

4th Annual
Australian Gas Markets Conference
Sydney, 2009

**Gas for low carbon emission power on the
east coast – a pipe dream?**

Jim Snow, Director

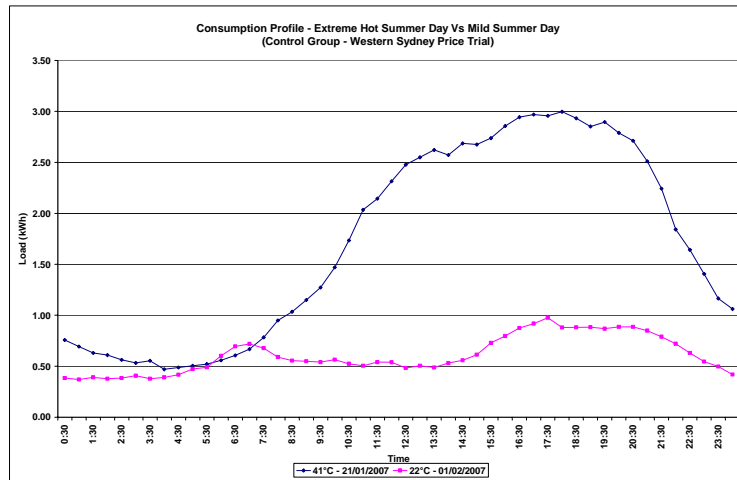
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Major Drivers of Change in the Energy Industry

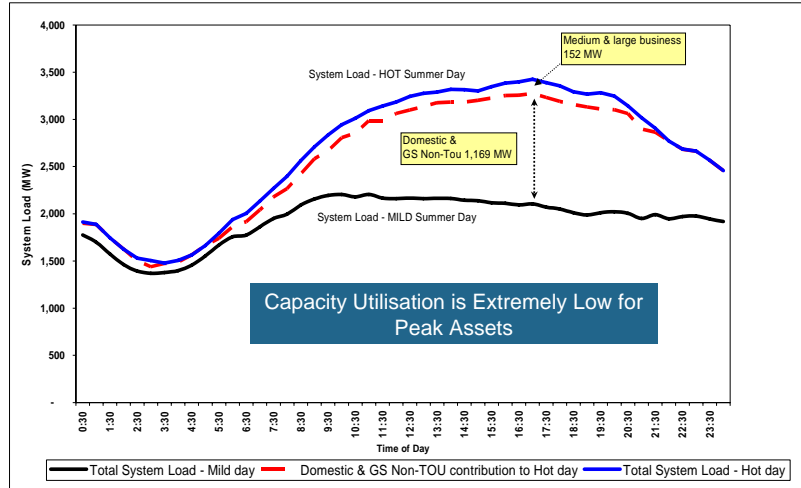
- **Electricity System Load Factor Decline**
 - Price Impacts
 - Air Conditioning driver
 - Demand Response
 - Load Forecasting
 - Asset Utilisation
- **Carbon Pollution Reduction Scheme (CPRS)**
 - Greenhouse Intensity & Permit Trading and Importation
 - Transport
 - More Demand Response
 - Funding Issues and Opportunities
- **National Renewable Energy Target (NRET)**
 - 5 fold increase – arbitrage, funding?

System Load Factor Decline

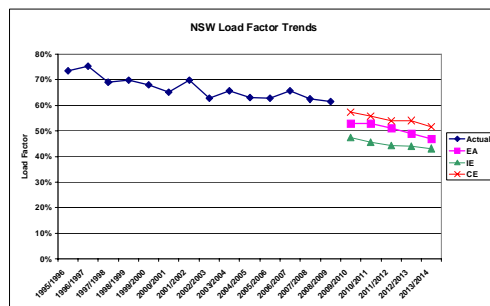
Air Conditioning – Western Sydney



Extreme Temperature Impacts Growing

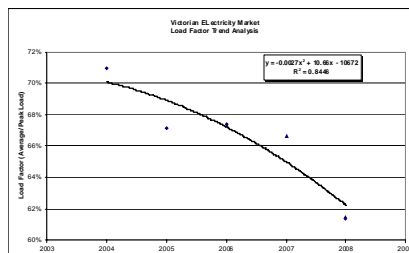


Load Factor Dropping in All States



This is driving up the underlying electricity price :

