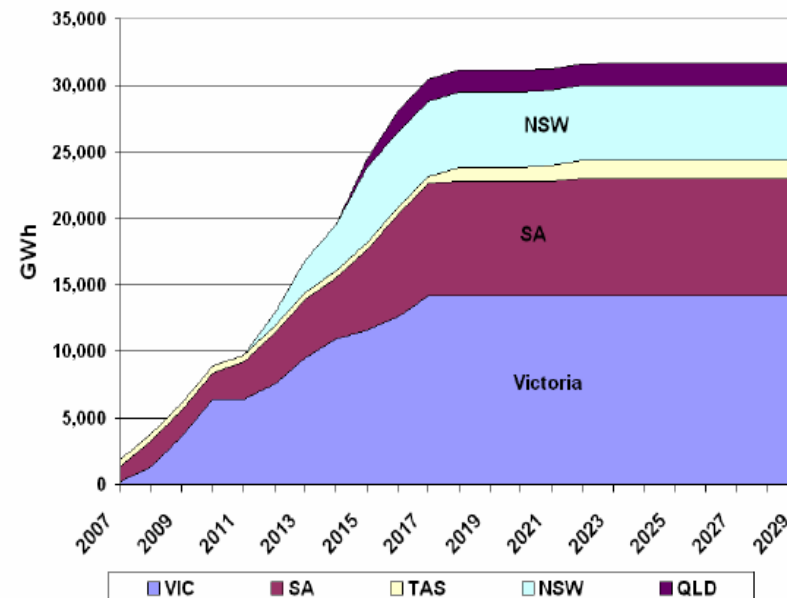
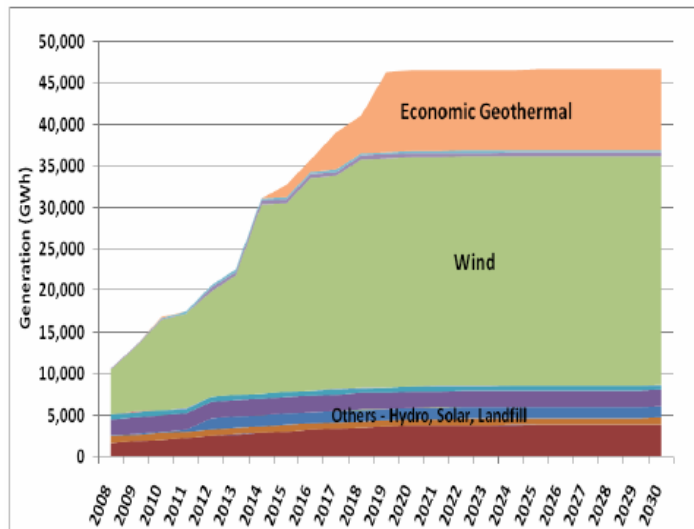
- New Renewable Target of 20% by 2020 might see 10GW of wind
  - Note that scheme expansion rules still to be finalised
  - Possible very high penetrations in SA + Vic; a major challenge for NEM

