

The Future Energy Market

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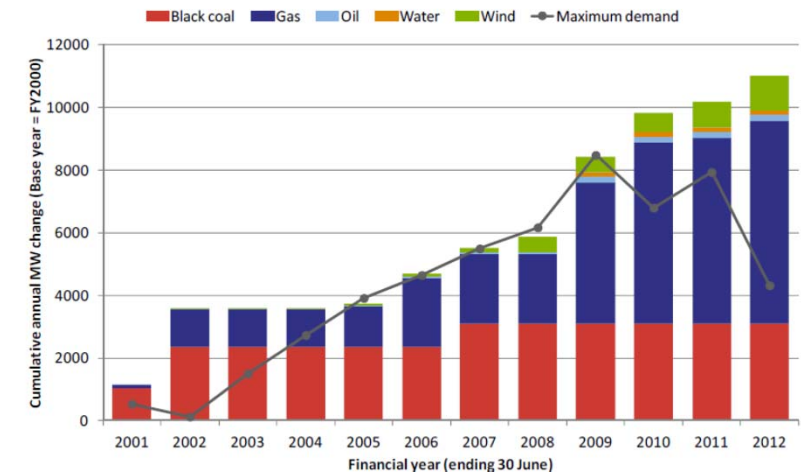
IPART: Regulation and Reform Presentation

August 11, 2012



Australia's power market issues -

- Technology is moving the dial and empowering the end user
 - User control (the internet)
 - Smart Grid
 - Solar (distributed energy), puts the power under the user's control
 - Solar storage at the household level is increasingly possible
- Environment
 - Electricity production is the single biggest contributor to global warming
 - Global warming is a big problem
 - Technology has answers
- Market structure doesn't stand still
 - Vertical integration, likely to increase but may not matter
 - Network competition?
- The problem for policy makers- how to get out of the way.
 - Network Pricing regulation at the expense of policy and planning development?
 - Network Pricing regulation hasn't worked anyway
 - Retail pricing regulation hasn't done much good. Prices in NSW higher than Victoria, used to be lower



Source: Frontier Economics

Europe hints at the future

- Renewables to wipe out 50% of profits
 - Half to 2/3rds central European generation EBITDA may be wiped out
- German renewables have crashed spot price and spreads in just two years
 - Solar is eliminating mid-day peaks
 - Wind is crashing night time spot prices.
- Source: UBS research, 19 July 2012

Europe: Renewables new capacity

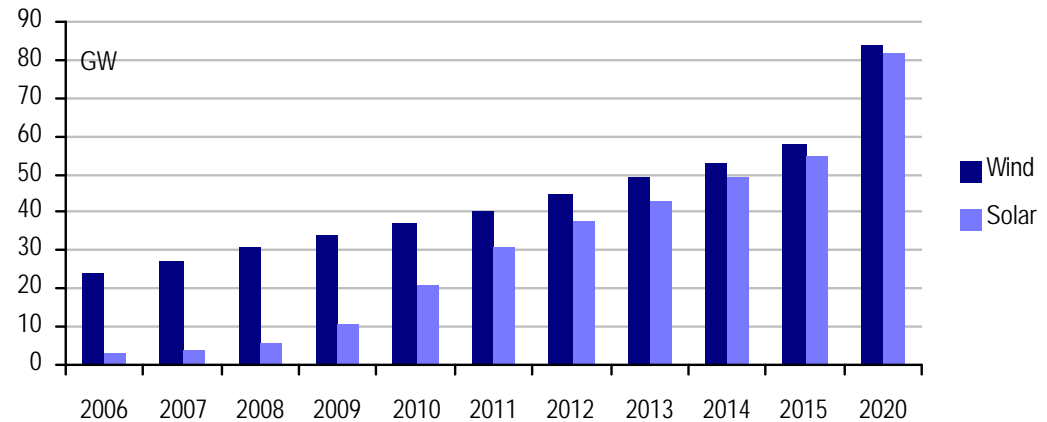
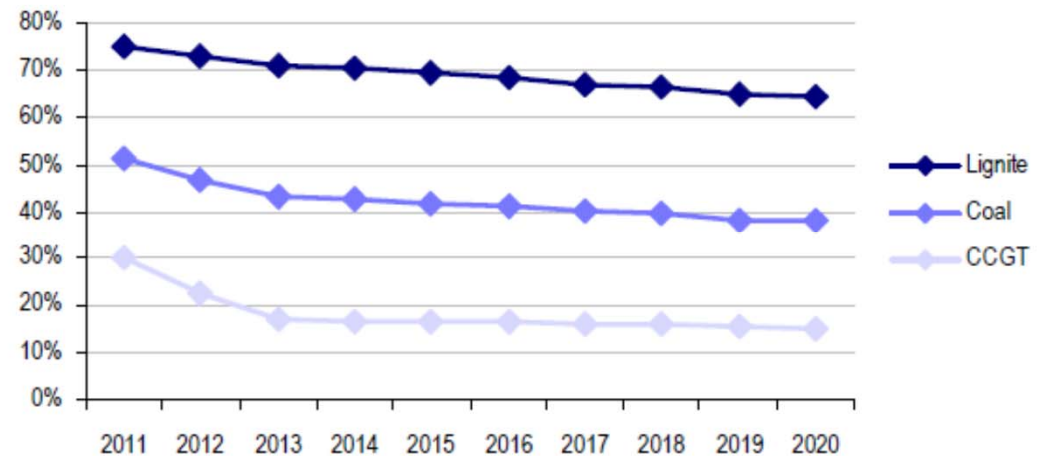


Chart 10: Load factors for thermal generation should fall despite capacity retirements

