Future Grids in Australia

Luke Reedman | PowerFactory Users' Conference and Future Networks Technical Seminar 2013

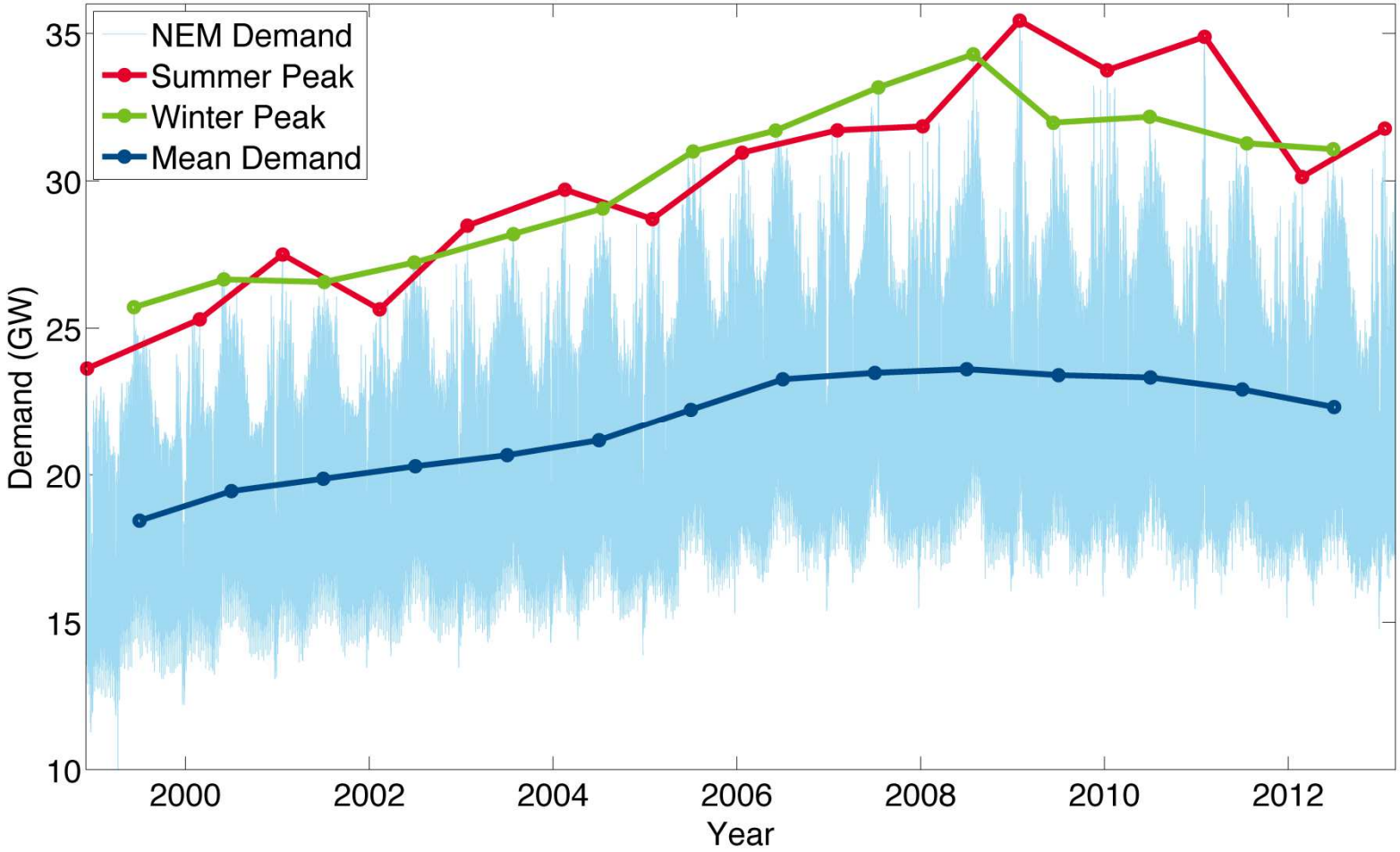
6 September2013