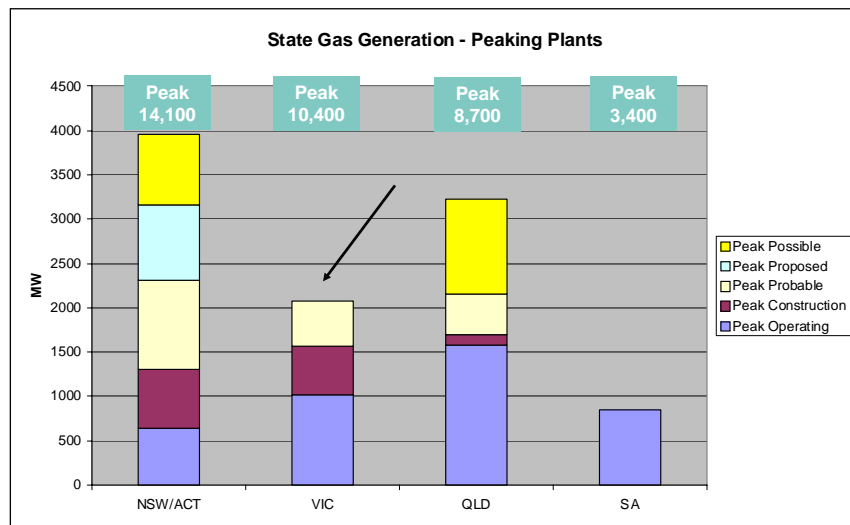
- Increases in LRMC's
- Dramatic Increases in Network Charges
- Increases in NEM Averages as more peaking plant is used
- Load forecasting – EVT, CBD Issues



Rush to Peaking Plant – Gas Fired

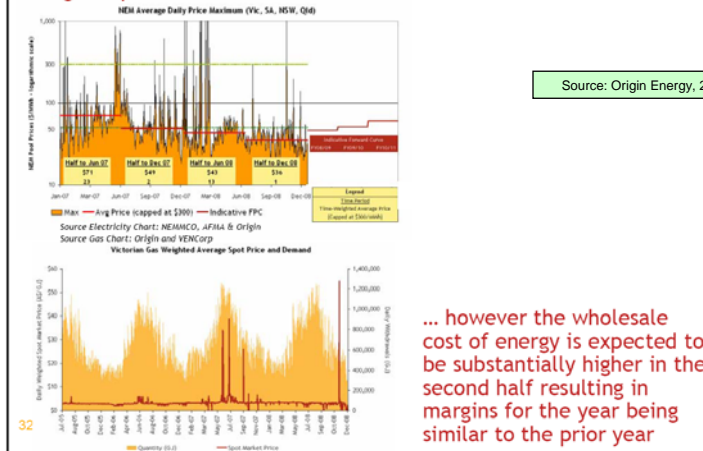
- Many firms are building large gas fired peaking plant – OCGT's
- Retailers are vertically integrating for **peak insurance** >\$300/MWh
 - Origin are using their own gas and contracting plant output – lot to protect as volatility rises
 - TRU and AGL doing the same – major rush on with something like 2 to 3,000 MW+ under way
- BUT this is not a greenhouse response...not yet anyway
 - A renewable energy peaker would be ideal and if it can be scheduled even better – solar has a chance but will it get up?
 - AND drive for renewables expected to make the situation worse because it “free rides” on the system (or maybe it won't?) they are not firm or able to be scheduled in most cases and competes with other base load generation while still requiring power stations that can be scheduled to cover when not available
 - The “wind issue” which will be covered later

