Electricity Supply Industry Planning Council

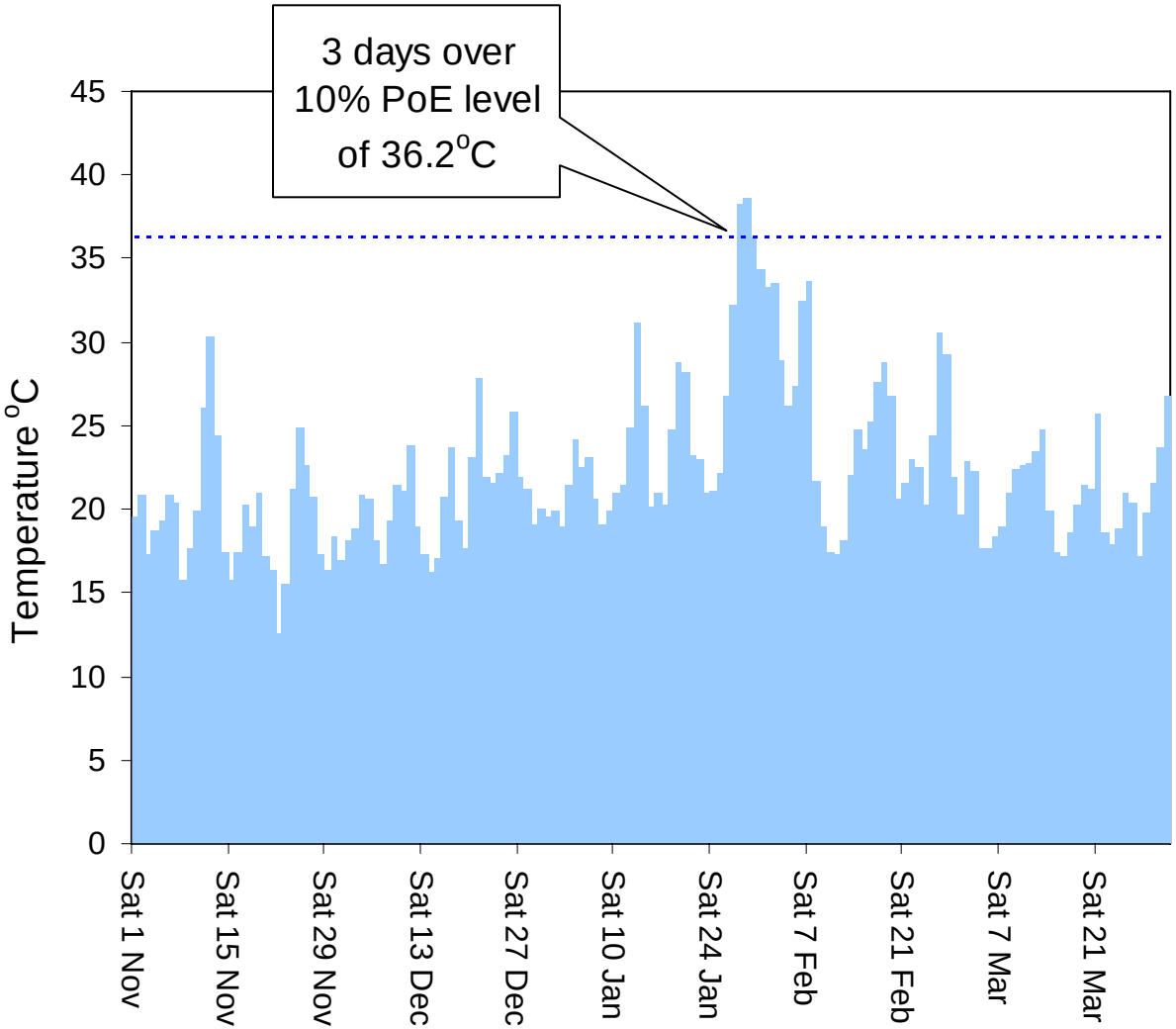
Draft Annual Planning Report 2009

Peak Demand Experience from 2008-09
New Records!

Summer 2009 heatwave

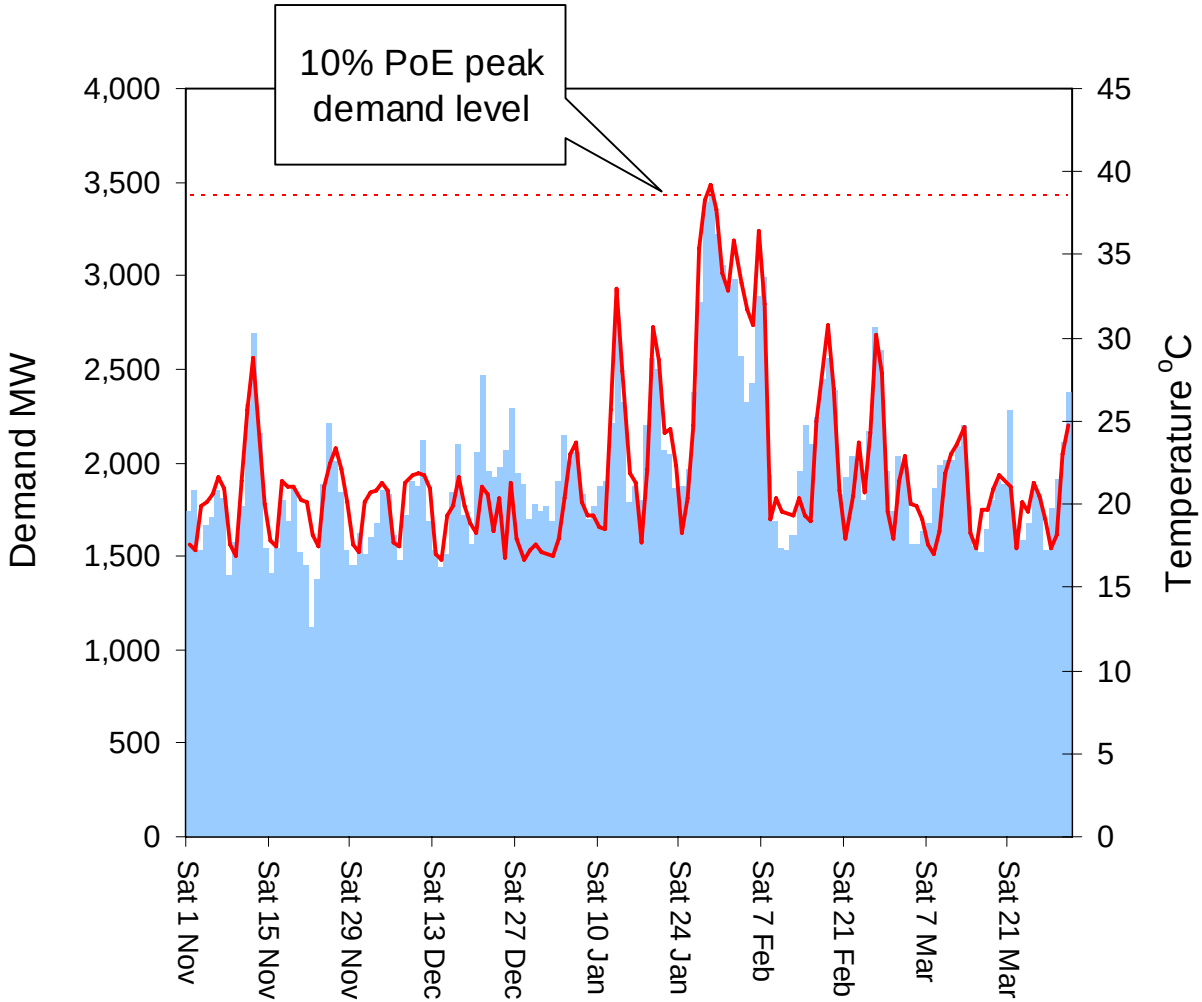
- An exceptional heatwave affected south-eastern Australia in summer
- the most acute period extended from 28 to 30 January 2009 with extreme temperature conditions in Tasmania, Victoria, southern New South Wales, and southern South Australia,
- many temperature records were set for day and night time temperatures as well as for the duration of extreme heat,
- many all time records were set and temperatures across widespread areas of South Australia were the highest since the 1939 heatwave.

Daily average temperatures during the 2008-09 heatwave



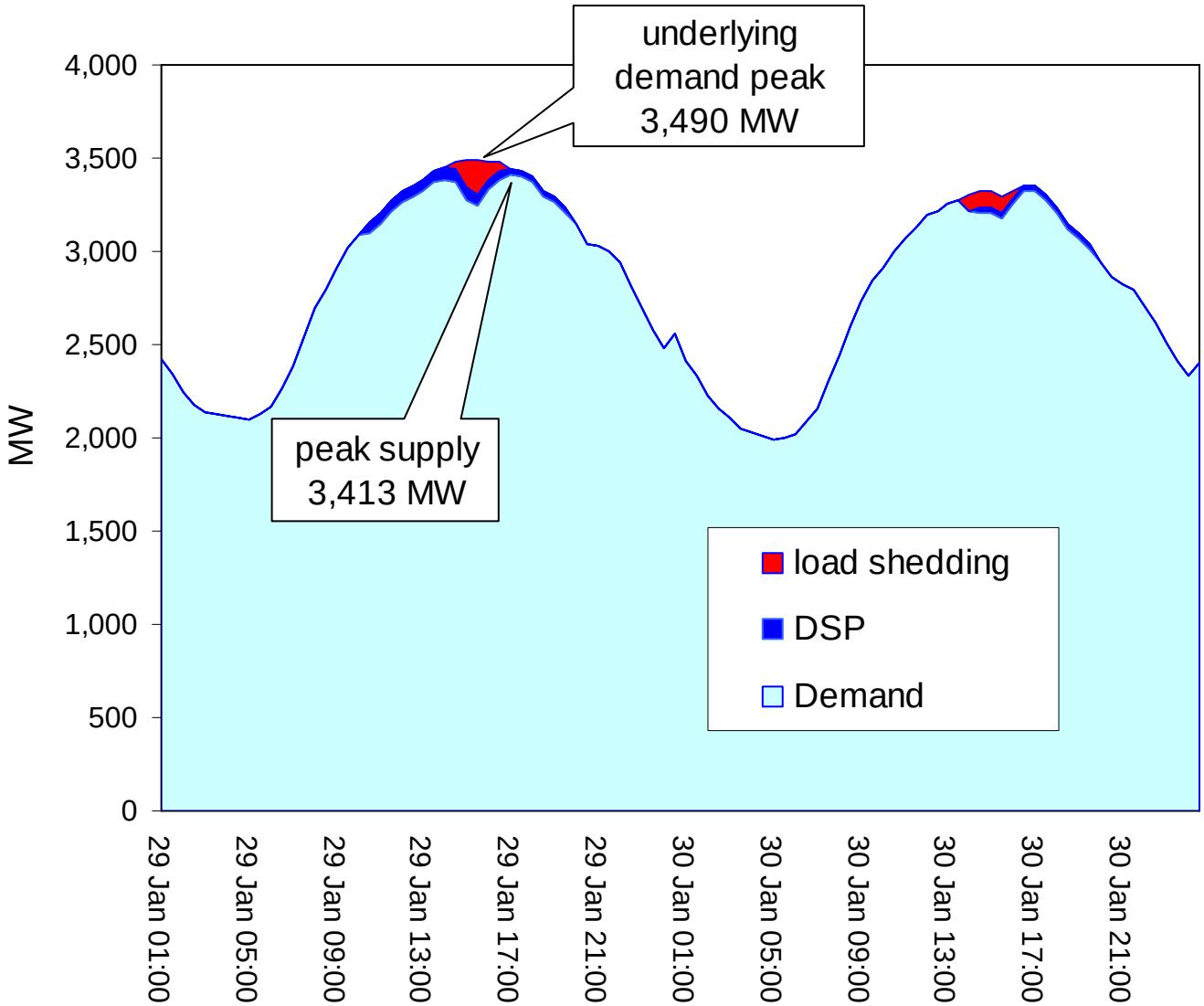
- Highest daily maximum of 45.7°C in 70 years
- Highest overnight minimum of 33.9°C on record

Daily peak demand levels during the 2008-09 summer



- 2008-09 10% PoE level = 3,425 MW
- Peak level of supply = 3,413 MW on 29 January
- Underlying demand (pre DSP & load shedding) peaked at 3,490 MW (5.6% PoE outcome)

SA Demand on 29 & 30 January



Probability of exceedance

- From a weather context, the event could be argued to be around a 1:70 year event or perhaps a 1.5% PoE
- The demand experienced was a lower probability due to a number major customers operating at reduced output during the period
- The ESIPC/Monash modelling has been developed with an expectation that this can occur and calculates peak demand PoEs using simulation techniques