In this talk

- Where have we come from
- Some recent changes
- The next 10-20 years

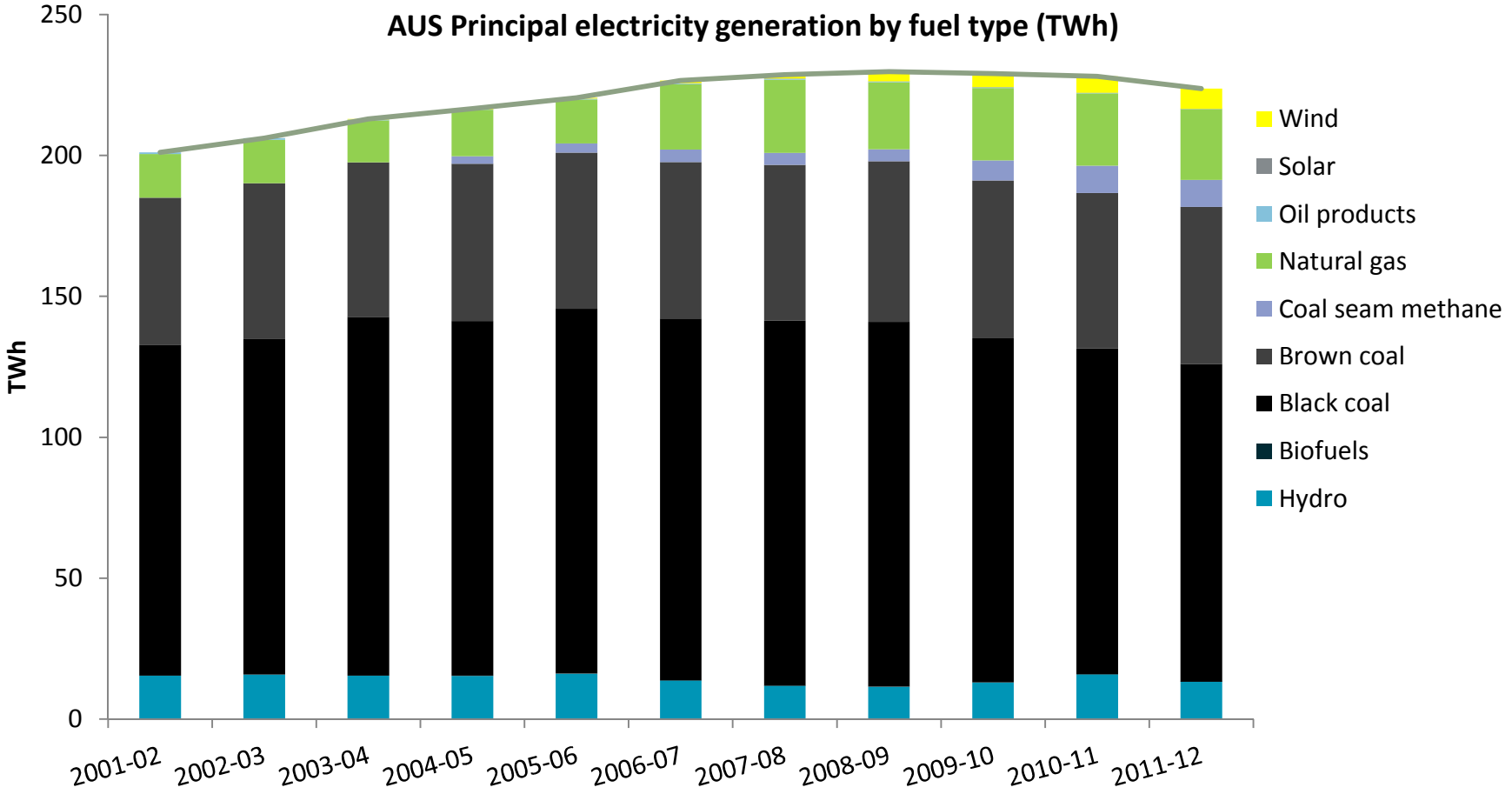
Where have we come from (last 10 years)