Peaking Generation



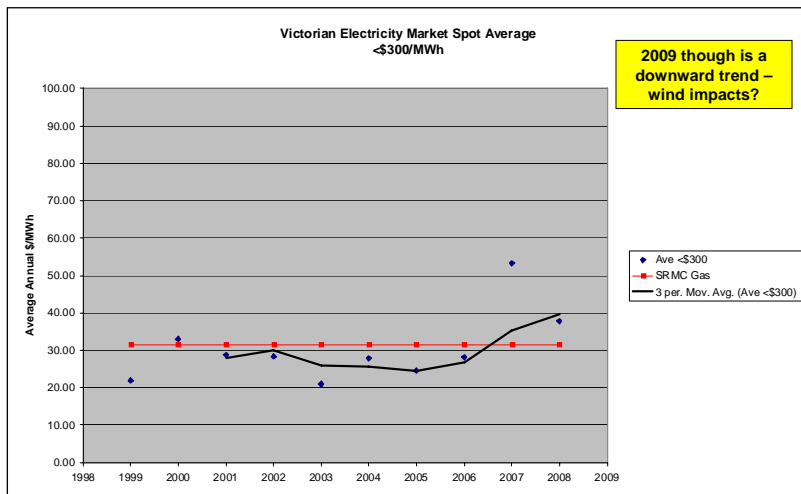
Wholesale Power - A Rising Market?

Tariffs were higher and purchasing costs of electricity were lower than in the prior corresponding period resulting in significant margin expansion...



Source: Origin Energy, 2009

Wholesale Power – A Rising Market?



Demand Elasticity?

- Economics says market demand will reduce if the supply price increases
 - The basis of much of the ETS – Garnaut
- Elasticities estimates do exist for Australia (NEMMCO)
 - -0.25 for Residential, -0.38 for Business
 - 25% increase in price – 6% to 10% decrease in volume
 - EnergyAustralia forecast 65% increase.....and GFC fallout
- BUT peak demand growth trend unlikely to change for a while
 - Hence why we have a decreasing load factor
 - This inevitably drives up **retail prices** and will become a major political and commercial issue (“death spiral”), and
 - Peak forecasting becomes highly uncertain – latent load?
 - EVT Issue - Melbourne summer outages, Sydney?
 - High prices, falling volumes and uncertain outcomes on hot days?

CPRS Issues (Power)

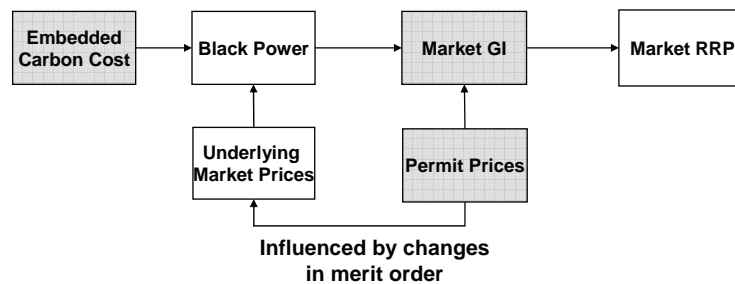
- Will inevitably ALSO increase the price of electricity
- Will change the merit order of generation plants
 - Lot of gas peaking plant being constructed
 - Free permits are not enough to stop major change occurring – just slow it down a bit – maybe (need to ask the Banks – recent AGL announcement Loy Yang)?
- Major modelling Issues – be really careful here
 - Assumptions on gas availability and price?
 - Debt Providers and Impairment Impacts?
 - Demand Side Assumptions?
 - Retailer Assumptions – Greenhouse Intensity Issues?