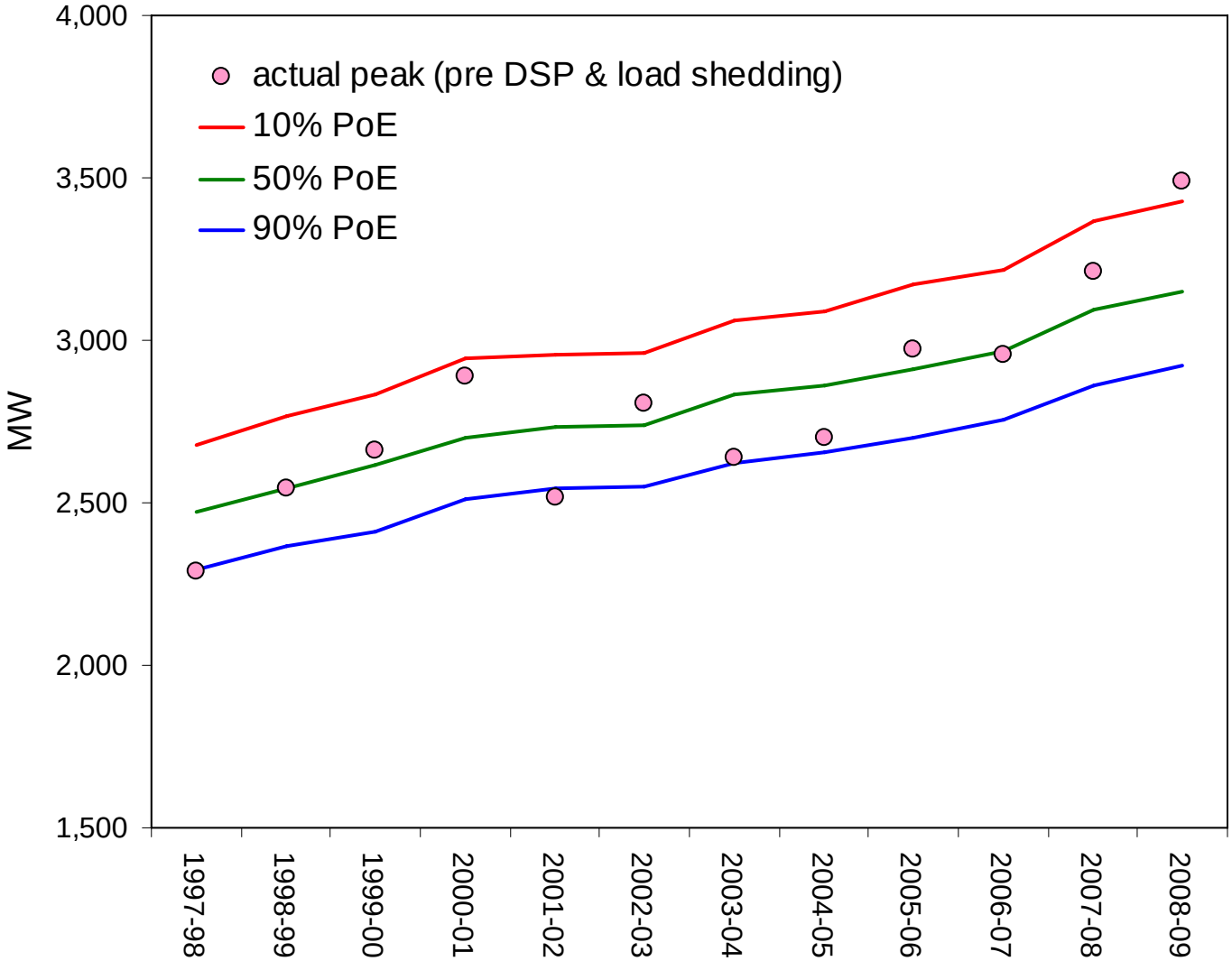
Customer Demand

- A core task of the APR is to provide a range of forecasts of SA peak demand and sales
- Ongoing growth is driven by econometric variables. Analysis has shown that:
  - Growth in demand is best represented by growth in GSP and real prices; and
  - Growth in sales is best represented by growth in GSP, real prices and a temperature variable.
- Volatility of peak demand driven by temperature and calendar effects is superimposed on this ongoing growth
  - Importance of understanding and quantifying this volatility has lead to the Planning Council entering into a 3 year program with Monash University in association with VENCorp
- Separate analysis of major mining loads probabilistically combined back with other demand

Demand Forecast Methodology

- Temperature and demand simulation models developed by Monash University
  - simulations used to forecast probability distributions
  - PoE levels not linked to a particular temperature event
  - forecasts incorporate a wide range of uncertainties
- Similar methodology applied in-house for winter peak forecasts
- Detailed reports on our website

Historic summer peak demands



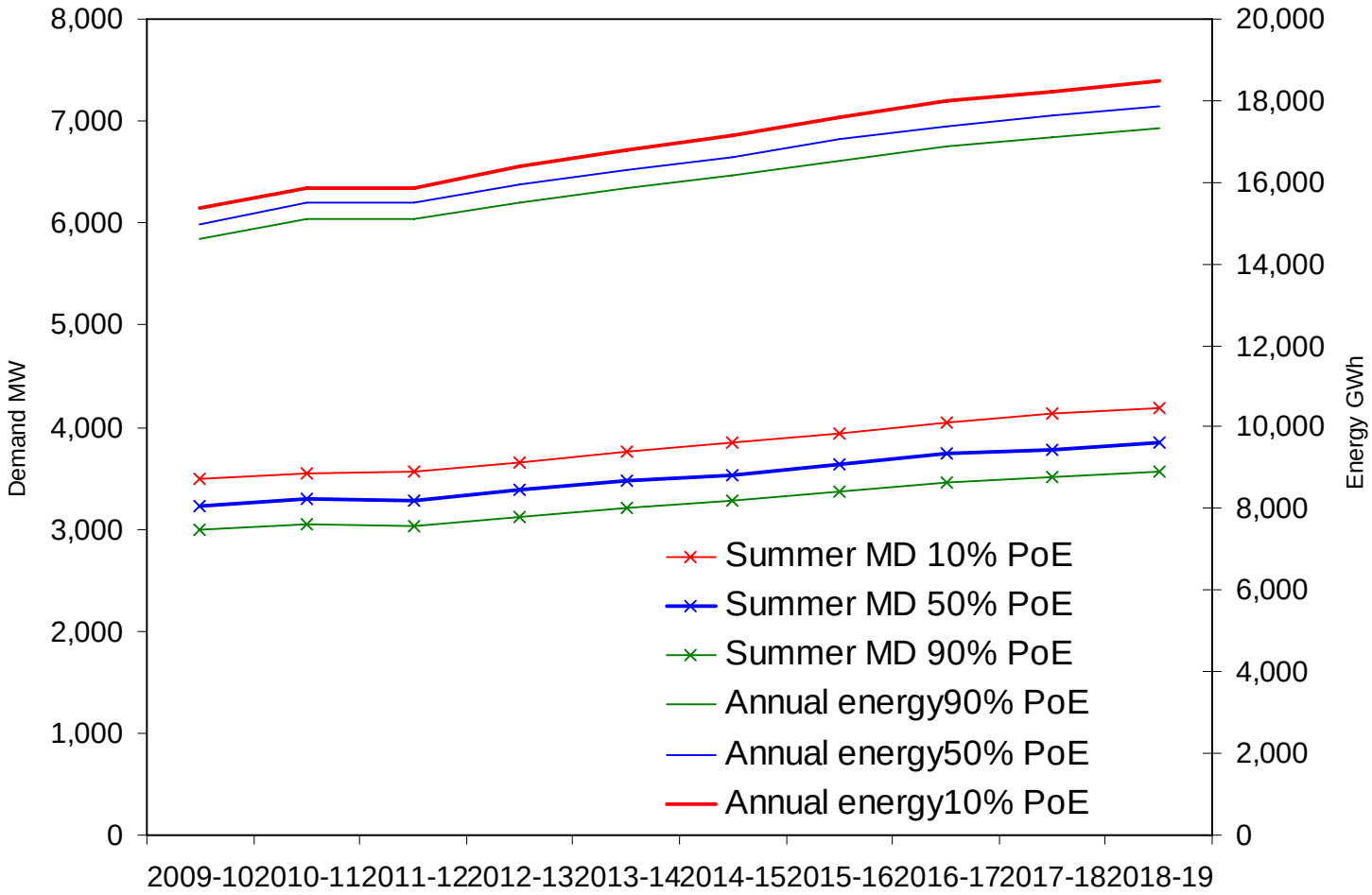
Forecasting development
New Risk Management Tool

Forecasting developments

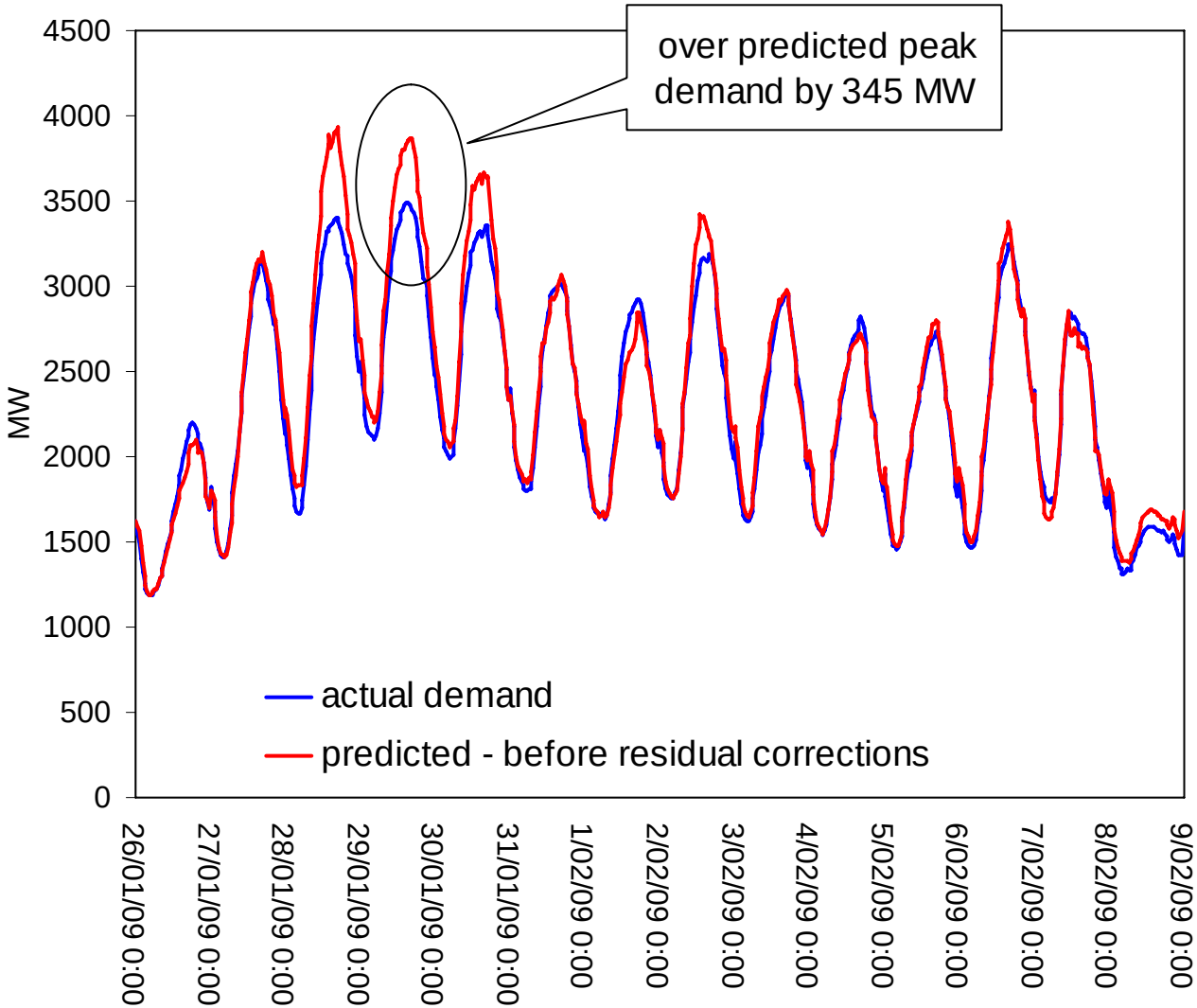
Development of methodology with Monash University has continued through the year:

- Summer demand models extended to the entire year
  - Models now used for Winter MD forecasts
  - Annual energy forecasts on the same PoE basis
  - All forecasts internally consistent with one another
- Report on price elasticity of demand vs annual energy
- Incorporated CSIRO climate change modelling
- Extreme summer has delivered significant improvement in modelling for extreme temperature events