Peak and average demand



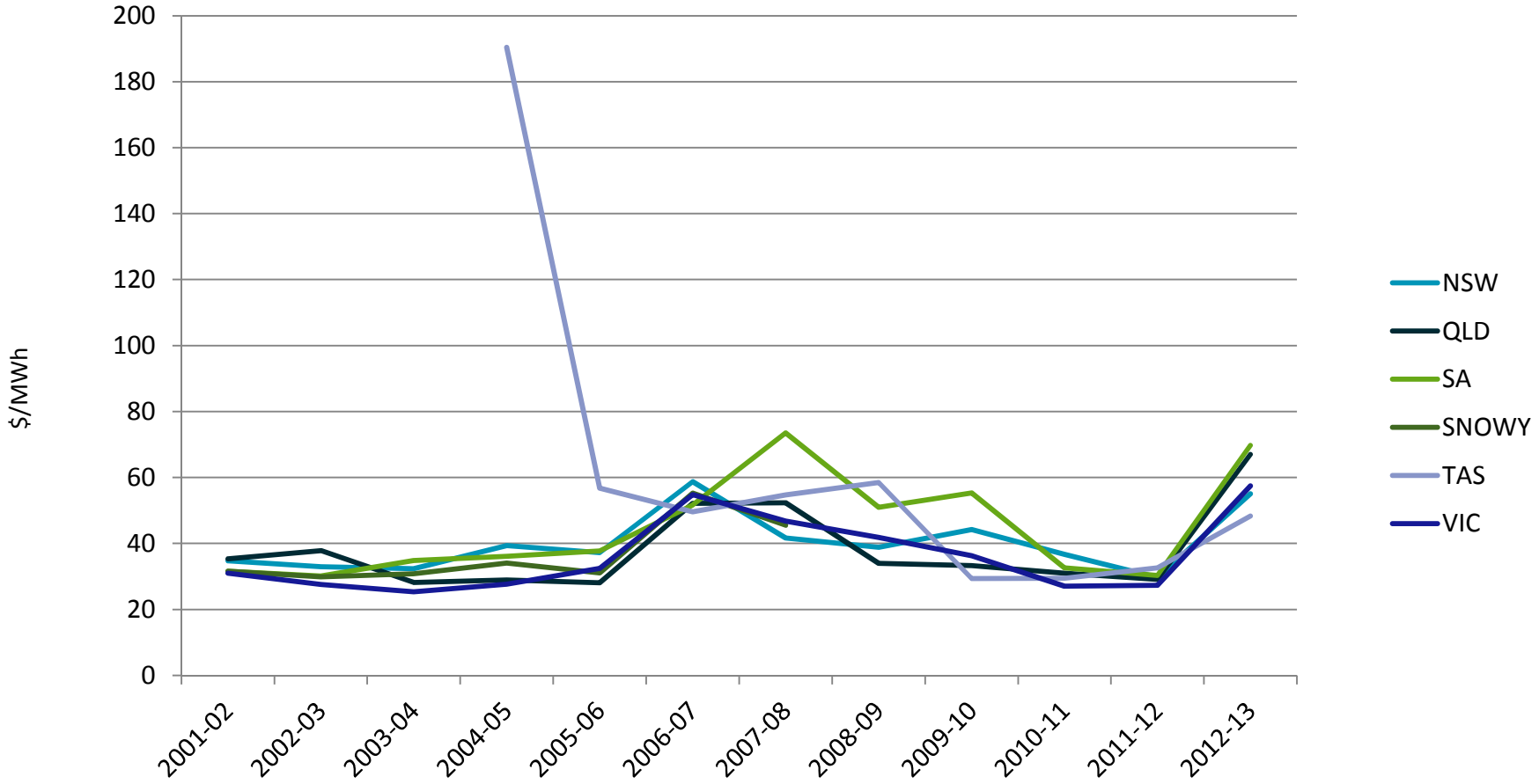
Source: CSIRO calculations from AEMO data