Wind Penetration by Energy



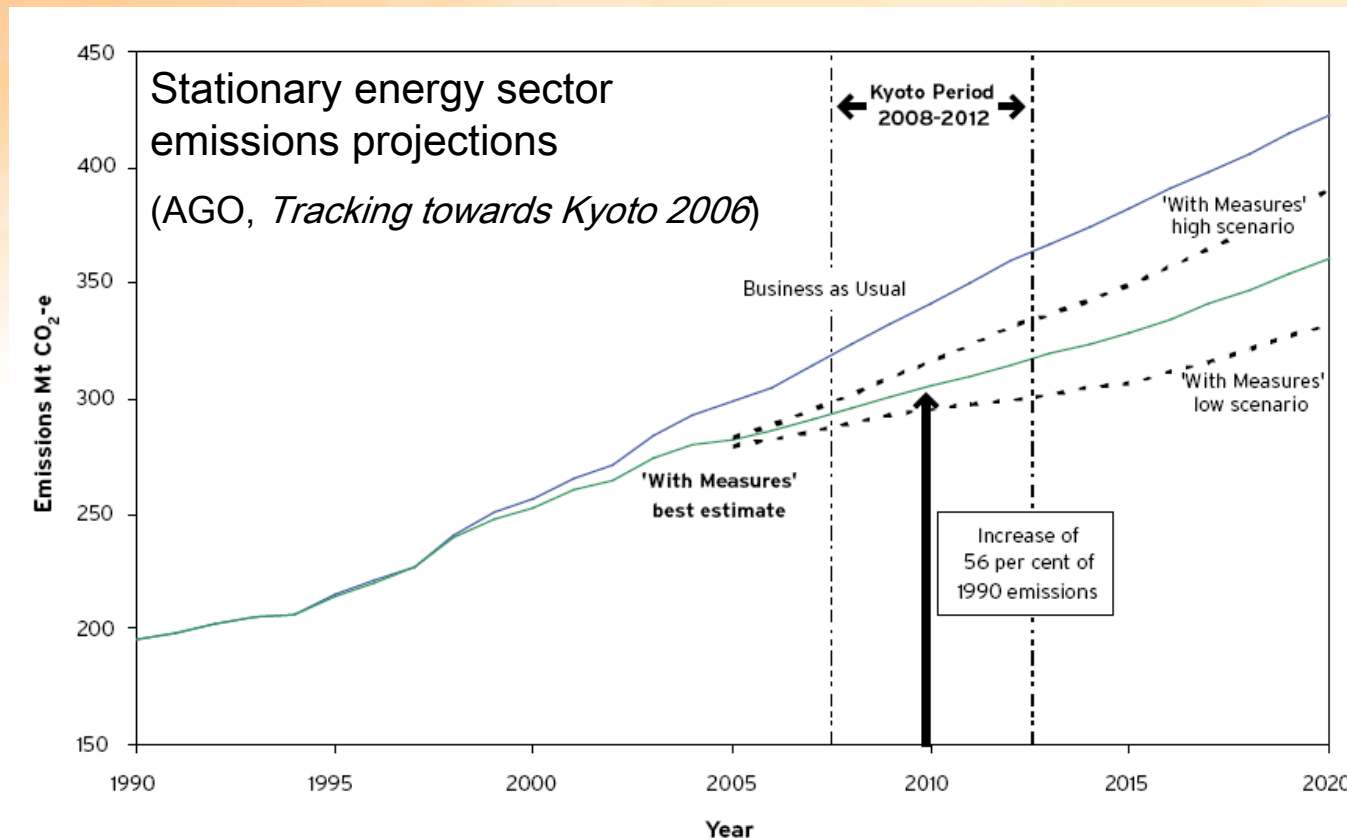
(ESIPC, 2005)

(IES, NSW Privatisation Conference, 2008)



# A challenging context for climate policy

- Energy-related emissions climbing – 70% of total
  - Estimated +35% over 1990–2004, projected +56% in 2010
  - ‘On track’ to meet Kyoto 108% target due to ‘land clearing’ hot air