CPRS Issues (Power)

- Innovations are coming
 - Keep an eye on coal gasification – lowers Greenhouse Intensity (GI) – and lower GI is critical - will discuss later
- Infrastructure issues are very challenging
 - Mainly relates to gas and electricity transmission
 - This will get much worse with the NRET
- CPRS may also have a major interaction with NRET
 - Arbitrage opportunities between schemes
- This is particularly important for large energy users
 - Lot of strategies for Industrial and Commercial operators to avoid pain and win market share – there may be a big shakeout in exposed businesses

What Value Carbon – Power Generation

- The real impact relates to 3 key parameters:
 - The market Greenhouse Intensity (GI) – CO_2/MWh ,
 - The anticipated price of tradeable permits, and
 - The cost of embedded carbon in the generation fuel
- What Value Carbon – carbon netback mark-to-market?



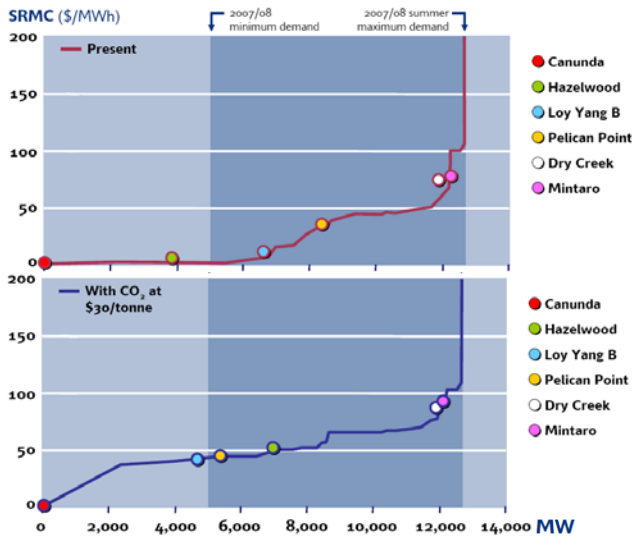
CPRS GI – Vic Example (Worst Case)

	MW	G.I. (tCO ₂ /MWh)	SRMC vs. CO ₂ permit price			
			\$0/tonne	\$10/tonne	\$20/tonne	\$30/tonne
Loy Yang A	2,200	1.2	8.00	20.00	32.00	44.00
Loy Yang B	1,100	1.2	8.00	20.00	32.00	44.00
Hazelwood	1,600	1.4	8.00	22.00	36.00	50.00
Yallourn W	1,480	1.4	8.00	22.00	36.00	50.00
	6,380	1.3				
NG-fired CC	450/550	0.4	33.00	37.00	41.00	45.00

This diagram is actually fundamental to the issue
 Long term average of 0.8 targeted – benchmark
 This is the key to assessing fuel value
 Carbon mark to market for fuel suppliers by
 technology and region ?

*Can CCGT Compete?
 At what Carbon and Gas Price?*

Carbon Impacts on Merit Order



Source : International Power, 2008

More Demand Response?

- They will exhibit the price based response outlined, but
- Firms that are directly covered will also have to for the first time manage their own greenhouse emissions legally and commercially
- They will have compulsory reporting with associated governance requirements,
- Have to lodge plans to reduce emissions, and
- Buy and acquit permits
- This is a massive behavioural change
- Potentially restructure of industry as well – close, out-compete?
- Big driver for self generation using gas or renewables or any other low GI fuel

Funding Issues Also Abound

- Impairment of existing assets
 - Banks the real deciders on who plays and who pays
- Debt is scarce – may not last but dry right now
- It is the time to have equity and any good banking lines
- Who has the money for this market – key issue now?
 - Cash generators like Origin, AGL, etc.
 - Chinese – some money flowing
 - Some large energy consumers?