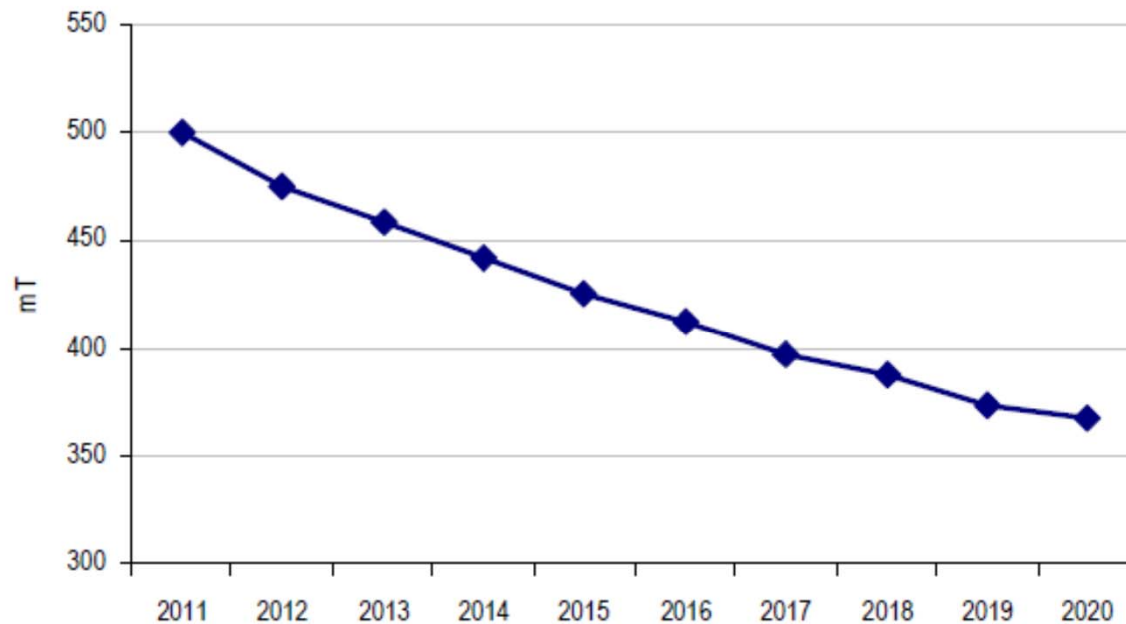


Source: UBS estimates

It works: Europe's Carbon output expected to fall

- Despite low carbon price. Carbon emissions forecast to fall faster than 1.74% target reduction rate

Chart 18: Carbon emissions from power sector should decline by c3.8% per annum

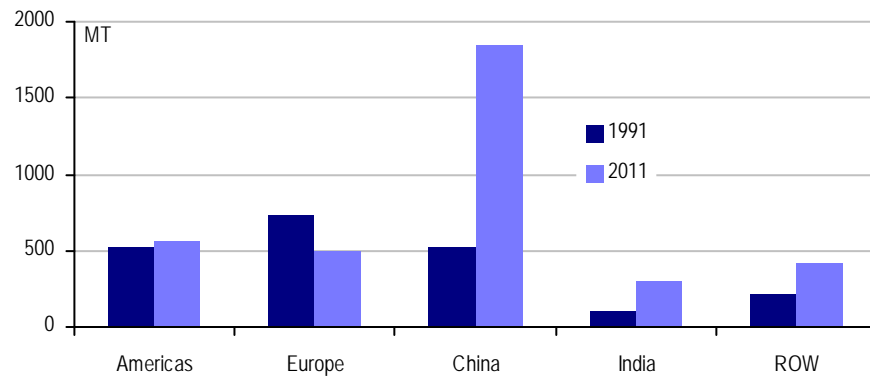


Source: UBS estimates

Global warming

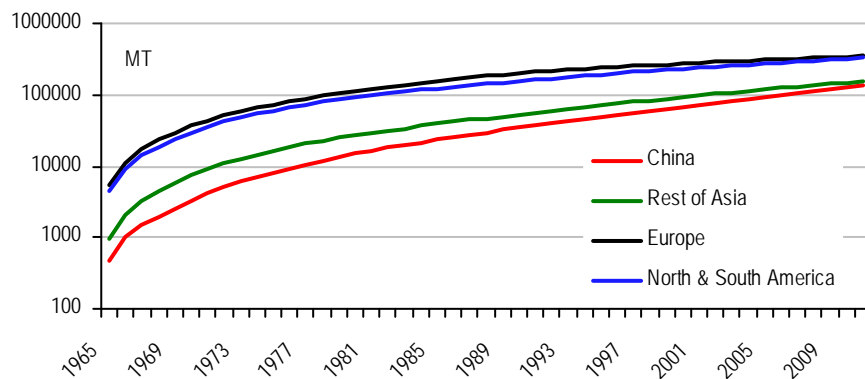
- Coal is the main problem
- Renewables – looking more like an answer