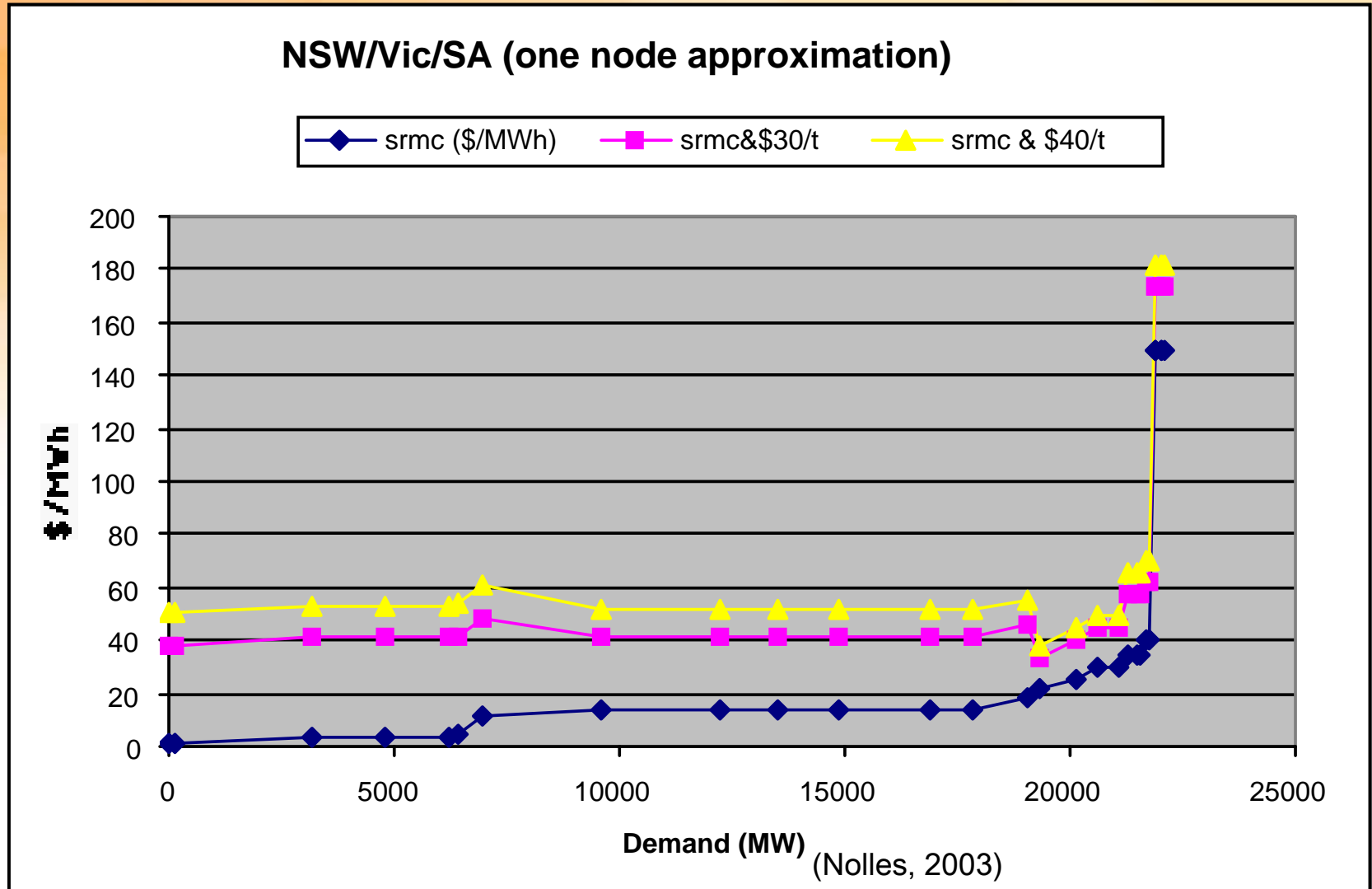


- Electricity generates 35% of total emissions + fastest growing sector.