Electricity generation



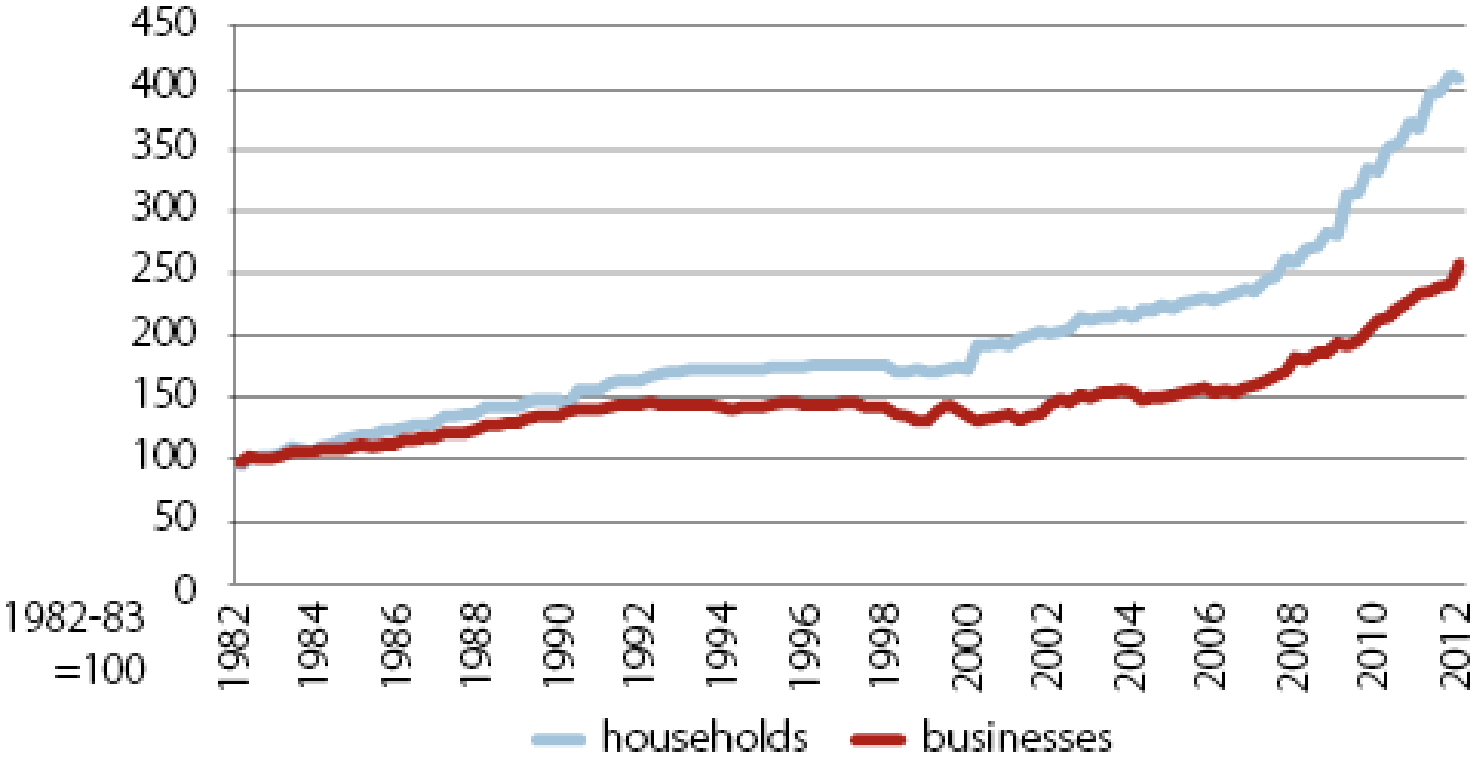
Source: ESAA (2013), Electricity Gas Australia 2013