Global thermal coal consumption



Source: BP

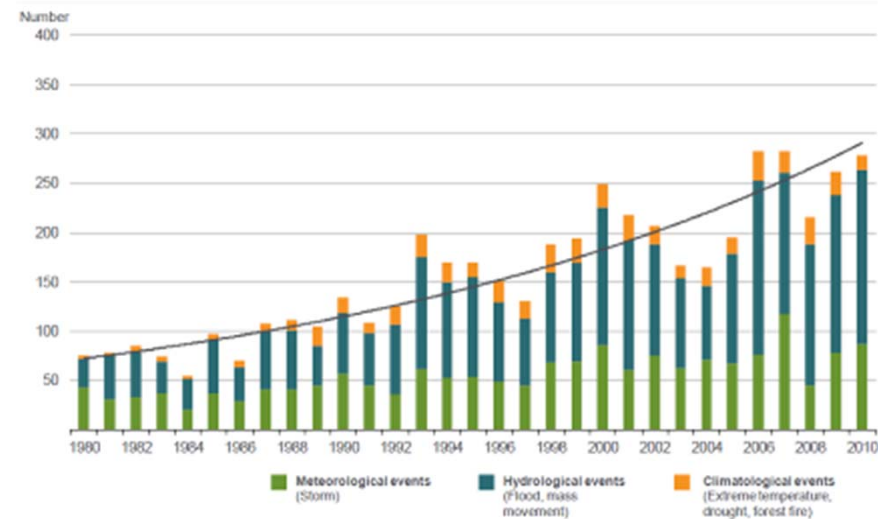
Cumulative carbon emissions



Source: BP

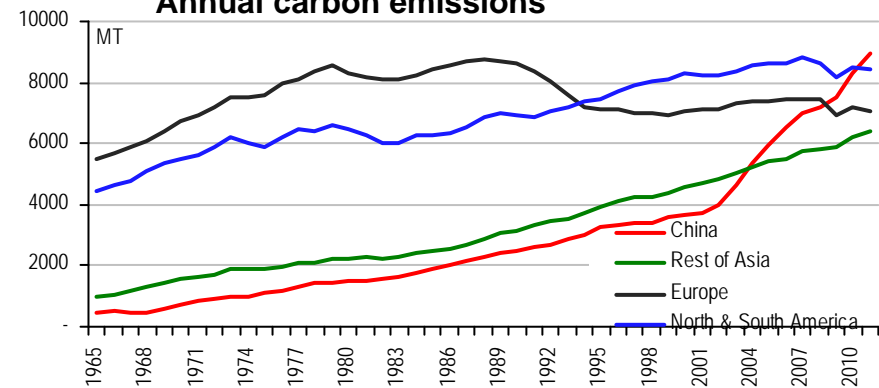


Weather catastrophes in Asia 1980-2011



Source: Munich Re

Annual carbon emissions

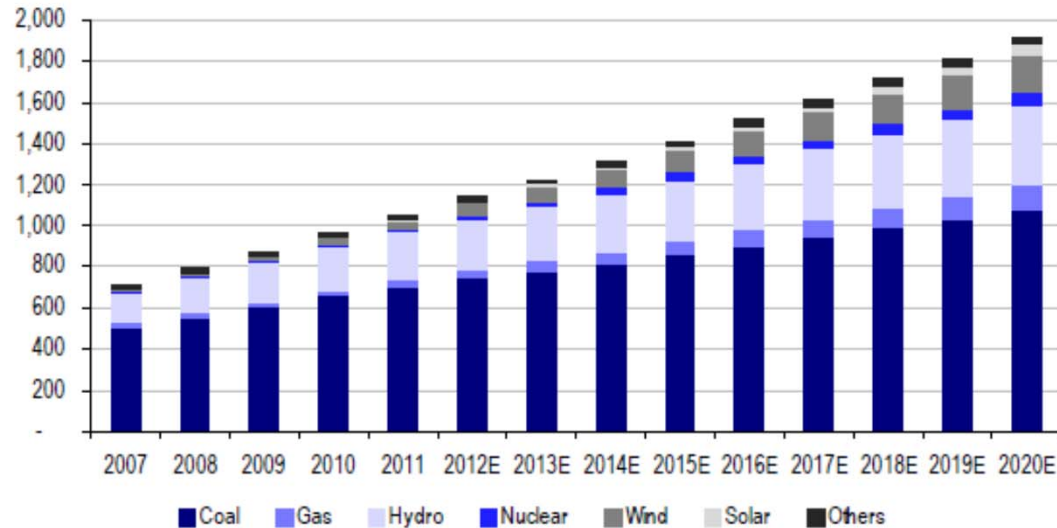


Source: BP

China – What are the limits?

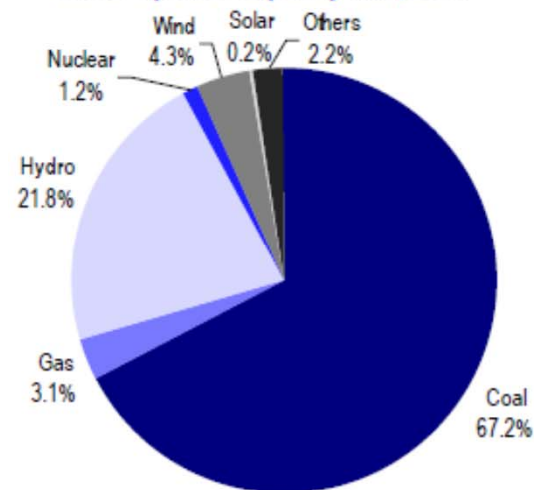
- Coal remains dominant 56% by 2020.
- Nuclear, gas, wind, solar slowly gain share