Sales and demand forecasts calculated on the same model



Modelling half hourly demand during the 2008-09 heatwave



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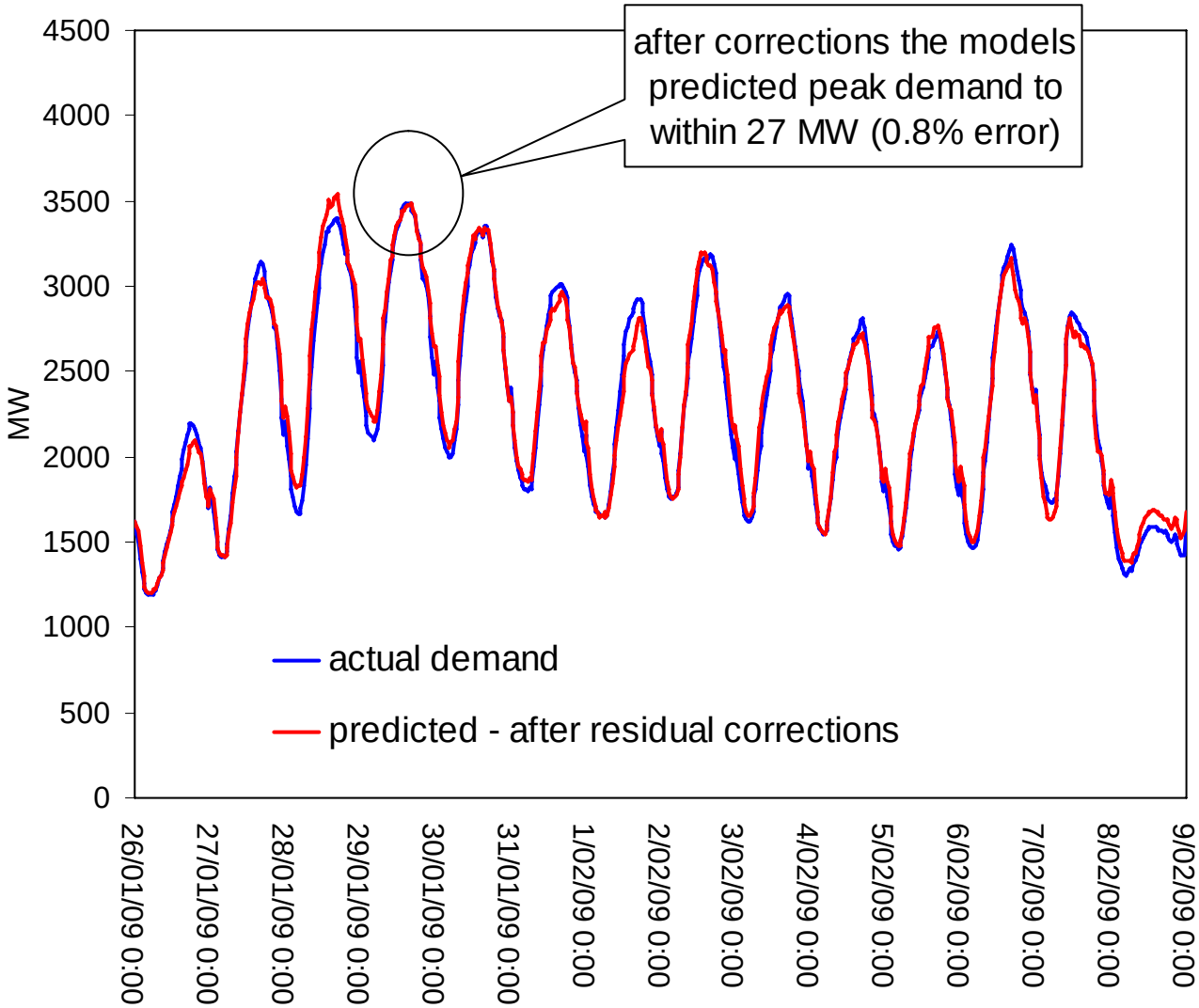


Forecasting developments

- Extreme summer event has not materially changed the calculation of 10% PoE outcomes or below but has significantly changed our view of more extreme conditions
- Raised the issue of demand saturation at very high temperature conditions

Peak Demand and Annual Energy Forecasts influenced by the economic circumstances and climate change policies

Forecasting Assumptions

- Key assumptions based on information provided by NEMMCO
  - Nationally consistent approach to developing State by State forecasts
- Information provided by NEMMCO included:
  - Economic forecasts
  - GHG abatement policies and electricity price index forecasts
  - Non-scheduled and wind generation projections

Global Financial Crisis

- 2009 economic outlook prepared by KPMG Econtech
- Significant structural adjustments required internationally, particularly in US and UK
  - unsustainable debt levels
  - extensive bank asset write-downs
  - moves for tighter financial market regulation
- Global recovery dependent on time for credit markets to return to normality and trade and economic activity to recover
- Considerable short term uncertainty
  - downside risks if further global financial shocks emerge
  - potential upside if the Chinese economy recovers strongly

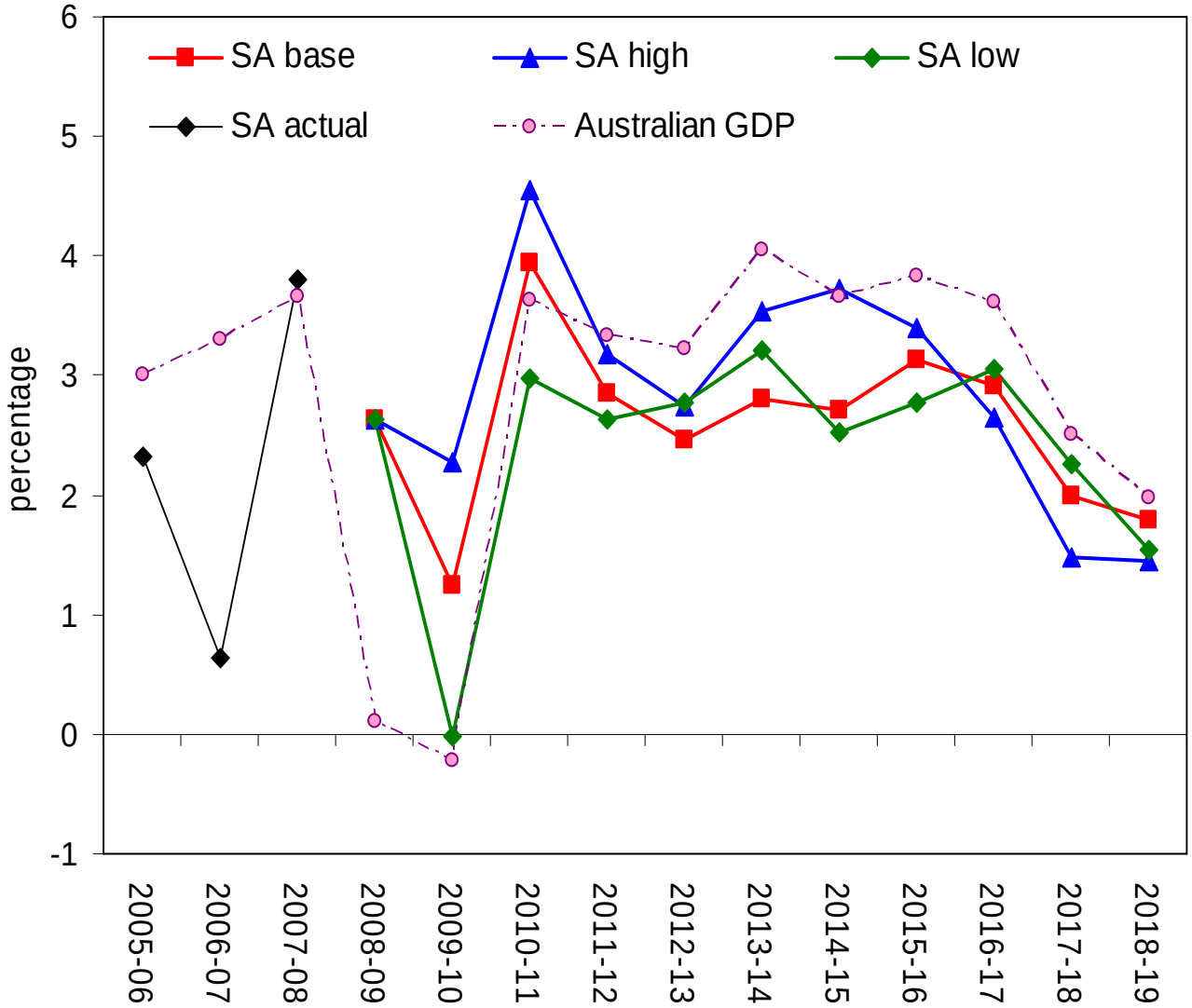
Outlook for the Australian economy

- Two years of near zero growth expected for Australian economy
- Strong rebound of growth expected in 2010-11 due to the impacts of:
  - Government fiscal stimulus package
  - rising unemployment and low wages growth
  - lower interest rates and exchange rate
  - pent-up demand for new dwelling investment

Outlook for the South Australian economy

- South Australia expected to perform better than average during the economic downturn
  - lower personal debt levels relative to the rest of Australia
  - comparatively cheaper housing
  - ongoing mining, defence and infrastructure investments
- Over the medium term, SA growth expected to be slightly lower than the national average

Economic growth assumptions



- Aust GDP:
  - near zero growth in 08-09 and 09-10
  - recovery to 3.6% in 10-11
- SA GSP:
  - 1.2% in 09-10
  - 3.9% in 10-11
  - 2.6% 10yr ave

Major new projects

- 100 GL desalination plant expected to be fully operational by 2012-13
  - net increase in energy requirement approximately 350 GWh pa
- High growth case includes:
  - potential large new pulp mill in South East with progressive commissioning between 2011-12 and 2013-14
  - a major expansion at the Olympic Dam mine although delayed from 2008 APR

Major new projects

- BHP Billiton completed Selection Study for Olympic Dam mine expansion and has published a Draft EIS
- 2008 APR high case assumed ramp-up between 2009-10 and 2016-17
- KPMG forecasts show sharp fall in commodity prices in 2009-10, with recovery to 2005-06 levels expected by 2011-12
- APR assumes a delay in the Olympic Dam mine expansion with load ramping up from 2011-12 in high case

Climate change policy assumptions

Base case forecasts:

- CPRS-5 targets introduced from July 2010
- initial carbon price $23/tonne (4% pa real increases)
- expanded RET targets adopted Jan 2010
- 45,000 GWh target ramps down from 2025

Low growth scenario:

- assumes CPRS-15 targets / $32 initial carbon price

High growth scenario:

- same as base case, but slower growth of carbon price

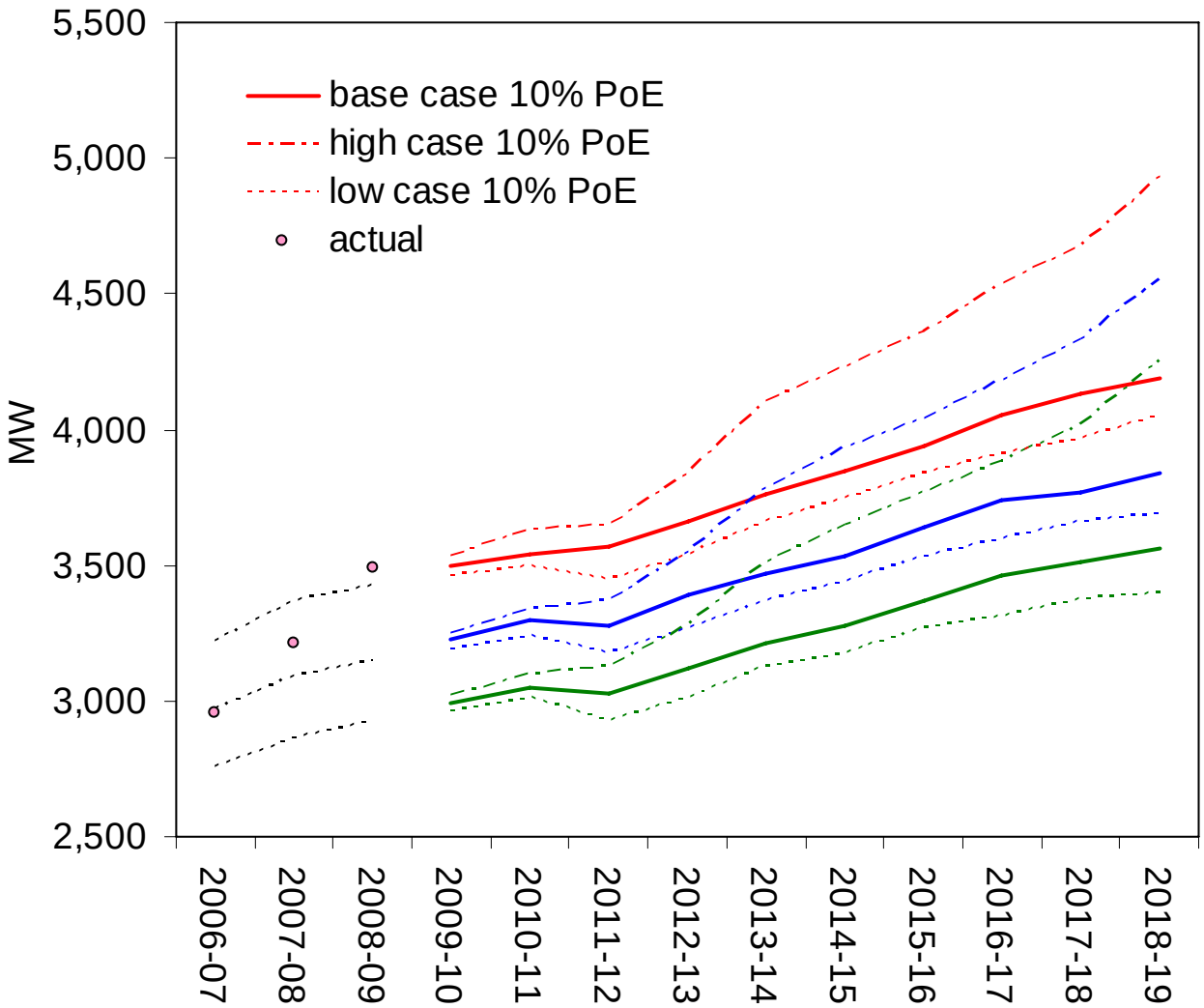
Climate change policy assumptions

- Range of other climate change policies will also affect demand:
  - policies to remove electric storage water heating
  - energy efficiency schemes including the MEPS scheme for lighting efficiency
  - residential energy efficiency scheme
  - solar PV subsidies and feed-in tariffs
  - solar subsidy schemes
- The APR makes post-model adjustments for those which are considered to be outside of trends
- Some uncertainty associated with the potential impacts of these programs