Wholesale electricity prices



Source: AEMO

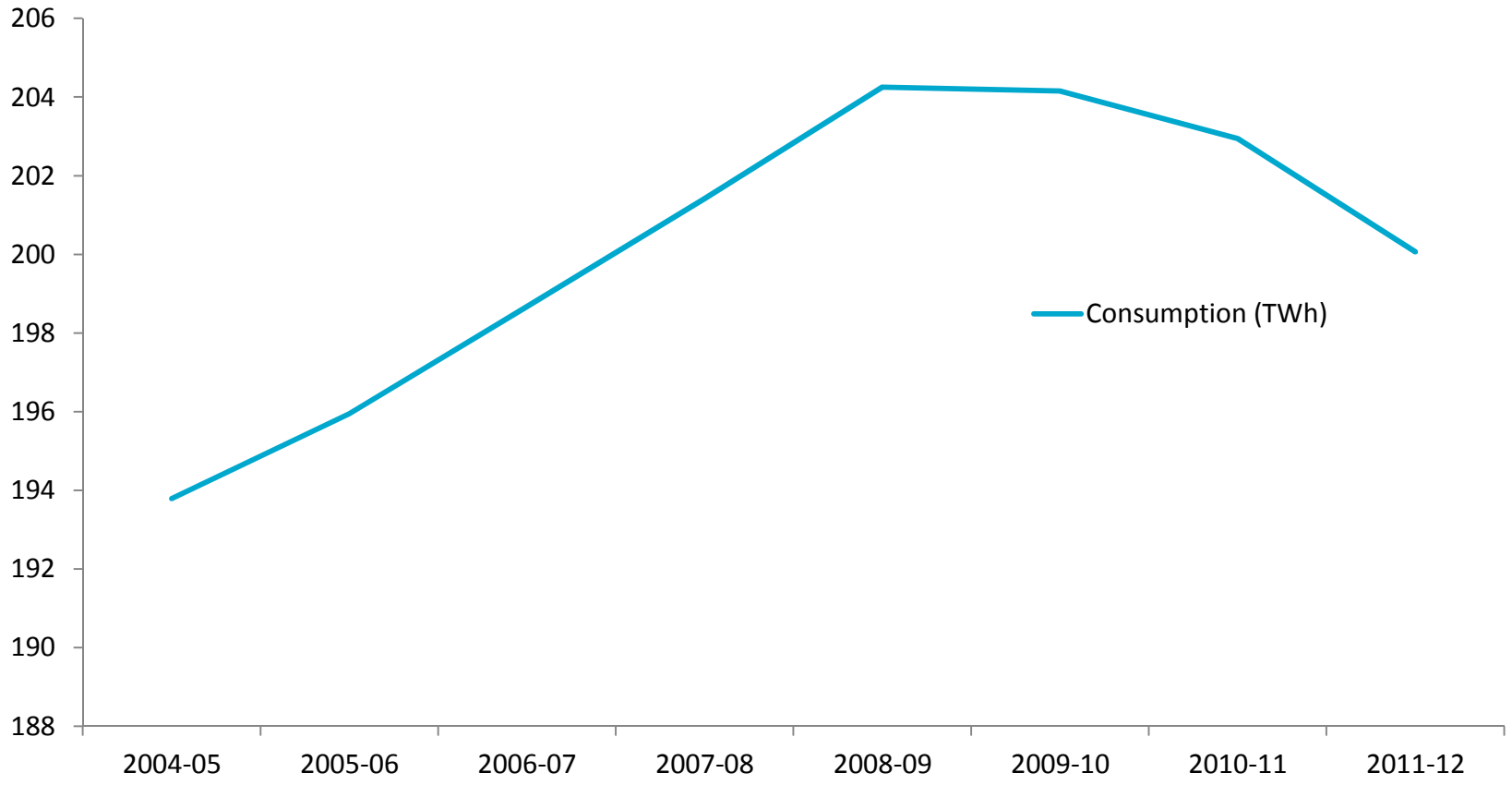
Retail electricity prices



Sources: ABS 2012, Producer Price Indexes, Australia, cat. no. 6427.0; Consumer Price Index, Australia, cat. no. 6401.0.