# New Federal Government commitments

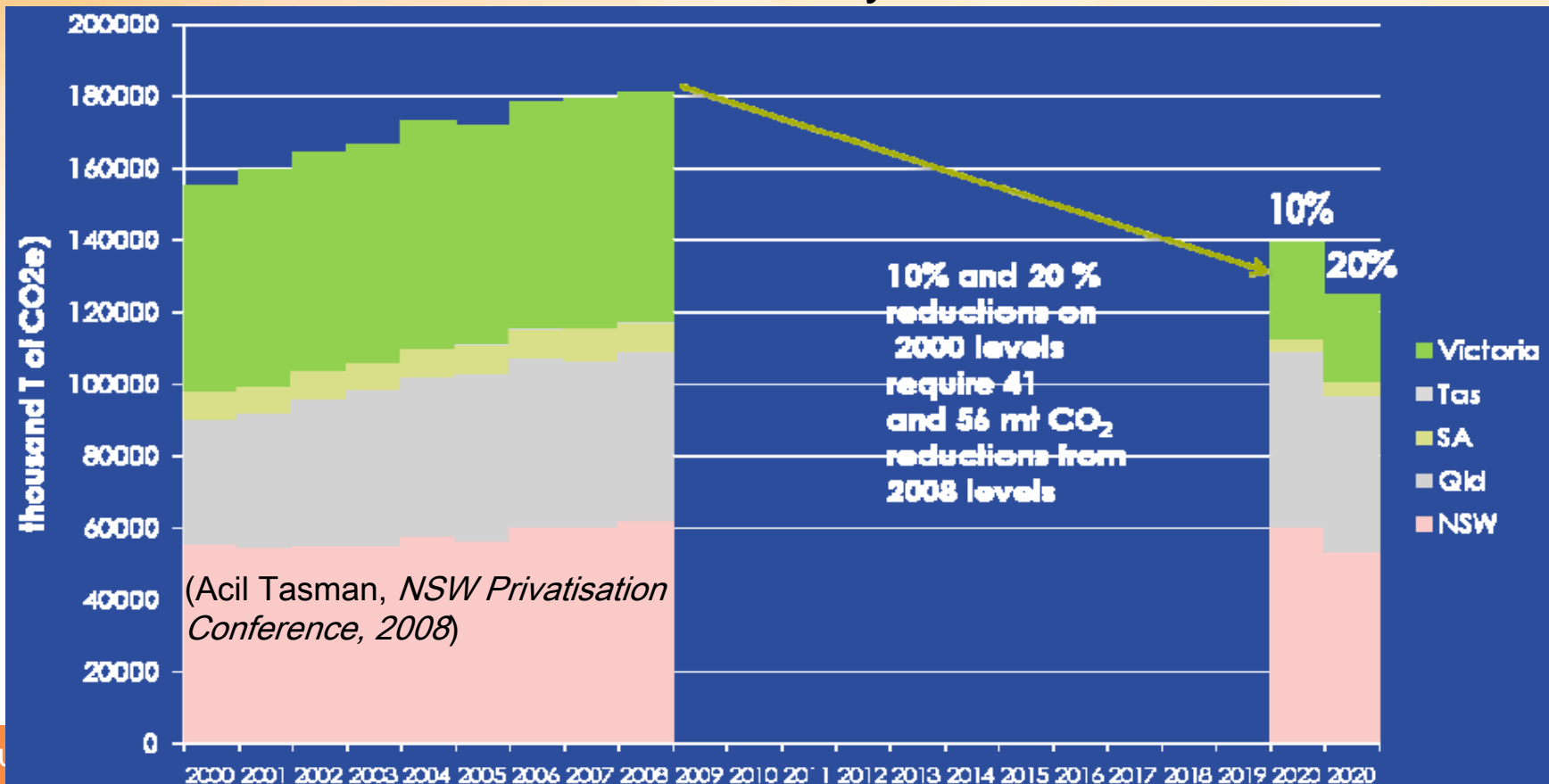
- Ratify **Kyoto Protocol**
- Introduce **Emission Trading System by 2010**. Detailed design finalised by end 2008.
- Adopt **greenhouse gas reduction target** of 60% on 1990 levels by 2050. Interim targets finalised wrt Garnaut review September 2008.
- Adopt **Mandatory Renewables Target** of 20% by 2020, 45,000GWh. Target to be phased out 2020-2030
- **\$500M Renewable Energy Fund** intended to develop, commercialise and deploy renewable energy.
- Invest \$500M under **National Clean Coal Fund** to finance deployment of clean coal technologies. (Energetics, Dec. 2007)
- Range of Energy Efficiency policies