Climate change policy changes

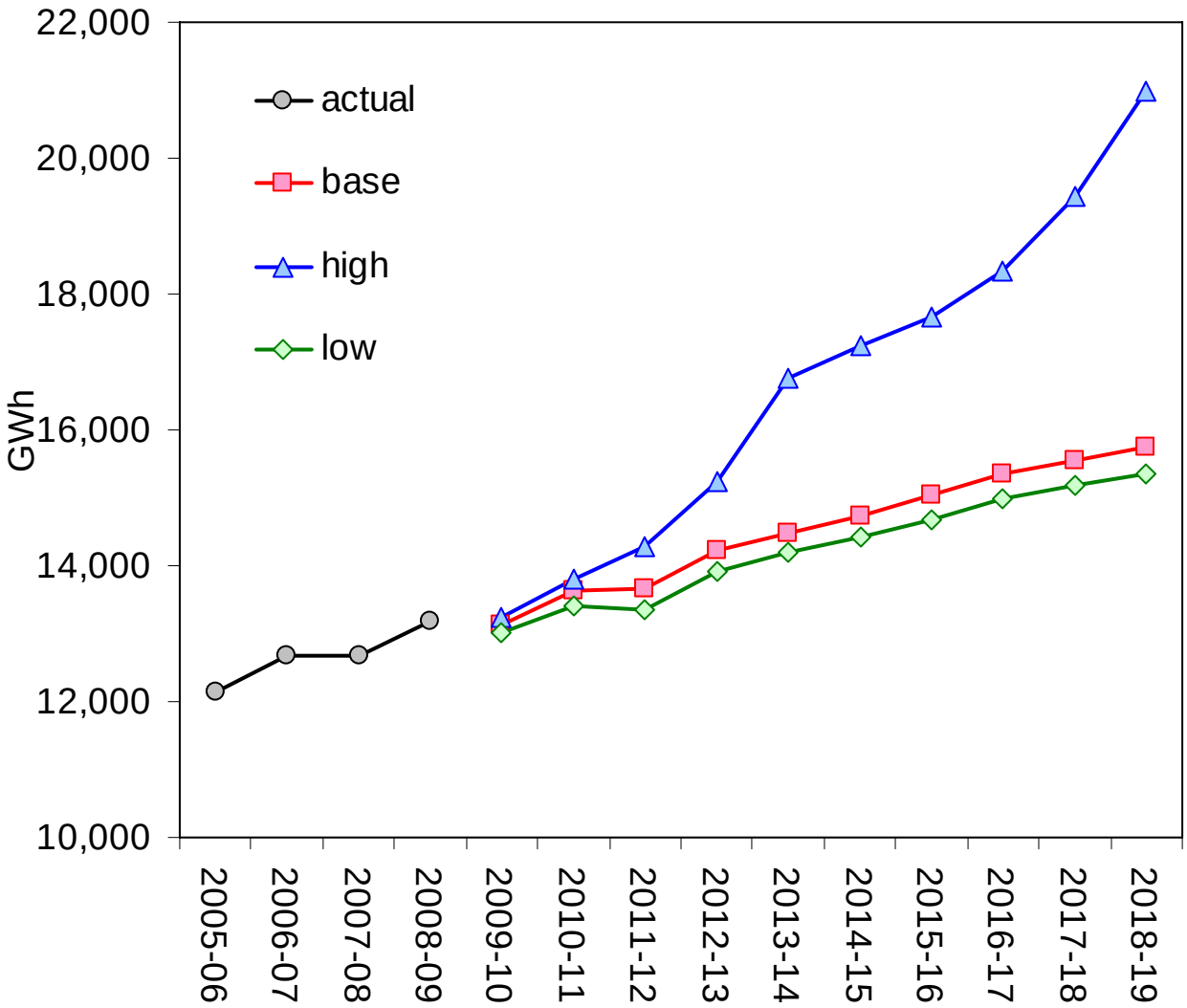
- Current uncertainty with the introduction and design of CPRS and RET schemes
- Recently announced changes:
  - CPRS introduction deferred to July 2011
  - first year carbon price capped at $10/tonne
  - 45,000 GWh RET target continues to 2030
  - additional support to EITE industries
  - Australia will target 25% emissions reduction by 2020 if global agreement to 450 ppm GHG target
    - suggests 20% higher carbon price by 2020
- Changes discussed in APR but forecasts not altered
- Actual outcome remains uncertain

Summer MD forecasts



- 2009-10 10% PoE: 3,500 MW
- 75 MW (2.2%) increase on the 08-09 10% PoE level
- revised down by 30 MW from the '08 APR
- forecast ave growth of 2% to 2018-19
- high case includes Olympic Dam expansion and new pulp mill

Customer Sales Forecasts



- 08-09 growth expected to come in at 4% (mainly pumping & Prominent Hill)
- Sales expected to fall 0.3% in 09-10, reflecting slowing GSP growth
- Residential sales -3.6%
  - EU business -0.2%
  - Pumping -29%
  - Other +20%
- Growth to 18-19 expected to average 1.8%
  - high case ave 4.8%
  - low case ave 1.5%

Supply mix and immediate supply options

Supply Mix

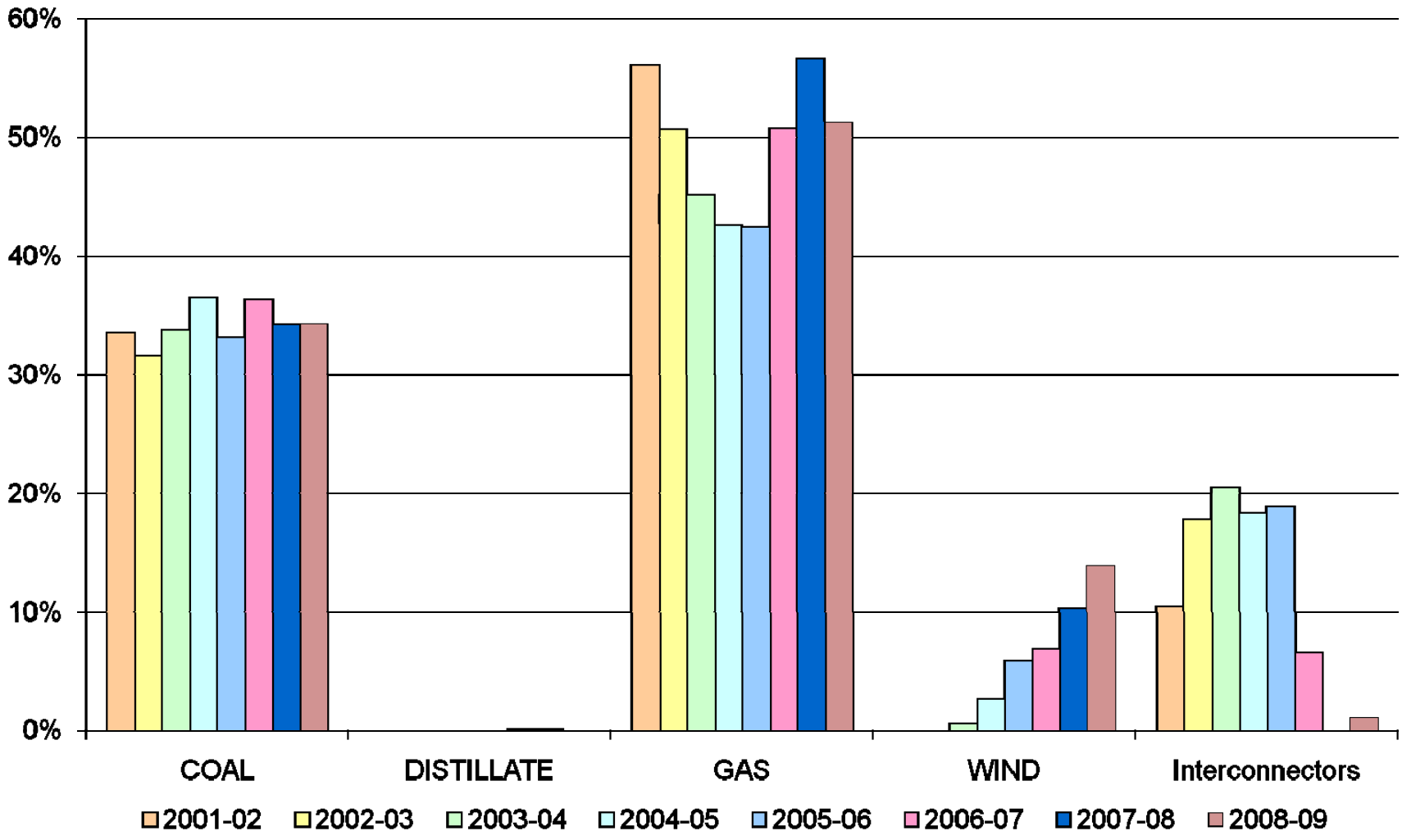
- Carbon trading and MRET extension will have a big impact on future plant mix
- Trend is already evident in lower imports over the past two years, increased wind generation and lower carbon emissions.
- Wind is expected to continue to grow (if not explode) in SA in the short to medium term
- Longer term potential growth of geothermal energy