NRET

- The targets are ambitious by any measure
 - 20% by 2020/30
 - 45,000 GWh vs. 9,500 GWh - 60,000 in total
 - Phase out by 2030 - CPRS?
 - Now a \$65/MWh Penalty level
- What will make up this mix - wind, solar, biomass, geothermal?
- How will it be funded?
- Can it all even be built – 30% LF = 15,000 MW + by 2020/30?
- Major opportunities here for new players, but
 - Can they find the money to participate
 - Again a buyers/funders market and highly bankable contracts needed
 - AGL say they are going big here, Origin also building up

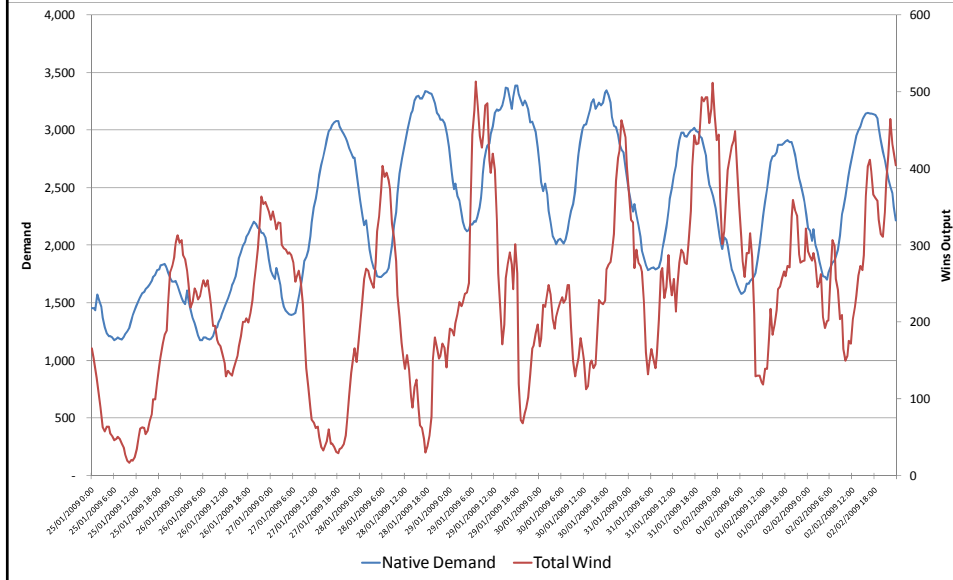
NRET

- Major issue will be ability to arbitrage CPRS market
 - REC's plus market price for the black – this is a major "market distortion"
 - Large element of double dipping – if this is allowed but seems to be what will happen
- Lot will also "free ride" as price takers
 - Wind for example is not dispatched and will eat into base load and cause major changes to the market if it becomes as big as anticipated
 - Evidence is this build up crashing/will crash NEM prices – for a while, then
 - Progressively will need fast response plants if wind takes the lions share of the NRET (as expected),` and
 - May also see wind being constrained off by AEMO for supply stability?
 - May give rise to new price pressures from "ancillary" support

January 2009 Heat Wave in SA

Note Lack of Overlap?

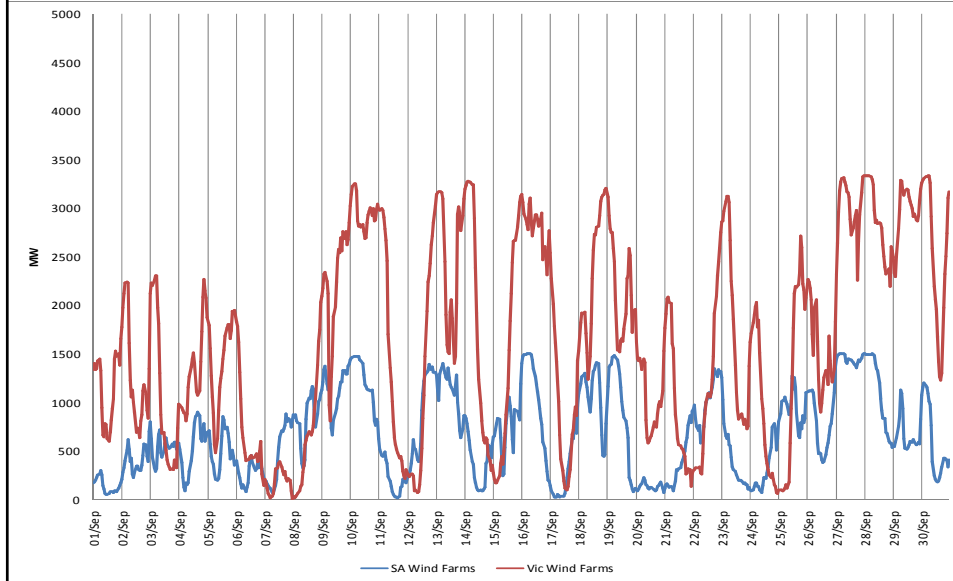
David Swift, AEMO presentation ACCC Conference July 2009