# Estimated effect of a carbon price on merit order

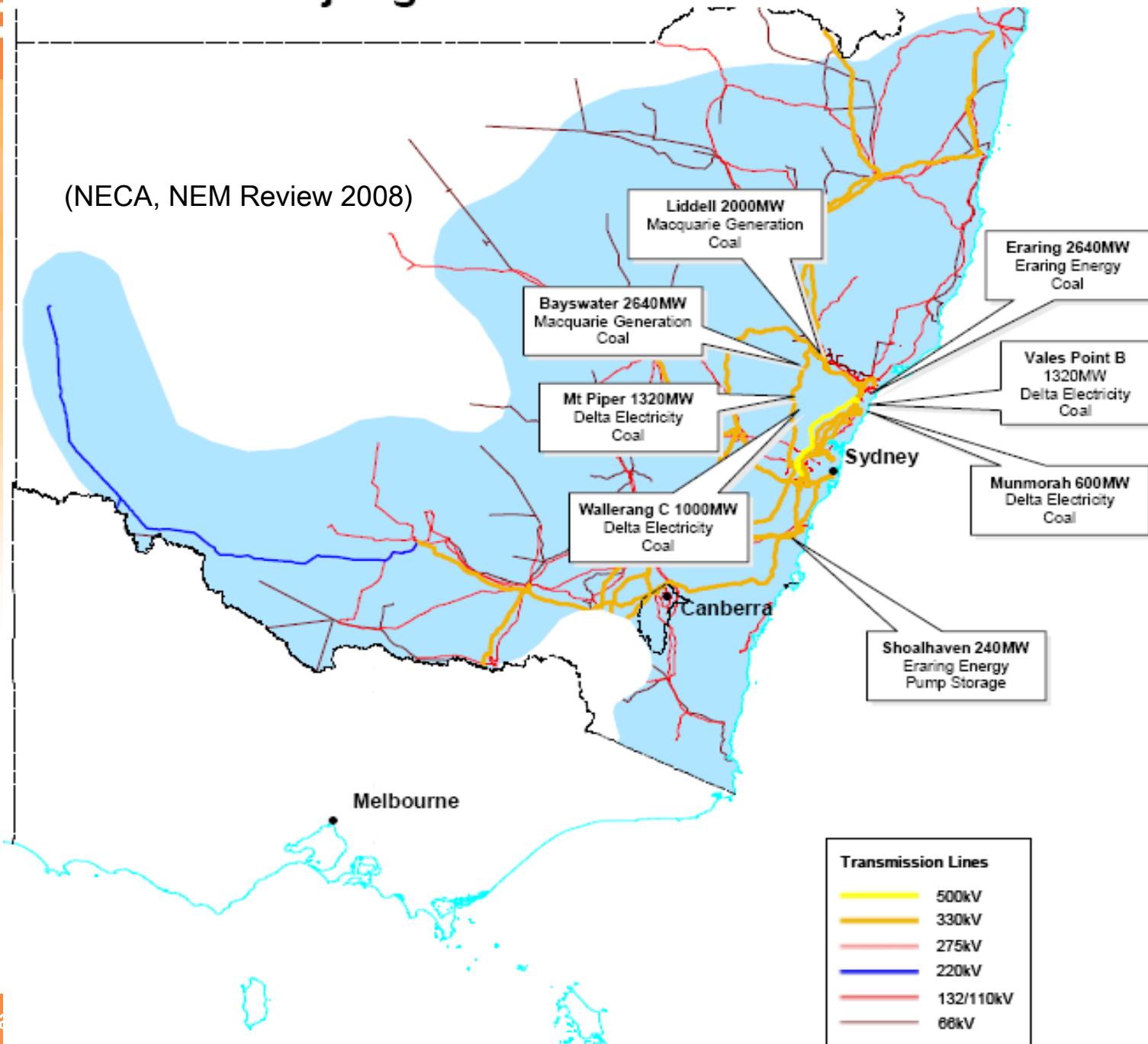


# Possible impacts of an ETS

- Brown coal in Vic appears vulnerable
  - Very high emissions + Vic CCGT opportunities
- Some NSW + Qld black coal may also be retired