China's power capacity (GW), 2007-2020E



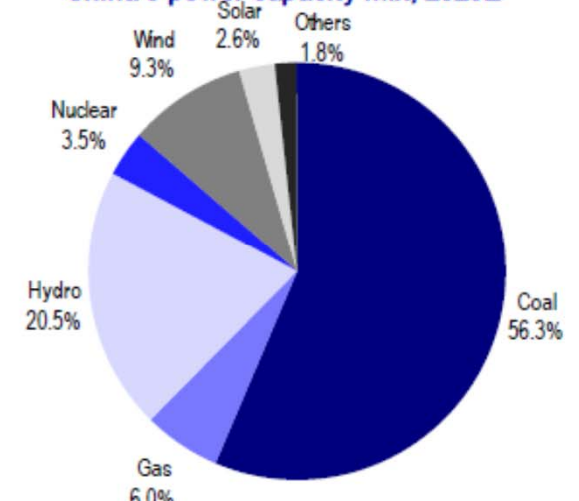
Source:UBSe

China's power capacity mix, 2011



Source: CEIC, NEA, CEC, UBS estimates

China's power capacity mix, 2020E

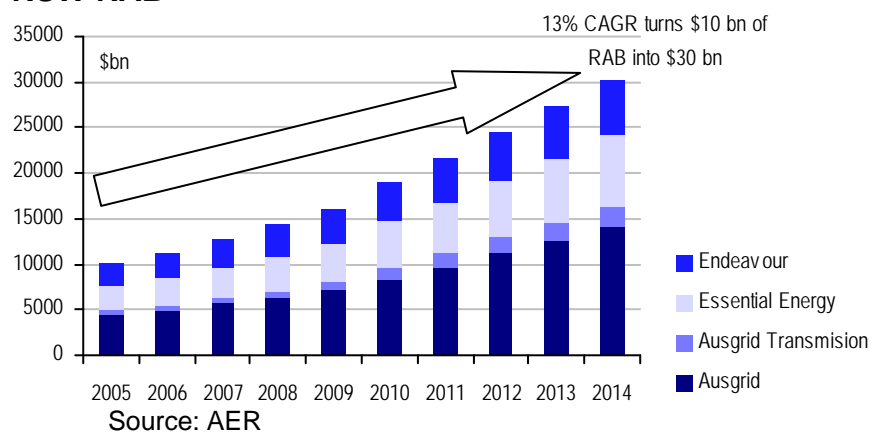


Source: CEIC, NEA, CEC, UBS estimates

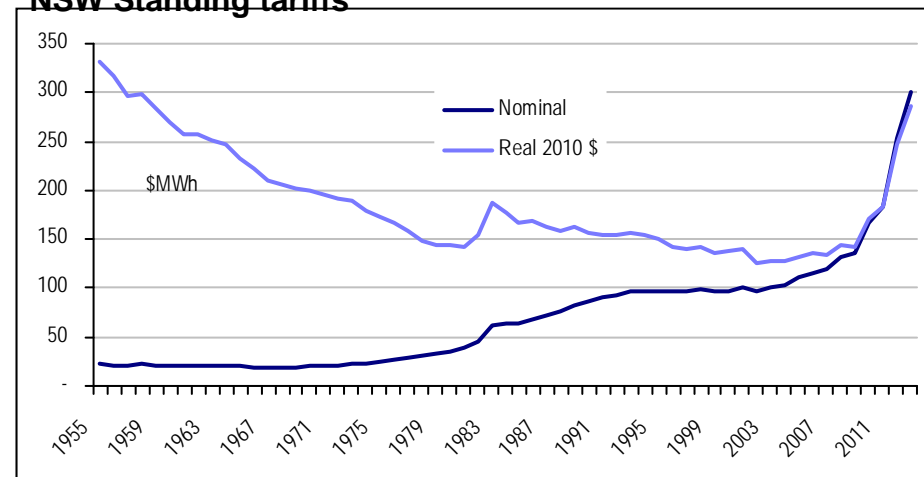
An inventory of where we are -

- Adversarial network regulation that has led to strong investment even in the face of flat volumes. Enquiries and reviews at every level of Government.
- Real electricity tariffs that in the past few years have reversed 50 years of real price declines
- A generation market with sub standard returns.
- A growing renewables market which struggles to keep a constant policy and incentive system for two years in a row
- A well designed Carbon “Tax” that should benefit Australians, since we learned from Europe’s mistakes, but which is used as a political weapon and likely to be scrapped at large cost to taxpayers
- An increasing vertically integrated electricity market which may see a decline in utility of the pool.

NSW RAB



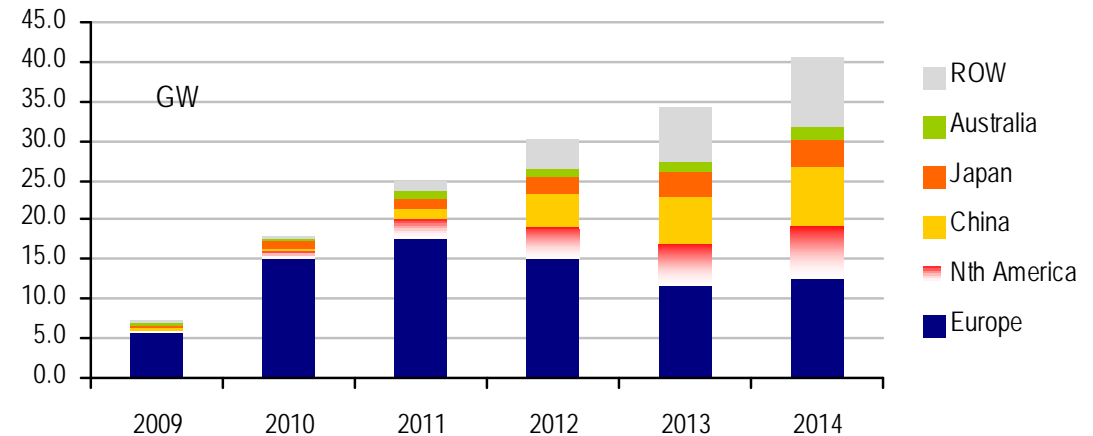
NSW Standing tariffs



Solar seems like a good challenge for policy and technology

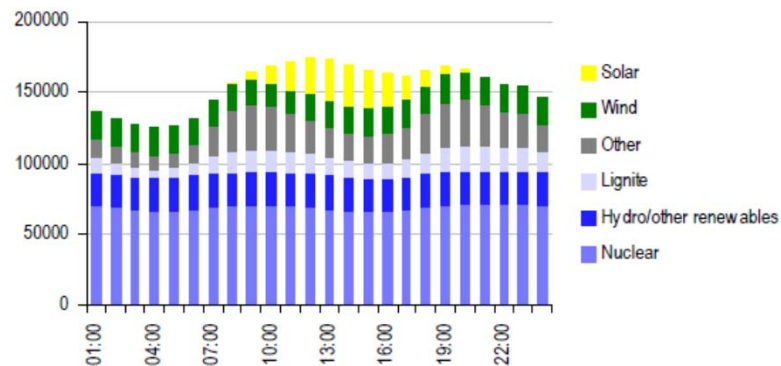
- 66% fall in installed cost in A\$ in two years.
- 30% of daytime electricity in Germany
- European thermal generation ebitda forecast to halve by 2020!
- Grid parity encourages solar

Global annual solar installation to go to 40 GW



Source: UBSe

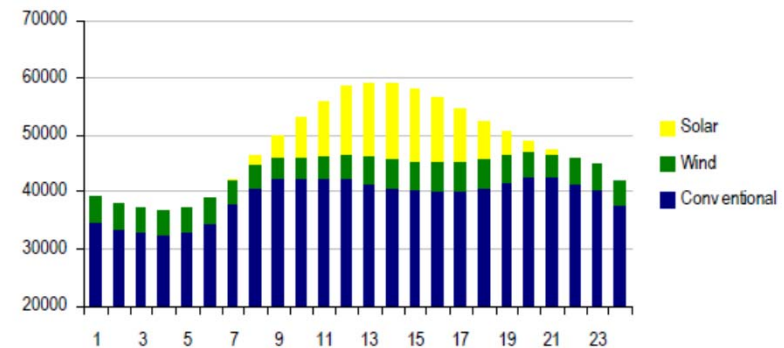
Chart 13: Generation profile, 2020E



Source: ENTSO-E, UBS estimates



Chart 9: Solar has flattened mid-day peak – average German generation March-June 2012