5000MW Example (modelled)

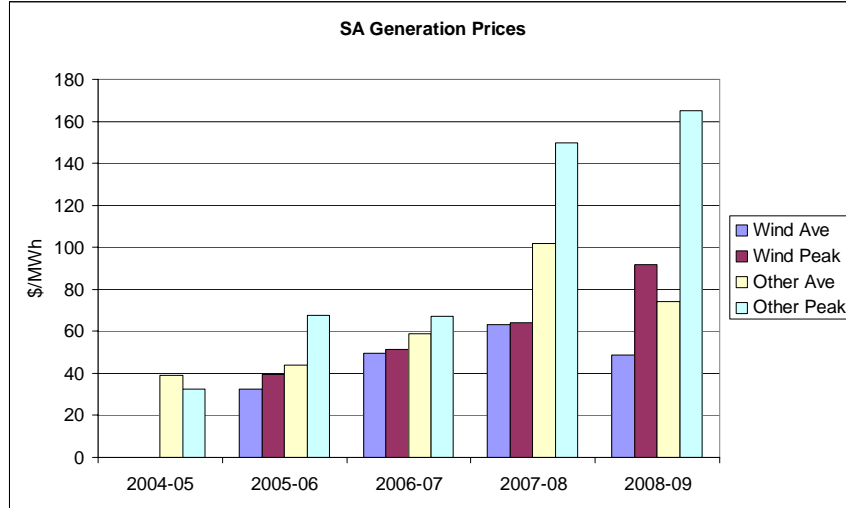
SA and Vic Wind farms - Note degree of overlap?

David Swift, AEMO presentation ACCC Conference July 2009



SA Price Trends?