# Location of major generation in New South Wales



## NSW electricity supply market share

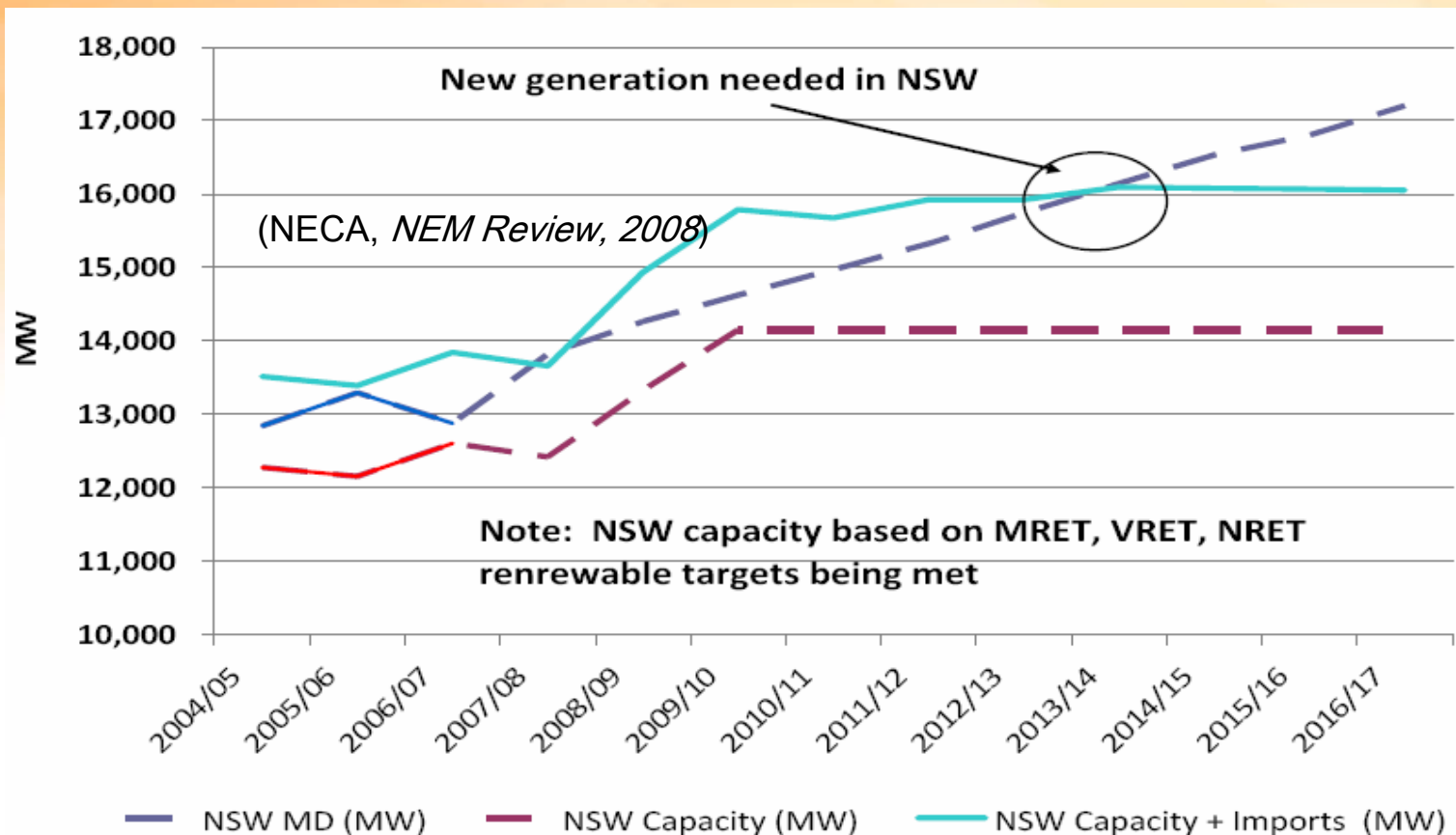
(NECA, NEM Review 2008)

Operating company	2004/05 (%)	2005/06 (%)
NSW government	83.2	81.7
- Macquarie Generation	36.4	34.8
- Delta Electricity	29.8	28.9
- Eraring Energy	16.9	17.9
Imports from QLD	6.2	7.3
Snowy Hydro	5.9	6.7
Imports from Vic	2.1	1.7
National Power	1.4	1.3
Marubeni	1.3	1.3
<b>Total electricity supplied</b>	<b>77,353 GWh</b>	<b>80,453 GWh</b>