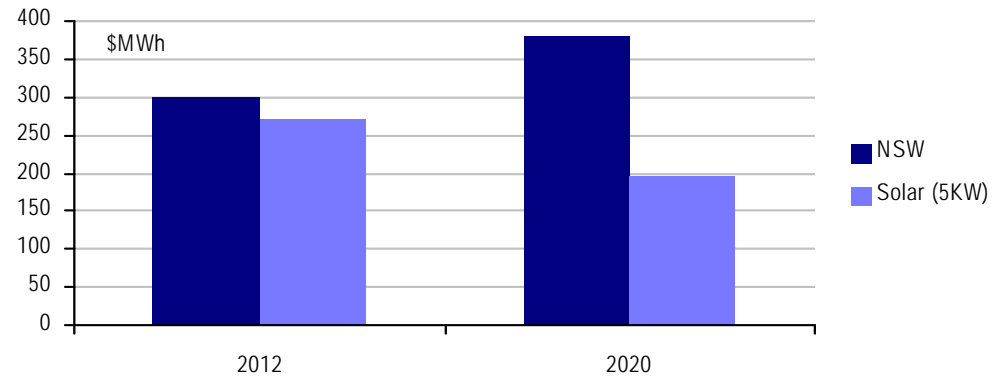


Source: TenneT, 50Hertz, Amprion, Transnet BW

Solar – Empowers the consumer

- Has reached grid parity in NSW
 - Assumes all electricity can be consumed behind meter
 - Ignores STC benefit (2012 \$4K)
 - Discount rate 7.8%
- Greatly empowers the consumer
- A typical “disruptive” technology like iTunes, Personal Computers, digital media
- Paybacks of around 6 years with solar credits and 10 years without
- Gap likely to increase over time
- User control of their system
 - Monitor use
 - Pay bills.
 - Control devices

Grid parity estimates – no subsidy, system cost \$4K/Kw

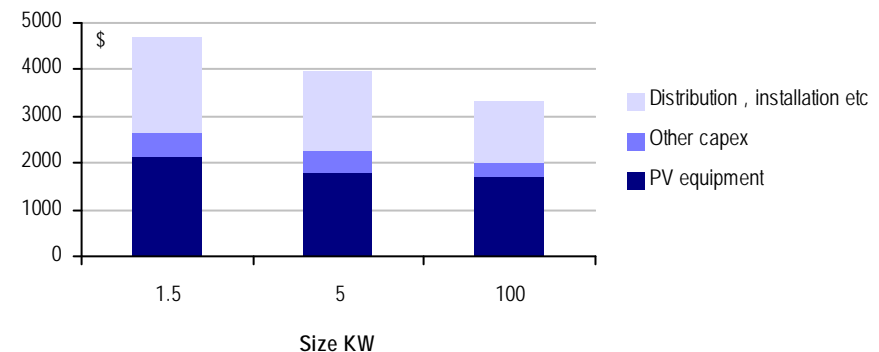


Source: UBSe, based APVA

Grid Parity Gap grows

\$MWh	2012	2020	Compound
NSW	300	380	3%
Solar (5KW)	270	195	-4%
Solar % of grid	90%	51%	

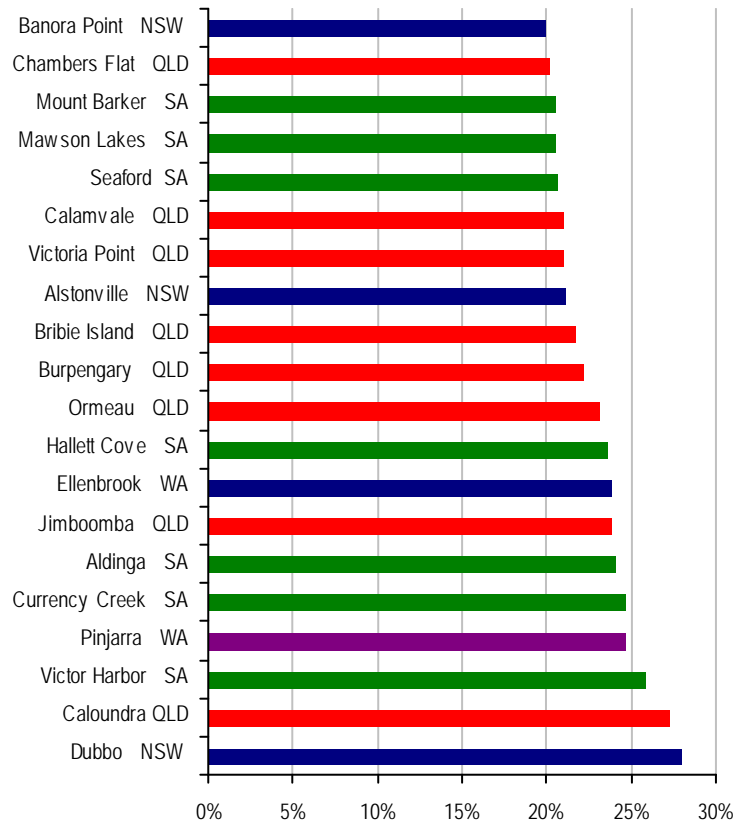
PV solar system costs 2013 \$KW



Source: UBSe

Solar – Subsidies planted the seed

Solar penetration top postcodes



Source: Sunwiz

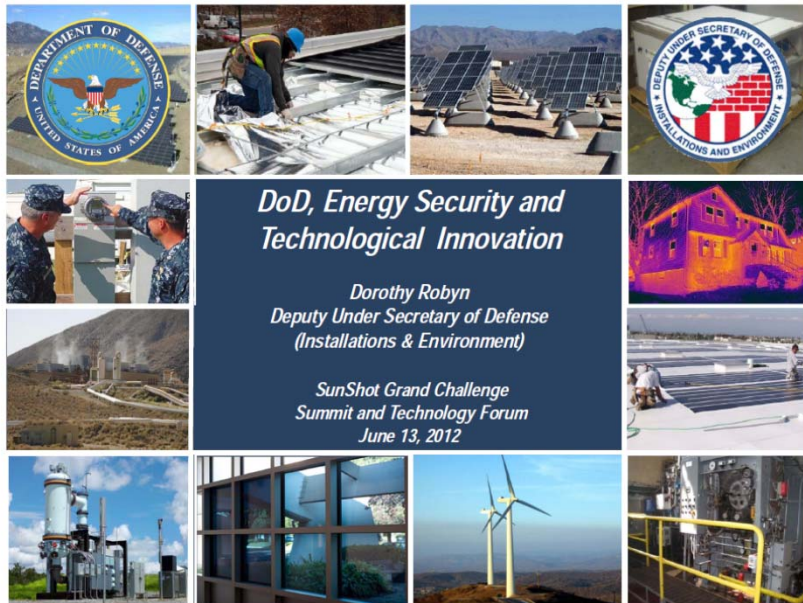
Table 18: Payback time of rooftop solar if used to cut energy bills (no feed in profits)