Scheduled Generation Projects: Future Options

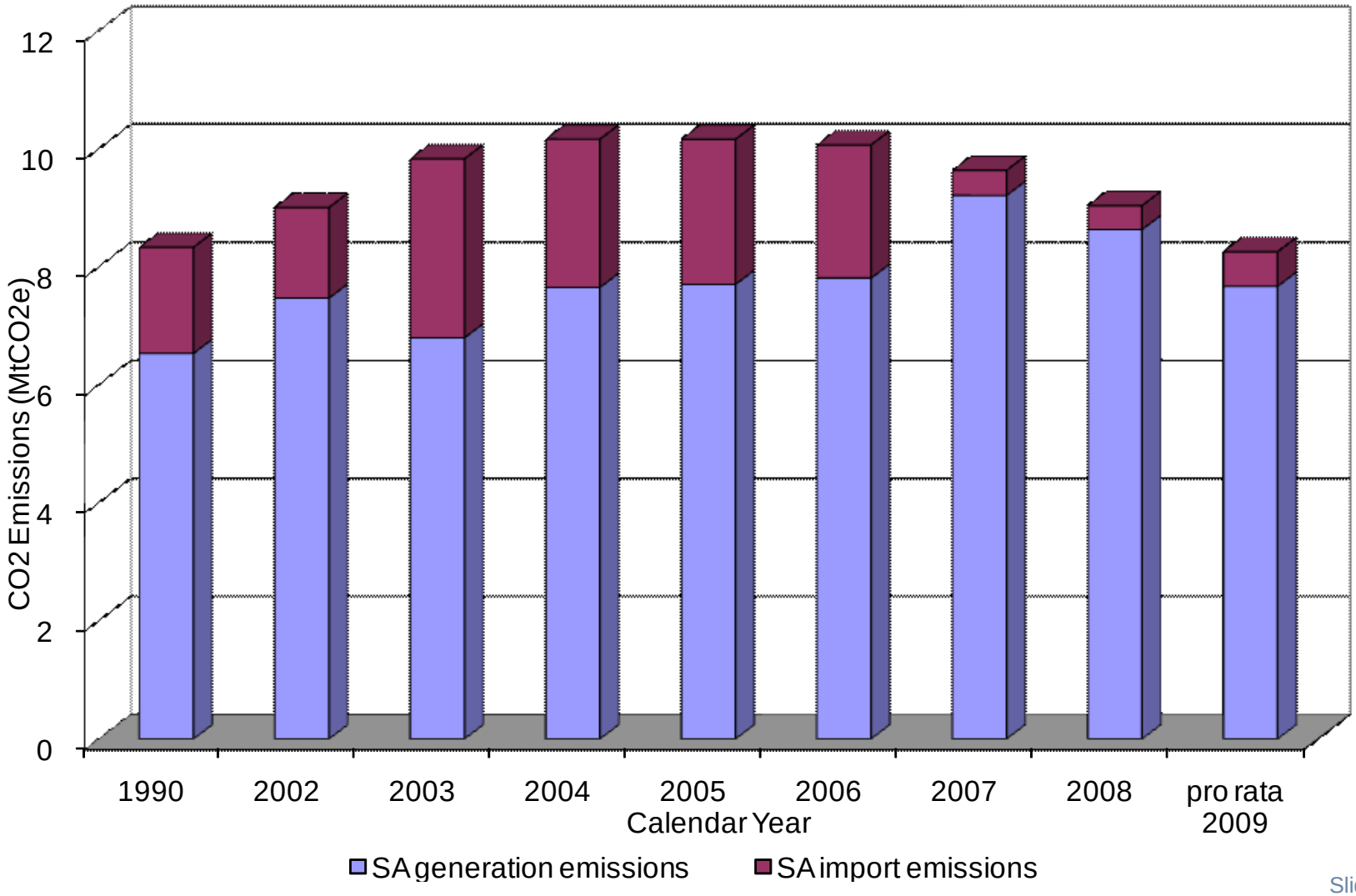
Major potential projects

- Conventional
  - Quarantine (Origin) – 75 MW conversion to combined cycle
  - International Power – 300 MW CCGT expansion at Pelican Point
  - Other Companies – 1,500 MW potential OCGT OR CCGT
- Renewable
  - wind generation continues to grow strongly as currently the most competitive renewable source of generation
  - further wind farm investment encouraged by the prospect of the expanded RET
  - 880 MW of wind generation projects “advanced” with 295 MW considered close to commitment

Energy Consumption by Source



Emission Levels

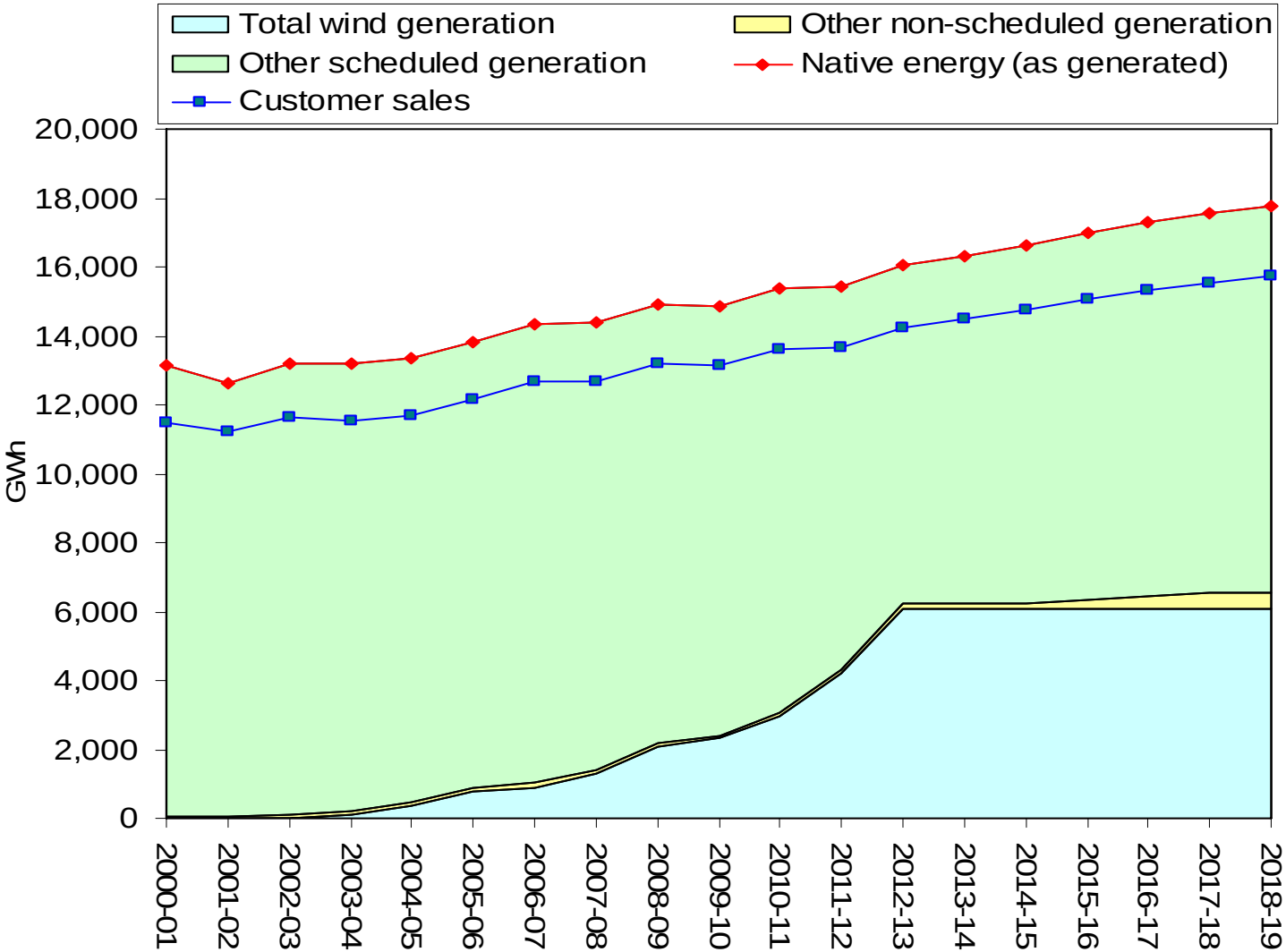


Growing Renewable Contribution

Contribution by renewables

- Fully commissioned wind generation capacity in South Australia is currently 740 MWs and in 2008-09 wind contributed over 14% of supply
- Wind farms currently under construction should take this to 868 MWs by the first quarter of 2010
- Wind farms which are very advanced, or to which company commitments have been made, are expected to lead to a total of around 1200 MWs in the next few years
- Somewhere in 2010 or 2011, we expect South Australia to be world leading in terms of the relative contribution of wind generation

Contribution by renewables – KPMG forecast

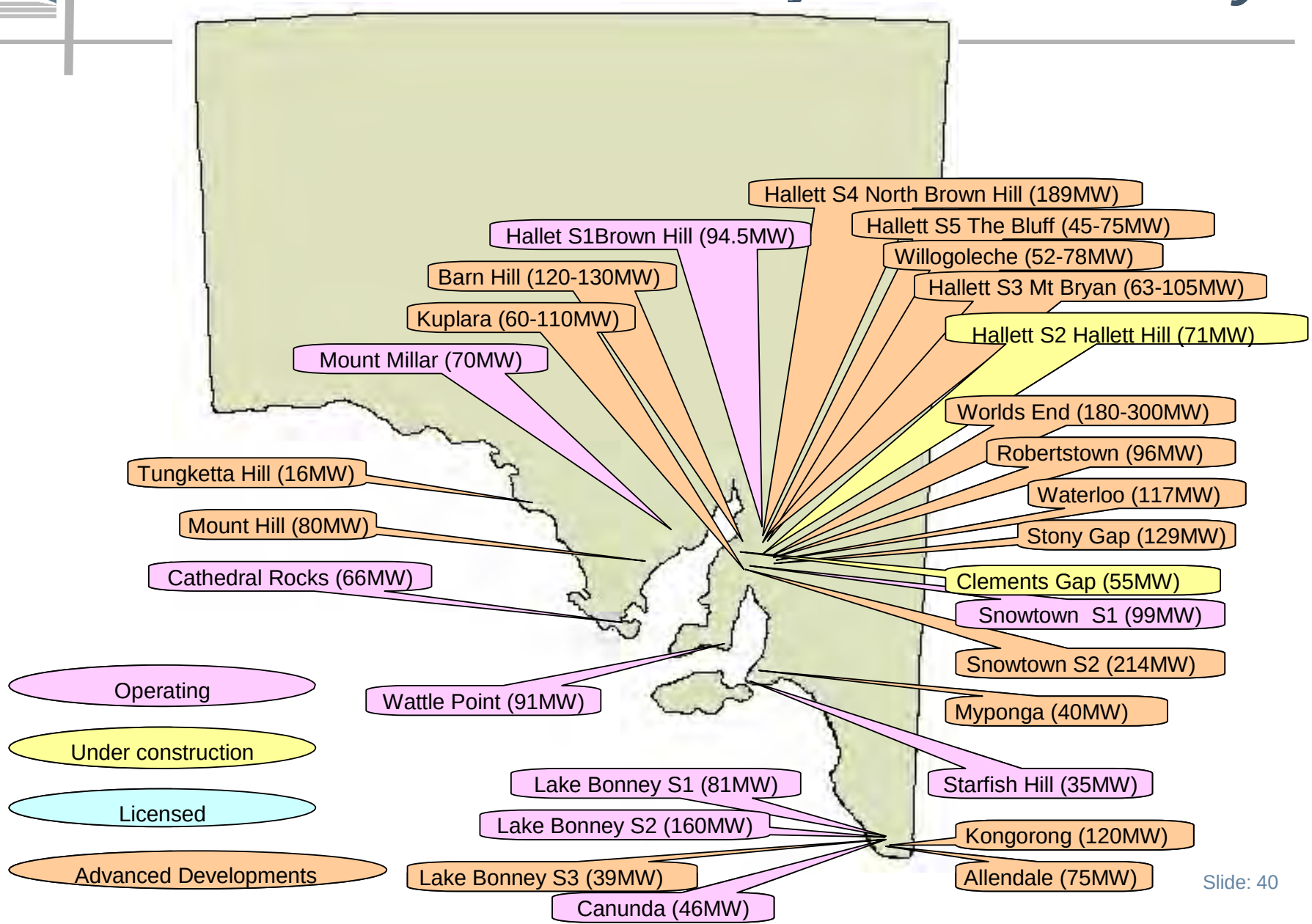


Contribution by renewables

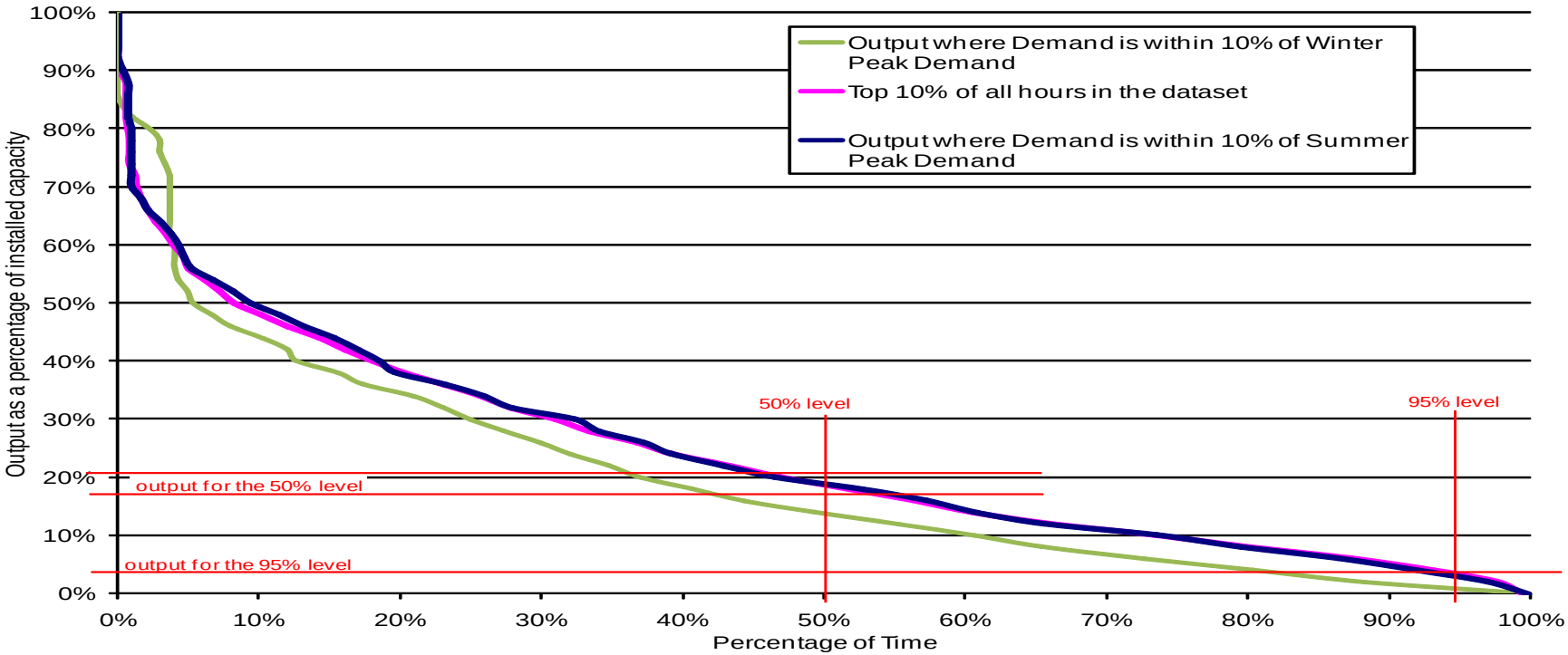
- KPMG's forecasts show SA's wind capacity rising from 740 MW in 2008-09 to 2,162 MW in 2012-13
  - no allowance for extension of 45,000 GWh RET target to 2030
- Forecasts are based on an assessment of the resource cost and not tested by:
  - considering the impact on SA pool prices; or
  - considering the full impact of network constraints and the need for network investment

Increasing experience with wind generation

Wind Project Summary



Wind Contribution at Peak demand



- Statistics support summer peak demand contribution of 3% of rated capacity
- Surprisingly winter contribution may be lower.