Source: Electricity Gas Australia (2007), ESAA



# Projected load growth + investment needs



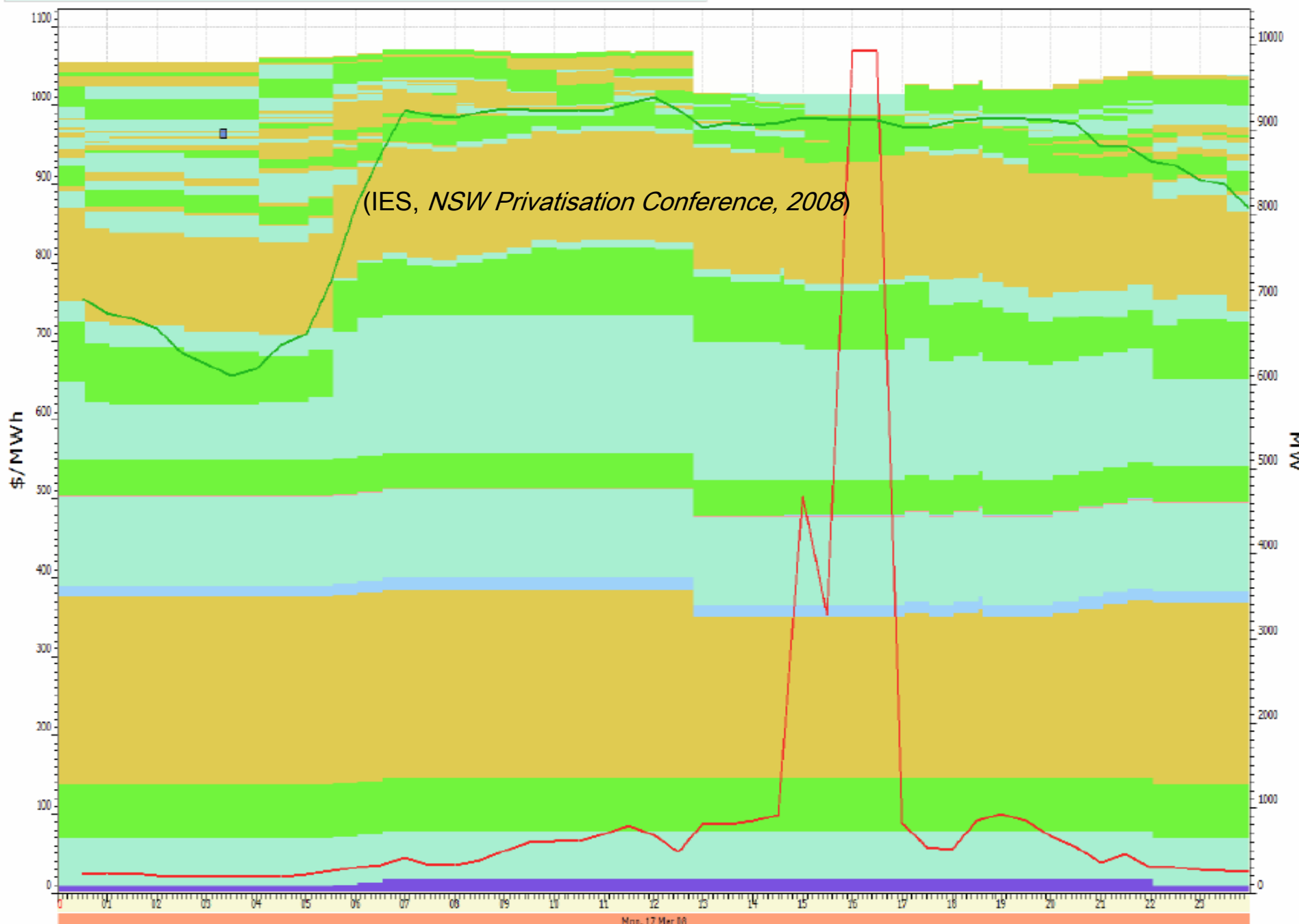
# Committed investments

(IES, *NSW Privatisation Conference, 2008*)

Timing	Region	Development	Capacity (MW)
<b>2008</b>	<b>NSW</b>	<b>Tallawarra</b>	<b>400</b>
<b>2008</b>	<b>NSW</b>	<b>Uranquinty OCGT (1-3)</b>	<b>480</b>
2008	SA	Quarantine OCGT	120
<b>2009</b>	<b>NSW</b>	<b>Colongra OCGT</b>	<b>600</b>
2009	QLD	Braemar OCGT	504
2009	QLD	Condamine CCGT	135
2009	TAS	Tamar CCGT	200
2009	TAS	Tamar OCGT	60
<b>2009</b>	<b>NSW</b>	<b>Uranquinty OCGT (4)</b>	<b>160</b>
2009	VIC	Bogong (Hydro)	130
2010	QLD	Darling Downs CCGT	630
2010	QLD	Yarwun CoGen	169

# Region Merit Order Stack 5min\_F (Generator, NSW1)

Price (30min) TotalCleared (30min) Snowy Hydro Macquarie Generation Eraring Energy Delta Electricity Redbank Sife



# NSW Govt proposal

- Sell retailers
- Long-term lease of generators
- Retain networks as state-owned corporations
- A range of claimed retail price, job security + environmental 'commitments'
- Key issues
  - Increased asset price if sold as vertically integrated gentailers with potential market power
    - Short-term gain... but what of consumer and overall market outcomes?
  - Carbon liabilities under forthcoming ETS
    - Are these coal-fired generators obsolete assets in a carbon-constrained future?
  - Retailers appropriate role in future industry
    - Genuine retail competition requires retailers to behave more like ESCOs than present 'insurance agents' focused on increased energy sales