Country	Investment (€/kWh/year)	Residential tariff (¢cent/kWh)	Payback period (yr)	Commercial tariff (¢cent/kWh)	Payback period (yr)
Spain	1.30	0.20	6.4	0.14	7.7
Italy	1.47	0.20	7.2	0.25	4.8
France	1.68	0.14	11.9	0.11	13.1
Germany	2.24	0.25	8.8	0.20	9.5
UK	2.29	0.15	15.2	0.12	16.2
Denmark	2.41	0.29	8.2	0.21	9.8

Source: Eurostat, BSW-Solar, UBS estimates

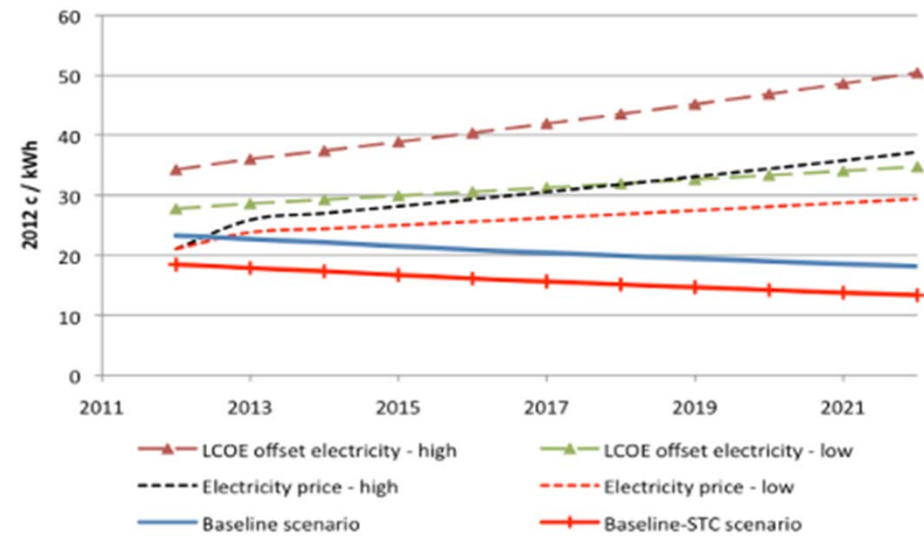
Commercial incentive also exists

- What about Government buildings?
 - Schools
 - Only require daytime electricity.
 - Lots of roof space
 - Armed forces?
 - Hospitals?



Source: USA Dept of Energy EERE

Commercial electricity – grid parity

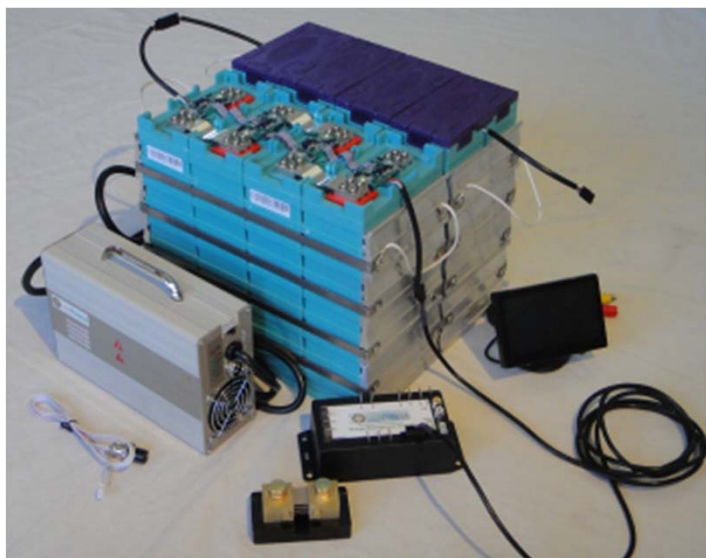


Source: APVA 2012

Battery storage – economics are improving

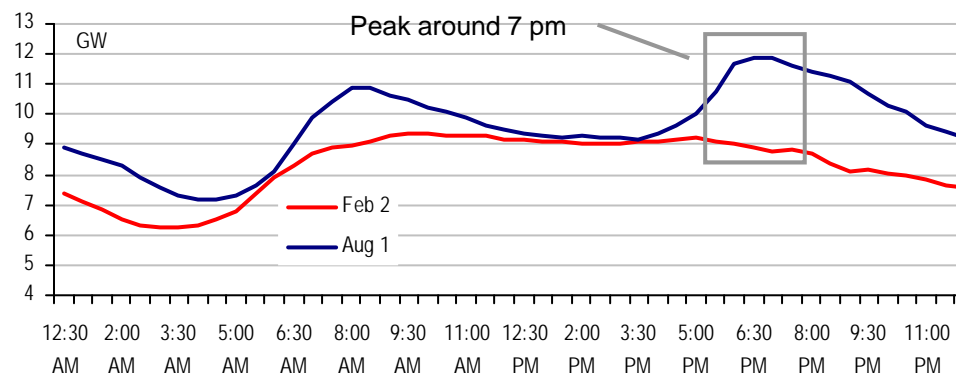
- Peak demand typically around 7-8:00 PM
- Storage cost payback under 10 years already, assuming fast rate solar chargers exist and using Lithium based batteries