Based on: David Swift, AEMO presentation ACCC Conference July 2009

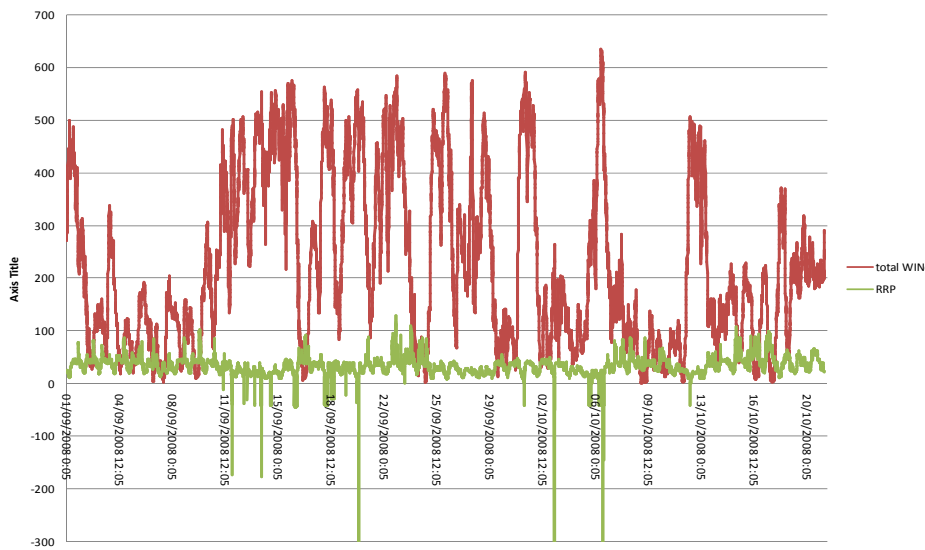


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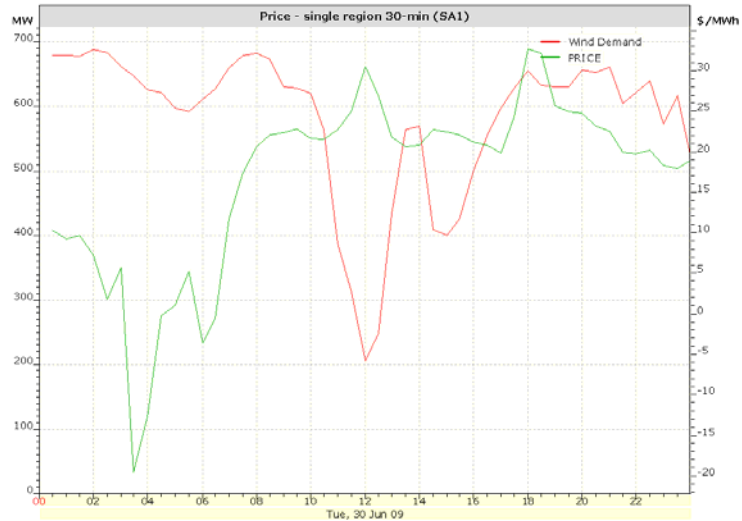
Negative Price Events

David Swift, AEMO presentation ACCC Conference July 2009

negative price dispatch intervals since September 08



Over-speed Event in SA on 30 June



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Relevance to Gas

- It is generally accepted that gas fired plant are the best at managing load fluctuations
- So will we see the OCGT plant used for more reasons than simply market price caps – auxiliary supply, more medium running because of wind
- And the question remains can CCGT's compete in the market?
 - Is the gas price stable enough or can it be linked to power markets, and
 - Can gas be purchased long term to back a CCGT plant at all now?
 - What about the LNG stampede – gas bankers?
 - Advent of Retailers with equity gas - how will this play out?
 - Do we have the pipelines to cope?



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Gas Availability on the East Coast?

- Eastern Australia currently has gas “limitations” for power gen that are becoming apparent
 - Santos has gas but no power gen deals being announced – is though permitting Shaw River Power Station (1,500 MW CCGT) using own gas (and looking for a partner?) – is 2P on books enough to support in south east – need circa 1,300PJ? Cooper Basin? Gunnedah? Queensland?
 - Origin is very short in the south – focused on peaking plant to cover retail positions with OCGT and to gain from “wind issue” – move onto mid merits and CCGT later – do they have the gas (economically) – have announced capability to draw 60PJ/year from Queensland via SA – forgoing LNG value – drilling more offshore SA and Vic?
 - Bass Strait has 2,000 PJ of 2P left for sale but again no longer term deals announced – everyone selling short?

Gas Availability on the East Coast?

- Price Arbitrage issues abound and as of today no old style CPI linked long term contracts being sold (to underpin a CCGT project for example)
 - Now that was not in the modelling assumptions and has interesting implications
 - Working on gas/power long term commodity linked hedge (with LNG link just for fun) – hard yards
 - Power netback deals – Arrow in Queensland, equity gas arrangements in-house?