Wind Contribution

Financial Year	Maximum Output (MW)	Installed Capacity (MW)
2005	235	318
2006	286	334
2007	320	493
2008	530	686
2009*	641	740

- Hallett Stage 2 and Clements Gap both commissioning generators and producing power
- Total nameplate of all installed wind farms including these will be 868 MW by Q1 2010

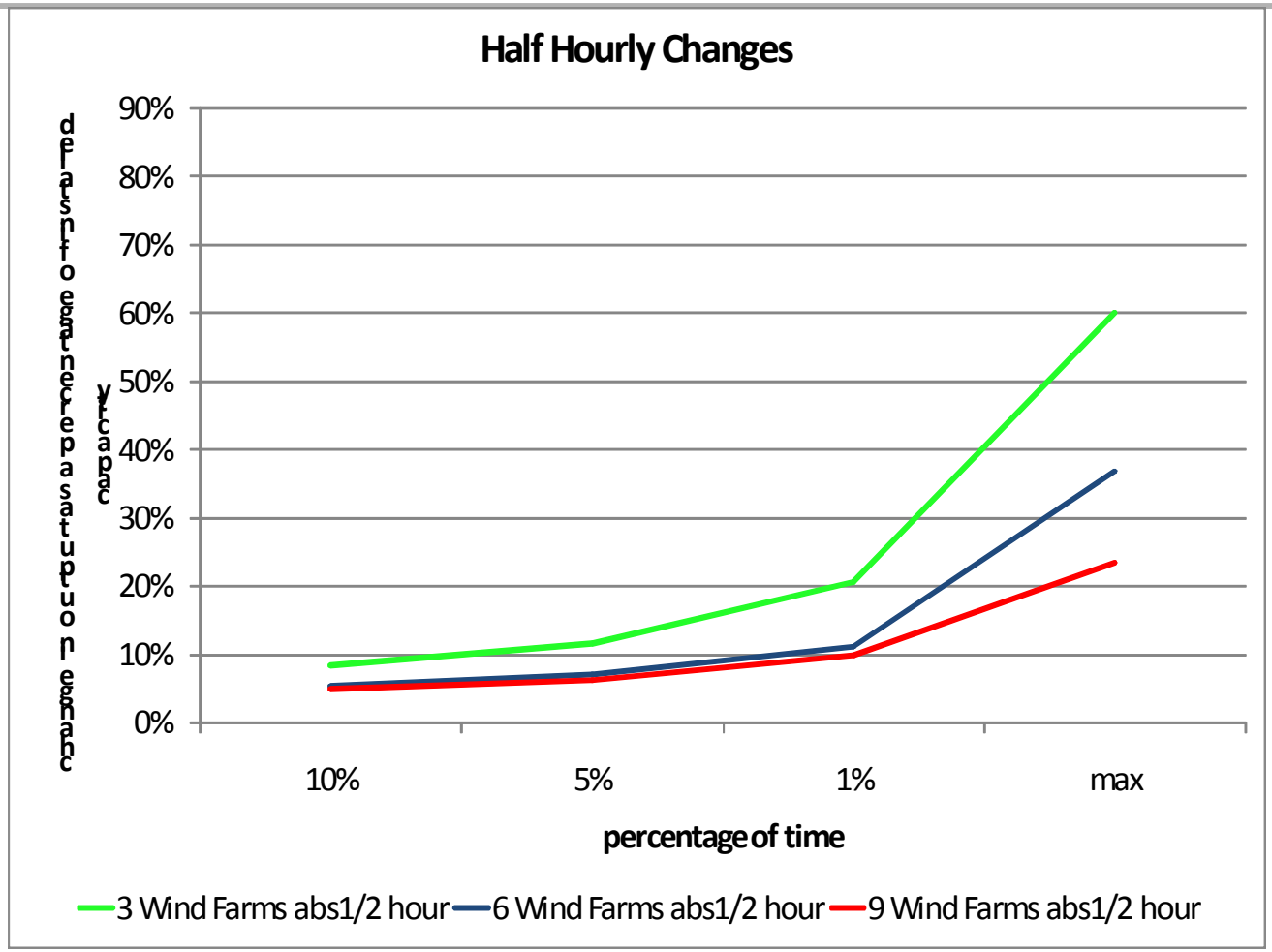
* Based on data to 28 May 2009

Wind farm capacity factors

Calendar Year	Canunda	Starfish Hill	Lake Bonney S1	Cathedral Rocks	Wattle Point	Mt Millar	Hallett S1	Lake Bonney S2	Snowtown S1
2006	34%	31%	23%	19%	30%	7%			
2007	38%	29%	28%	33%	35%	15%		9%	
2008	34%	29%	28%	35%	35%	19%	32%	25%	27%
2009	26%	26%	21%	26%	32%	24%	35%	21%	39%

- Data for these capacity factors came from NEMMCO public tables.
- Results may not yet indicate long term production as most wind farms still establishing operational and maintenance procedures.
- 2009 numbers are 1 January to 1 June.

Wind farm diversity



- Benefits from some diversity between the output of the wind generators in SA are evident.

Pool Prices for Wind

Year	Volume Weighted Price for Wind Generators		Volume Weighted Price for Other SA Generators	
	Full Year ($/MWh)	Summer ($/MWh)	Full Year ($/MWh)	Summer ($/MWh)
2004–05	NA	NA	39.25	32.62
2005-06	32.57	39.59	43.91	67.50
2006-07	49.69	51.55	58.71	67.21
2007-08	63.31	63.94	102.01	149.92
2008-09*	48.56	91.80	74.26	165.28

* Based on data to 28 May 2009

Negative pool prices

- In September 2008 there were 196 negative priced dispatch intervals;
  - far more, in total, than had been experienced at any other time during the operation of the NEM.
- The negative price periods often corresponded to times where there were high levels of wind generation at the same time as low demand, particularly in the south east
- Since that time the behaviour of generators has changed and, while the circumstances that lead to the low prices have recurred, negative price outcomes have been rare.

Longer term supply options

Longer term Generation Options

Geothermal

- Geodynamics and Petratherm targeting 1,000 MW;

Solar Thermal

- Aquasol targeting 180 MW by 2013

Interest from others including

- Wave and ocean current generation
- Larger scale Solar PV

Embedded generation and demand side management are likely to increase in importance in response to higher prices

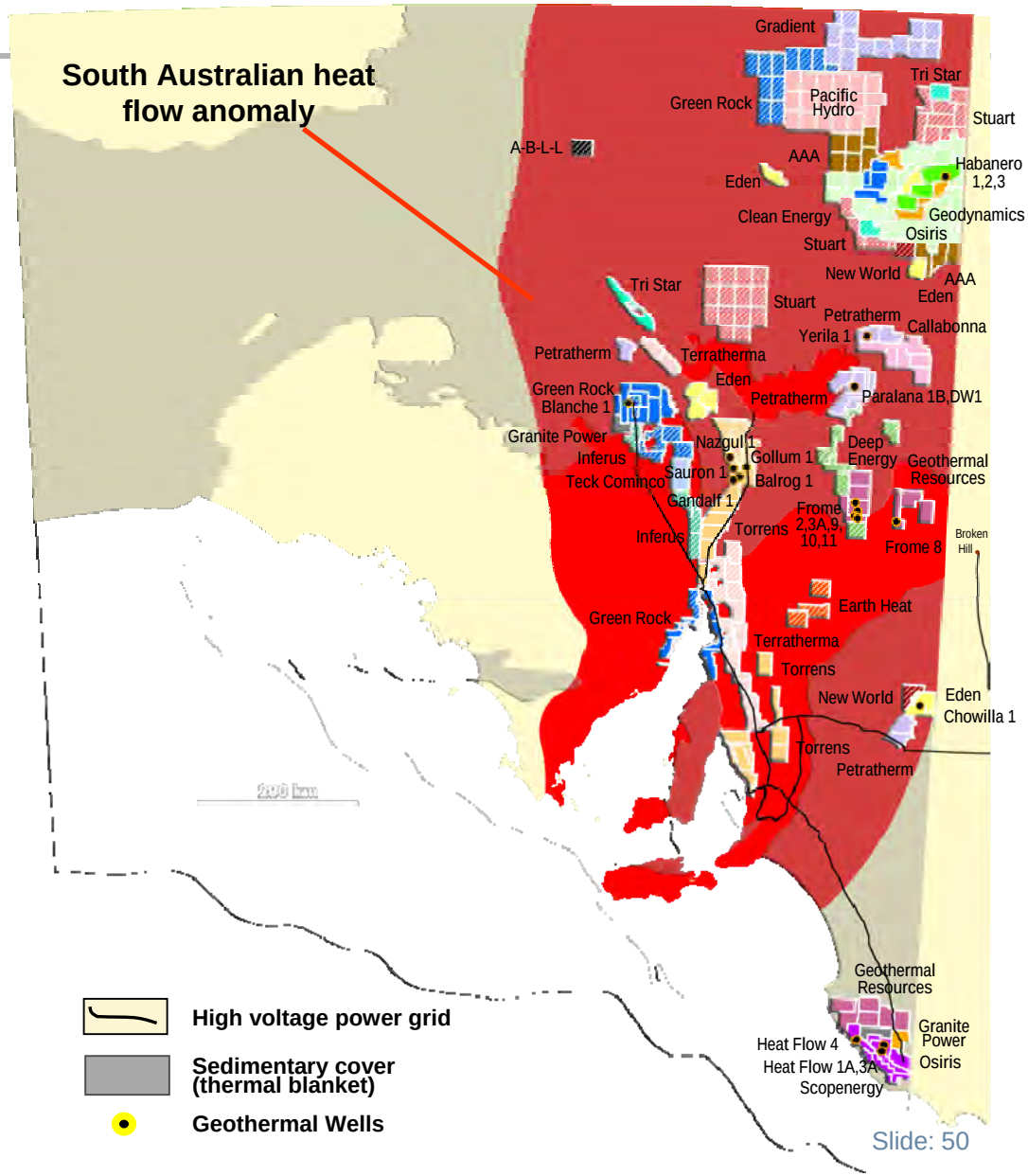
Geothermal

- Significant interest with:
  - 28 companies
  - 234 licences on variety of plays covering 120,000 km^2
- Over $700 million in exploration work programs
- Further spending for demonstration plants with the first, Geodynamics at Habanero, projected for operation in 2009

Geothermal

- ✓ Tri-Star Energy
- ✓ Clean Energy Australasia
- ✓ Osiris Energy
- ✓ Origin Energy ❋
- ✓ Callabonna
- ✓ Deep Energy
- ✓ Inferus
- ✓ A-B-L-R Joint Venture
- ✓ AAA Energy
- ✓ Earth Heat
- ✓ New World Energy
- ✓ Stuart Petroleum ❋
- ✓ Geodynamics❋
- ✓ Petratherm ❋
- ✓ Geothermal Resources❋
- ✓ Green Rock❋
- ✓ Torrens Energy❋
- ✓ Eden Energy❋
- ✓ Scopenergy/Uranoz-Panax❋
- ✓ Pacific Hydro
- ✓ Teck Cominco❋
- ✓ Granite Power
- ✓ Gradient Energy

❋ Public Share-Listed



Other Carbon Neutral Options

- Across the NEM we expect to see investment in developing other renewables including;
  - Biomass
  - Wave
  - Solar thermal
- Significant investment in the development and demonstration of carbon capture and sequestration in Victoria, NSW and Queensland
- Lowest cost overall development across the NEM is needed to efficiently meet climate change and renewable energy objectives

Improved supply-demand situation

Supply demand balance

The supply-demand balance has improved since 2008 APR

- SA forecasts for summer 2009/10 are 30 MW less than those forecast last year due to the downturn
- Victorian forecasts are for summer 2009/10 are 325 MW less than those forecast last year
- Some additional generation has or is expected to be completed by summer
- Supply-demand balance for SA on a standalone basis is positive under the base case for 3 years and for 4 years for SA/VIC