24 V 2.6KWh 100 Amp/Hour Lithium Battery



Source: Elite Power System

NSW demand



Source: NEM-Review

NSW - median household

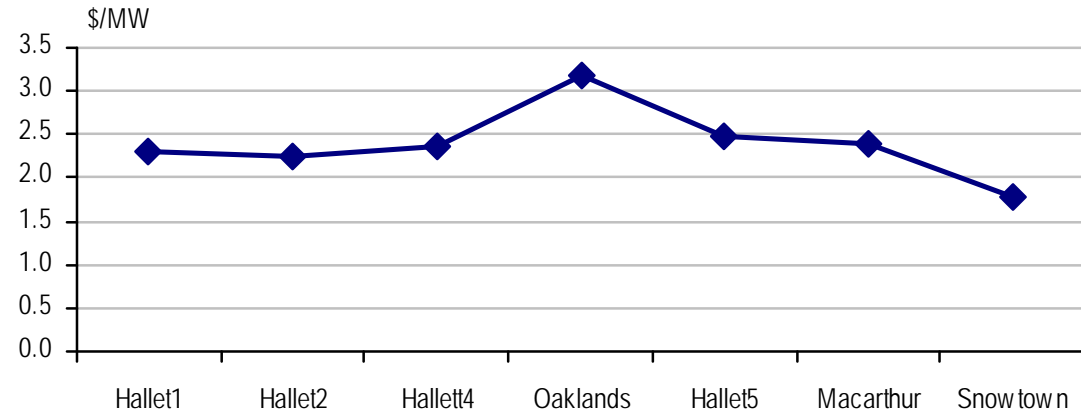
	Unit		Comment
Annual consumption	MWh	7	IPART
Daily average	KWh	19	
Share of 4 pm - 9 PM		33%	UBSe
Storage required	KWh	6.3	
24 V 2.6KWh pack cost	US\$	1,725	Elite Power
Packs required		3	
Cost of storing 200 Amphours	\$	5,175	
Capacity per pack	Amp Hours	100	
Peak cost	C KWh	52.5	Origin Energy
Daily saving	\$	3.3	
Annual saving	\$	1213	
Payback	Years	4.3	

Source: UBSe

Wind cost has come down – Snowtown 2 \$1.8 m MW

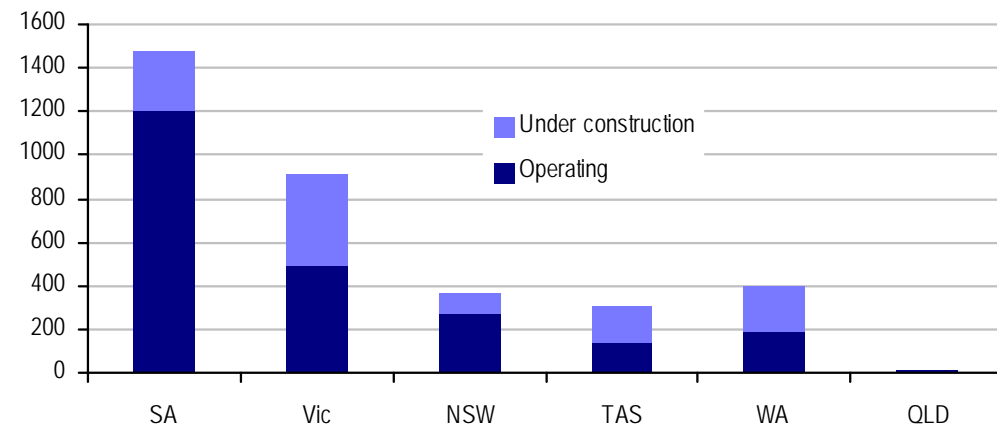
- Wind reduces carbon
- Modularity encourages investment flexibility
- Impacts thermal generation quite negatively
- Not a game changer from the consumer's point of view.

Recent wind farms: Capital cost \$/MW



Source: Company announcements

Wind farms by State

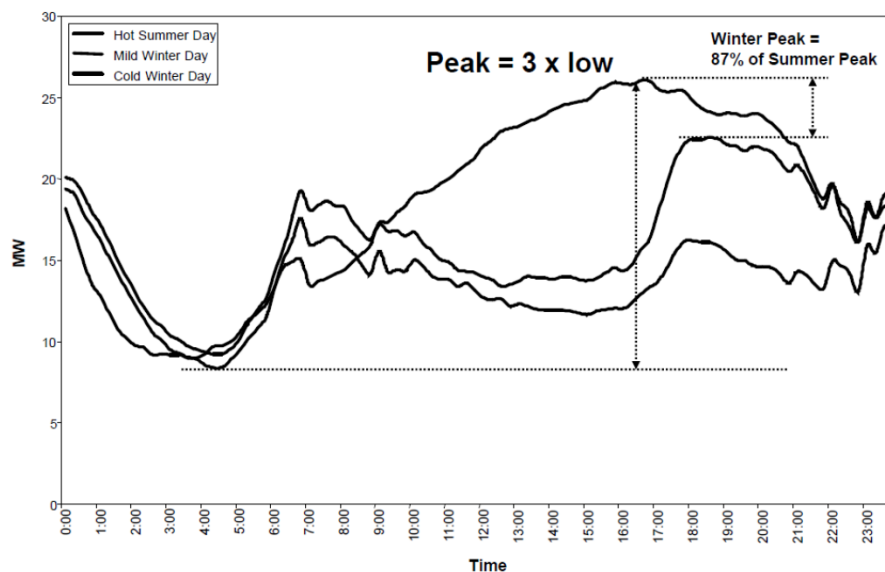


Source: Based on CEC data

Networks

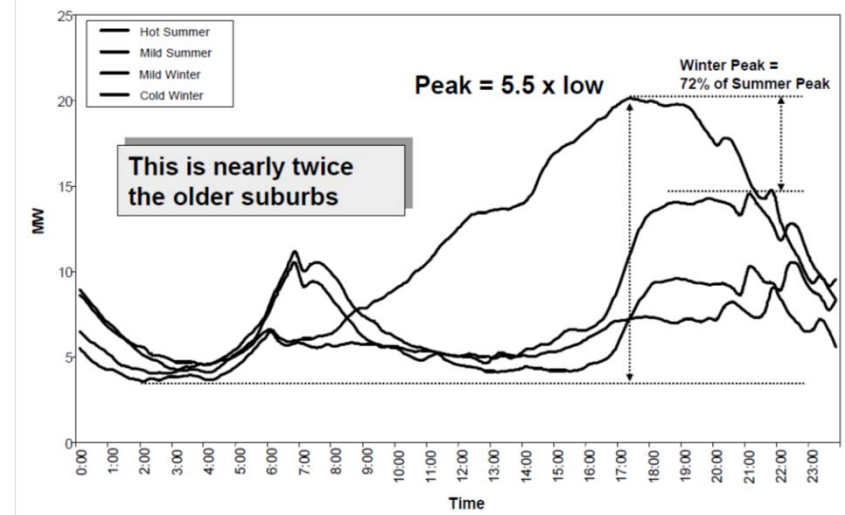
- Peak demand is a network issue, not a generation issue mostly
- Solar – Network augmentation, reduces peak demand, but needs storage.
- Time of use pricing
- Load shedding – do we need a formal market?