Gas Availability

- But we have all this CSG I hear you say?
 - In Queensland most of it is currently earmarked for LNG developments – Origin has some to export interstate – but otherwise none to be had
 - Everyone busy doing 2P reserve proving – billions \$ being spent
 - Claim could be 250,000 PJ – 10 x Bass Strait – may be a timing issue?
- How much LNG?
 - Each train of 3.5 mtpa requires about 6,000PJ of reserves
 - Origin/Conoco Phillips – 14m tonnes/year - needs a 1,000 PJ/year pipeline (48 inch) and 24,000 PJ of reserves
 - Santos/Petronas – GLNG – 10 mtpa – another say 17,000 PJ
 - BG/QGC/AGL – 12 to 15 mtpa – another say 24,000 PJ
 - LNG Ltd (Golar/Brand/Arrow) – 1.5 mtpa – 1,200 PJ
- Yep – circa 50,000 PJ.....no wonder they are busy?

Gas Availability

- NSW CSG?
 - Eastern Star Gas, Santos and AGL (Sydney gas) in NSW – Santos also have ownership in ESG
 - The key issues here are proving reserves and the distance to markets without any pipelines – reserves come with markets
 - ESG Has announced MOU's up to 1,300 PJ and busy trying to prove this up by years end (talk earlier)
 - How much gas in NSW that is useable – 6,000 PJ C3 ESG, 17 TCF, more?
 - Pipelines?
 - LNG development at Newcastle?

LNG Prices Crash

LNG Outlook

Will CSG make power?

- Economic theory says we will eventually have a clearing price that is more rational for the LNG market – (gas bankers?)
 - Recent prices driven by lack of supply/excess demand
 - This is changing – Chinese doing deals for new projects with what is reported to be LNG to Oil commodity linked prices?
- Power netback prices may though be attractive in the end
- BUT long term GSA's are tight at the moment – and the game has changed with groups who are happy to sit on reserves and lock them up for LNG long term – and paid BIG money (\$1.78/GJ 3P)
- AND major issue with grid infrastructure
 - Pipelines will be required to get to southern markets – and pipeline businesses risk adverse with GFC
 - Electricity transmission may get the gig as it is a “common good” – market pays – but this is also a raging argument – especially for wind plants

OCGT vs. CCGT

- OCGT plant developments are tolerant to higher gas prices if aimed at a cap market
 - Fuel price capped by distillate and carbon prices have little real impact, and
 - They are not as sensitive to price resets which makes gas contracting easier
- CCGT's are very sensitive to both gas and carbon permit prices – affected more by well head sensitivities to markets and to new haulage pipeline costs, and
 - Very difficult to garner a long term bankable gas supply agreement at this time – this may well change but 15 year deals are hard to nail for large volumes
 - Retailer equity gas is also a new advent, and
 - There may end up issues about market concentration of upstream “basin” ownerships (retailer equity gas may well be a response to this)
 - Ongoing tension between large LNG sales and gas for domestic markets – will the east coast end up like WA in this regard?
 - Coal may well be very competitive to CCGT – wind may mean coal competes

OCGT vs. CCGT

- Means OCGT's good investment and CCGT very risky right now
 - Can always convert OCGT to CCGT if and when required (and if you can access gas)
 - May well end up running extensively as mid merit plant
 - Much greater separation between prices in the peak and off peak periods (big case for pricing reforms in certain areas such as networks)
 - Greater ancillary service payments – maybe some constraints on wind at certain times?
 - Major demand side responses to come?
- Gas supply for CCGT development will have to be extremely flexible in terms of prices and conditions and pipelines will need to provide flexible storage services – everything the gas industry does not want – but may well develop and embrace?

Oakley Greenwood – Thank You

Melbourne

Alan Rattray

Energy trading and risk management
Strategy advice
Analysis

Lance Hoch

Gas and electricity network and retail
Demand side expertise including energy efficiency
Climate change impact analysis

Stephen Thompson

Gas swaps and procurement
Gas & Electricity Trading
Energy Market Design
LNG
Gas haulage agreements
Power generation matters

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Business Strategy
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Energy project development
Network regulation
Energy Marketing
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Industry Restructuring

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Model development
Competition matters

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Gas/electricity interactions

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