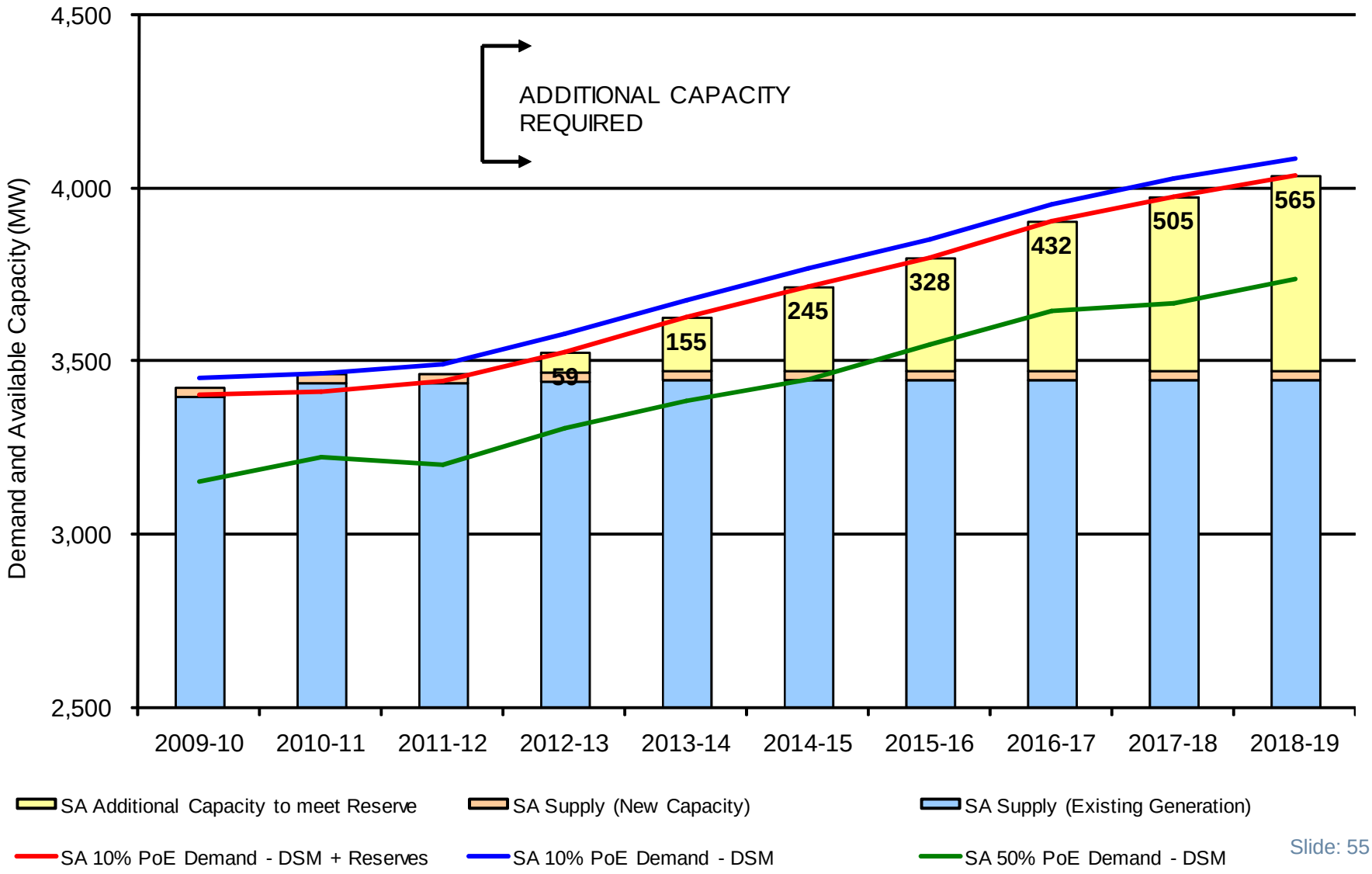
Generation in SA

Period	Summer 2008-09	Summer 2009-10	Winter 2010
Conventional Thermal Generation	3,208	3,409	3,641
Wind Generation (installed/firm)	740/22	868/27	868/131
Total for the Supply Demand balance	**3,230**	**3,436**	**3,772**
Non scheduled non wind	120	120	120
Demand Side Participation	94	66	66

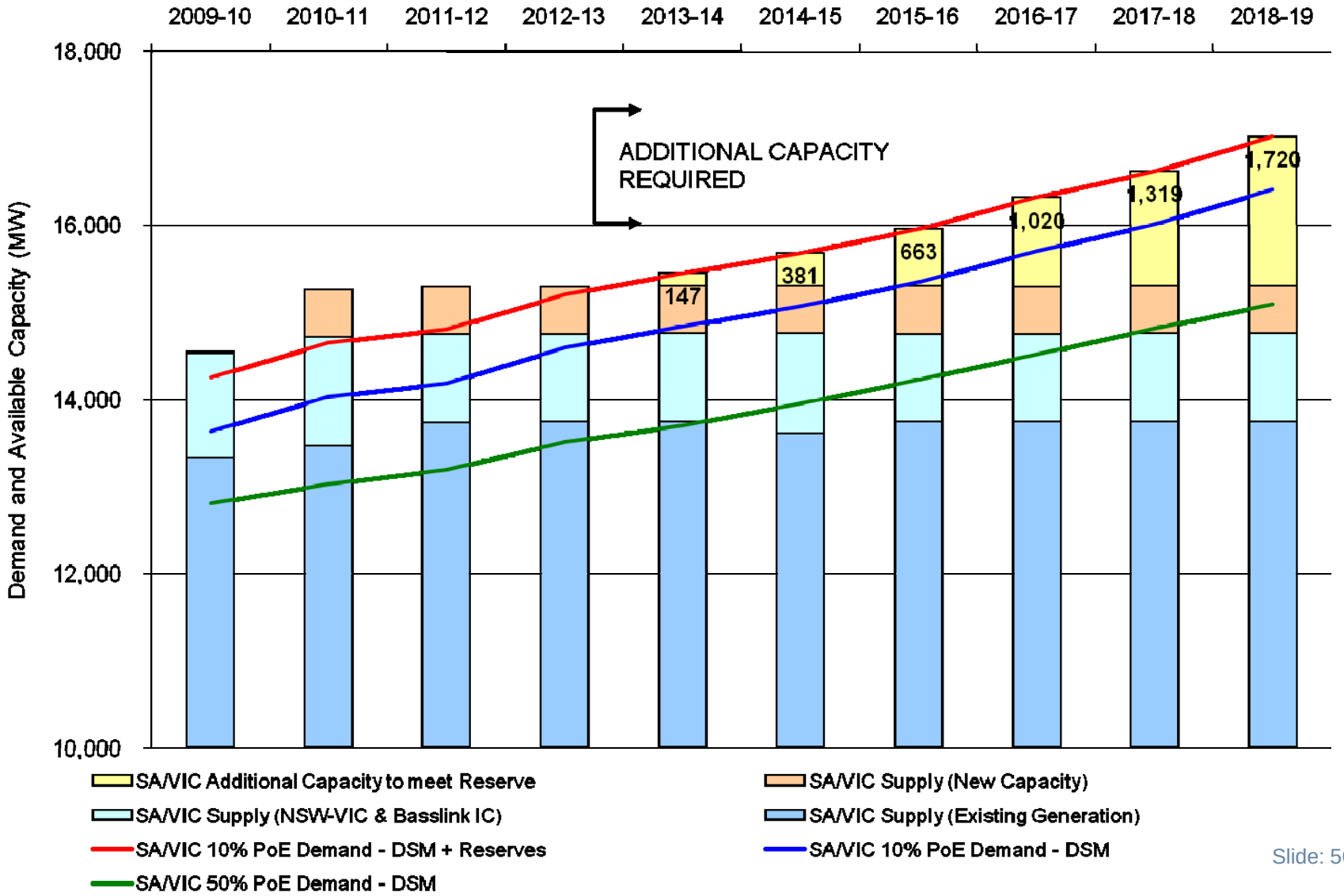
- New Generation (target completions EOY 2009)
  - AGL, Hallett Stage 2 – Hallett Hill (71 MW)
  - Pacific Hydro, Clements Gap (55 MW)
  - Port Lincoln Unit 3 (25 MW)

[1] This is made up of 105 MW of non renewable embedded generation, 2 MW of small hydro and 15 MW of biomass generation.

SA Supply-Demand Balance



SA VIC Supply-Demand Balance



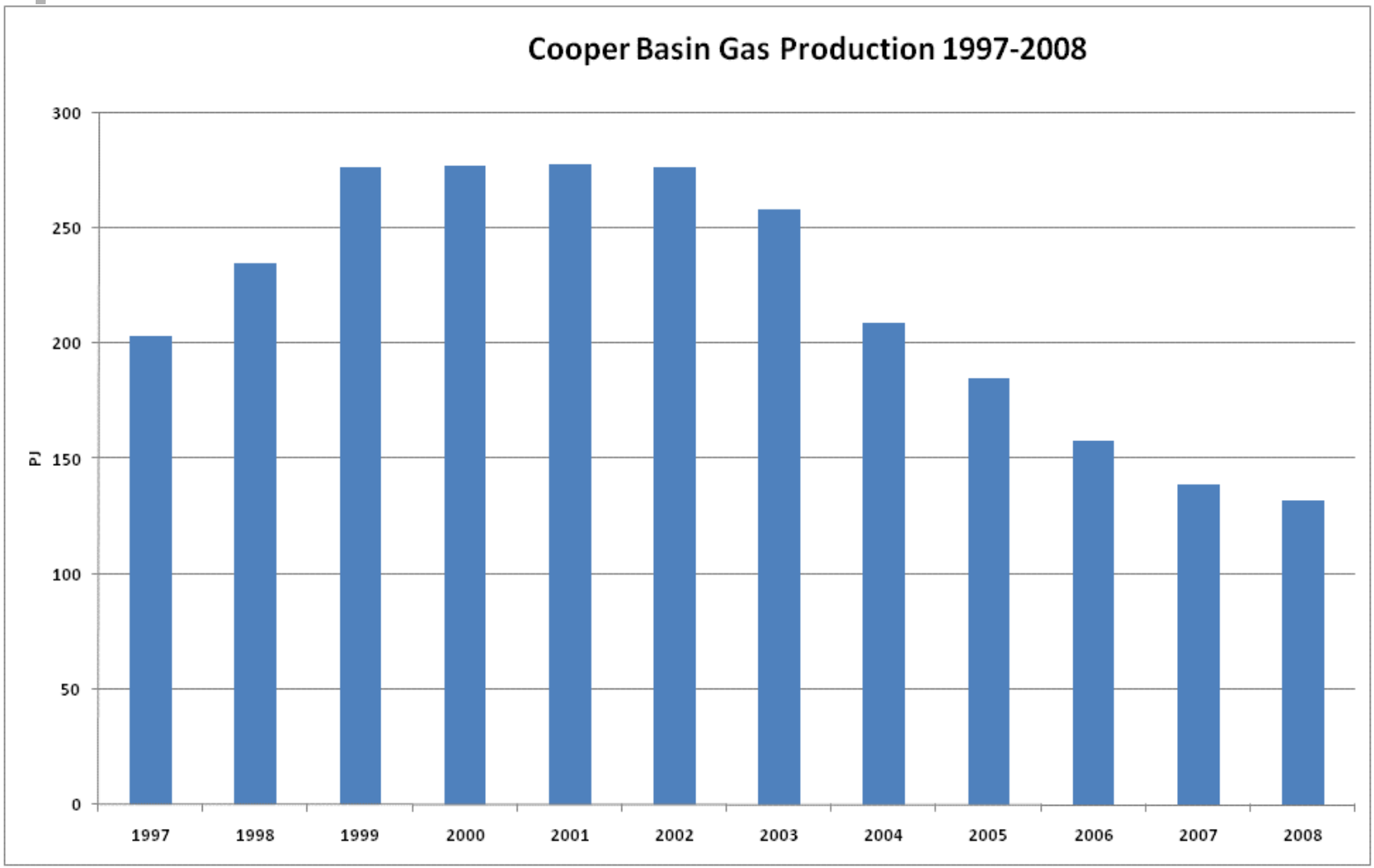
Supply-Demand Balance

- The positive supply – demand outlook on the base case are subject to a range of uncertainties including the timing and extent of the proposed emissions trading scheme
- High case would grow demand faster and quickly erode reserve plant margins
- Gas supplies appear adequate to underpin reliable supply