Load Profiles – Older Suburb (Greystanes)



Source: Integral presentation to IPART 2003

Load Profiles – New Suburb (Glenmore Park)



Source: Integral presentation to IPART 2003

The grid in the hopefully near future

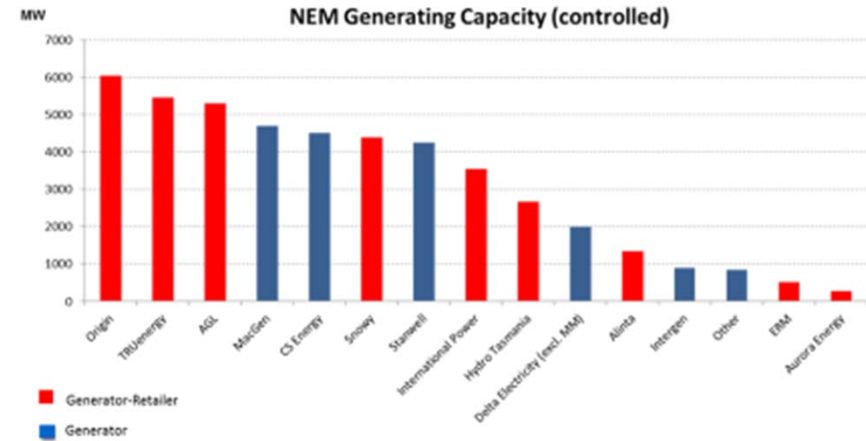
- Smart grid concept exists but progress is slow. No regulatory allowance
- Must start with time of use meters, roll out in NSW and QLD slow
 - Victoria mandated meters, NZ over 50% penetration
 - Can be achieved with modest incentive but still consumer choice
- Network efficiency and benchmarking lacking
- Network competition lacking
 - Last mile competition per UK model?
- NEM designed for central generation
 - No incentive to value distributed energy
- > \$50B in network upgrades
 - could increased DE (PV, EE & DSM) provide a lower cost solution?
 - Could we end up with stranded assets if net zero energy / self-sufficiency increases?

Network issues

- What happens to current retail and network market structures if:
 - All buildings are net zero energy
 - Usage keeps dropping
 - Customers opt for on-site storage and purchase only in off-peak periods?
- Network tariffs where to?
 - Time of use tariffs that properly reflect marginal cost of peak consumption
 - Tariffs that can accommodate falling network utilization
 - Tariffs that incentivise distributed connections

Market structure

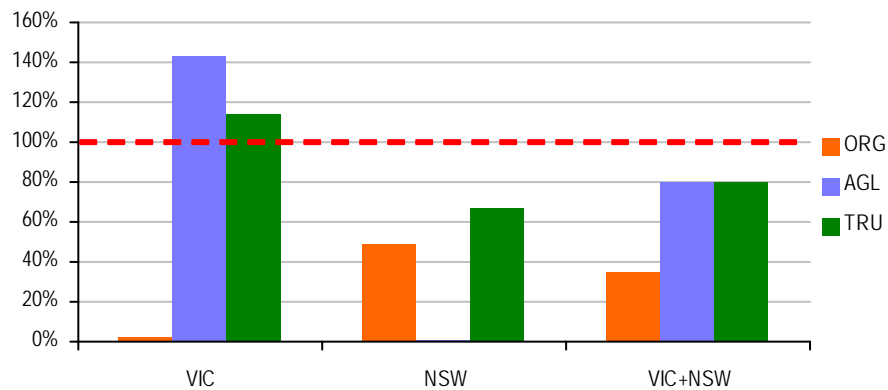
- Vertical integration is increasing
- Post NSW further privatisation, vertical integration could be much higher
- Raises question about usefulness of NEM



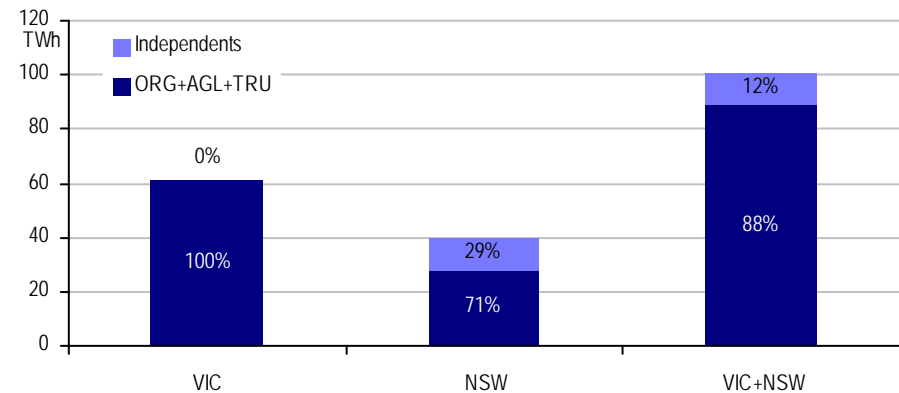
Source: Delta Electricity

Potential market share of majors post NSW privatisation, closure of Hazelwood, closure of Point Henry smelter

Self supply by majors today



Source: UBSe



Source: UBSe

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Neutral	Hold/Neutral	37%	31%
Sell	Sell	8%	16%
UBS Short-Term Rating	Rating Category	Coverage ³	IB Services ⁴
Buy	Buy	less than 1%	0%
Sell	Sell	less than 1%	0%

1: Percentage of companies under coverage globally within the 12-month rating category.

2: Percentage of companies within the 12-month rating category for which investment banking (IB) services were provided within the past 12 months.

3: Percentage of companies under coverage globally within the Short-Term rating category.

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Source: UBS. Rating allocations are as of 30 June 2012.

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