SA Gas Supply Situation

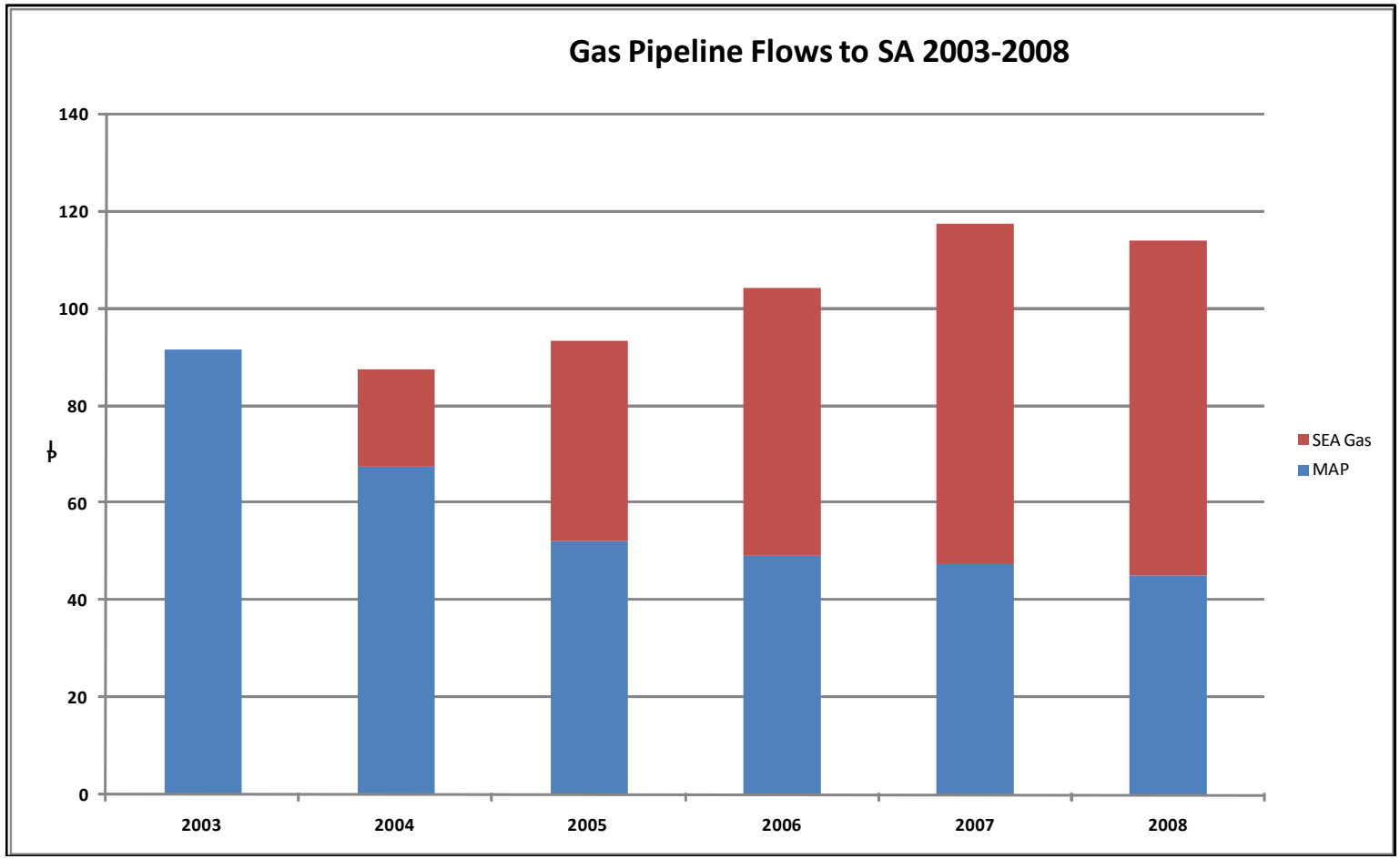
- Adequate reserves to 2015 with existing P and 2P reserves and to 2025 - with “known” additional reserves
  - Moomba production in decline
  - other fields adequate capacity in P and 2P and Resources
- Companies operating in eastern Australia now have over 26,000 PJ of Proved and Probable (2P) gas reserves, up from 16,200 PJ in the last APR
- CSM growing quickly although plans for export are also advancing

Cooper Basin Production



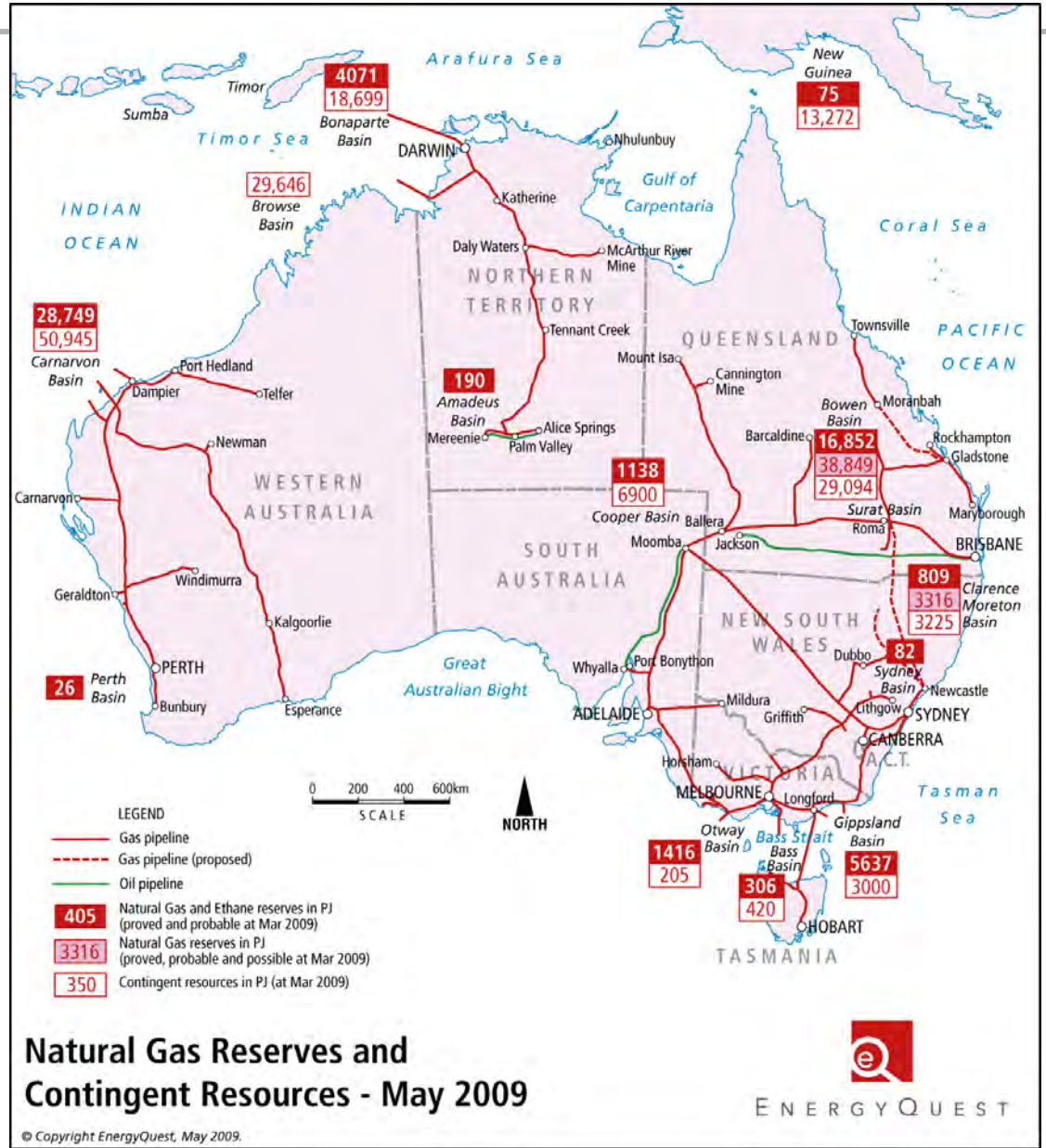
Source: EnergyQuest

Growing gas imports to SA



Australian Gas Reserves

Australian Gas Reserves



SA Gas Supply Situation

- Processing facility capability adequate now
  - expansions likely in future
- Pipeline capacity adequate for now
  - with the completion of the QSN Pipeline between Ballera in south-west Queensland and Moomba in South Australia, CSM is now being transported directly to southern markets,
  - additional pipeline capacity to access CSM is under consideration
- Storage likely to become an issue with more volatile gas demand

Coal Supply Situation

- Accessible coal reserves at Leigh Creek limited
- 10 - 15 years remaining life
- Alternatives are being explored including
  - other local deposits near Leigh Creek mine
  - other known South Australian resources
    - Lochiel,
    - Bowmans,
    - Lake Phillipson or
    - Lock
  - NSW coal transported to Port Augusta

Network issues

Network issues

The network is required to:

- maintain power quality and security standards;
- meet the connection point reliability standards set out in ESCOSA's "Electricity Transmission Code"; and
- provide power transfer services where it is cost effective to do so

Reliability performance assessment

- The Planning Council has undertaken a worst case assessment of the ability of the transmission network to meet the reliability standards;
- The transmission system performed well under last summer's heatwave conditions;
- However our worst case analysis highlights several areas in the network where performance to standards over the next few years relies upon planned network projects.

Reliability performance assessment

Important projects currently being progressed include:

- CBD/City West project
- Mt Barker 275/66 kV sub-station development
- Templers 275/66 kV sub-station development
- Ardrossan West upgrade and Kadina East reinforcement.
- Whyalla/Cultana upgrade

Reliability performance assessment

- Reliability and security in some areas is maintained by embedded generation or network control schemes;
  - such schemes can be a very efficient way to meet network demands but involve some complexity;
  - ElectraNet have undertaken to better document the operation of each of these schemes to provide a better understanding of how they act and interact
- Under some scenarios, reliability in the Riverland and mid-north is dependent upon an optimistic view of the transfer capability of Murraylink at peak demand.

Corridor transfer indices

Corridor transfer indices have again been calculated in this years APR

- The indices for the **north distributor** have decreased from those calculated last year, primarily due to additional generation connected to the underlying 132 kV system
- The negative sign on the indices indicate that under at least some conditions, there will be congestion on the corridor
- The difference between the two indicators demonstrates that there is scope to improve transfer capacity through the corridor

Corridor transfer indices

- The indices for the **south distributor** have also decreased from those calculated last year, primarily due to demand growth
- The negative sign on the indices again indicates that congestion is likely on this corridor from time to time
- Congestion on this corridor should be viewed as separate to any constraints imposed on flows through Heywood substation although both are presented as interconnector constraints in the market

Potential network enhancements

- The Planning Council have been examining the potential to reduce constraints in the network by segregating the 275 kV network from the underlying 132 kV system
- This is considered likely to be of value to transfers on the north distributor and the south distributor and to longer term development of these transfer corridors
- ElectraNet have undertaken to further consider such an approach

Potential network enhancements

- Several other relatively low cost upgrades to transfer capacity are available in some areas
- These network augmentations are not, however, required to meet reliability standards as supply security can be maintained albeit with constraints on generators
- To be justified for construction, any such augmentation would need to demonstrate that it delivers net market benefits over the planning horizon

Future network augmentation

Drivers for network augmentation

- In the short to medium term, we expect continuing constraints on transfers from the southeast and increasing constraints through the mid-north
- For additional wind generation in the mid-north:
  - connection point location and particularly connection point voltage will be critical
  - 275 kV injection to the Barossa, real time rating of critical lines, load growth in the north and some network control schemes could help
  - connecting parties will need to assess their likely congestion risks

Impact on Networks

- Some modest improvements are possible at relatively low cost
  - major mitigation of congestion will be expensive
- High levels of wind penetration will have an impact on the market and the power system
  - major interconnector upgrade may be a solution
- Longer term demand for network augmentation and extension to access more renewable energy resources:
  - Wind in the southeast, Mid-north and Eyre peninsula
  - Geothermal prospects in the far north

Impact on Networks

- Greenhouse policy will also have a marked impact on networks across the NEM
- Change of generation mix will change the use of the network and bring new demands on its development
- Strong growth in wind generation is also forecast in Western and Central Victoria and south-western New South Wales
- Major interconnector upgrades need to be considered on a NEM wide basis

New network and market model

- The Planning Council has been developing a national electricity market model which incorporates a simplified network model
- Model requires:
  - high level network model
  - locational representation of generation
  - locational representation of demand
  - new reduced set of constraints
- Model is now operating

National Transmission Planner

- The Planning Council's experience demonstrates the need for the new National Transmission Planning function
- NTP function will be part of the new Australian Energy Market Operator
- The Planning Council will be merging into AEMO on 1 July 2009

The Australian Energy Market Operator

AEMO transition

- AEMO will be required to continue to provide some South Australia specific advisory services currently supplied by the Planning Council
- Other functions will shift to Government including the role of the responsible officer and Jurisdictional System Security Coordinator
- ElectraNet will publish an APR similar to that they currently produce

AEMO transition

- ESIPC office will become the South Australian office of AEMO
  - phone numbers and email addresses will change
  - an information sheet is available on AEMO with a list of new contact details
- ESIPC website will close but information, including this year's APR, will be available on the new AEMO website from 1 July
- AEMO wishes to ensure an ongoing level of engagement with South Australian stakeholders