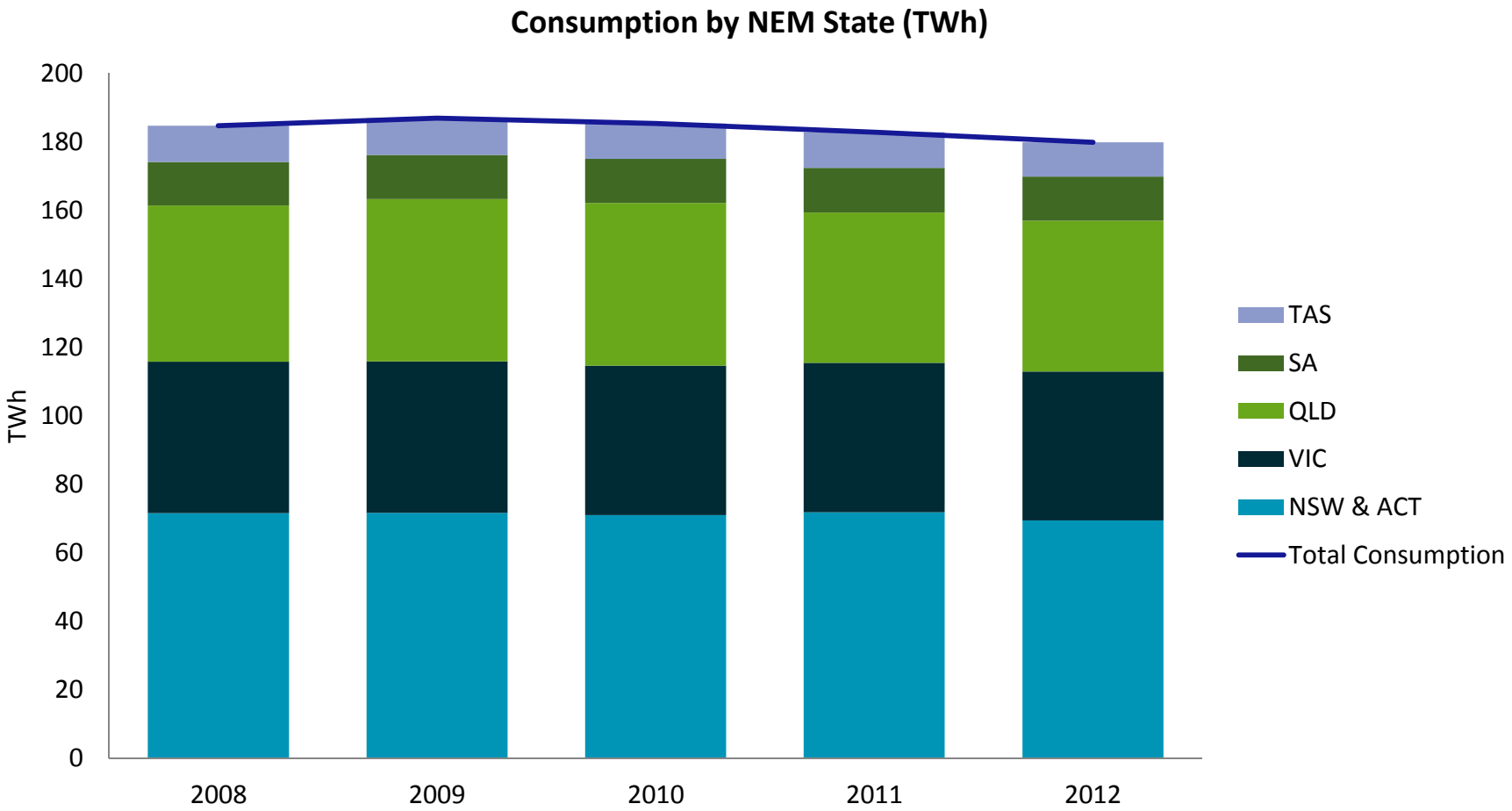
Some recent changes

Electricity consumption declining



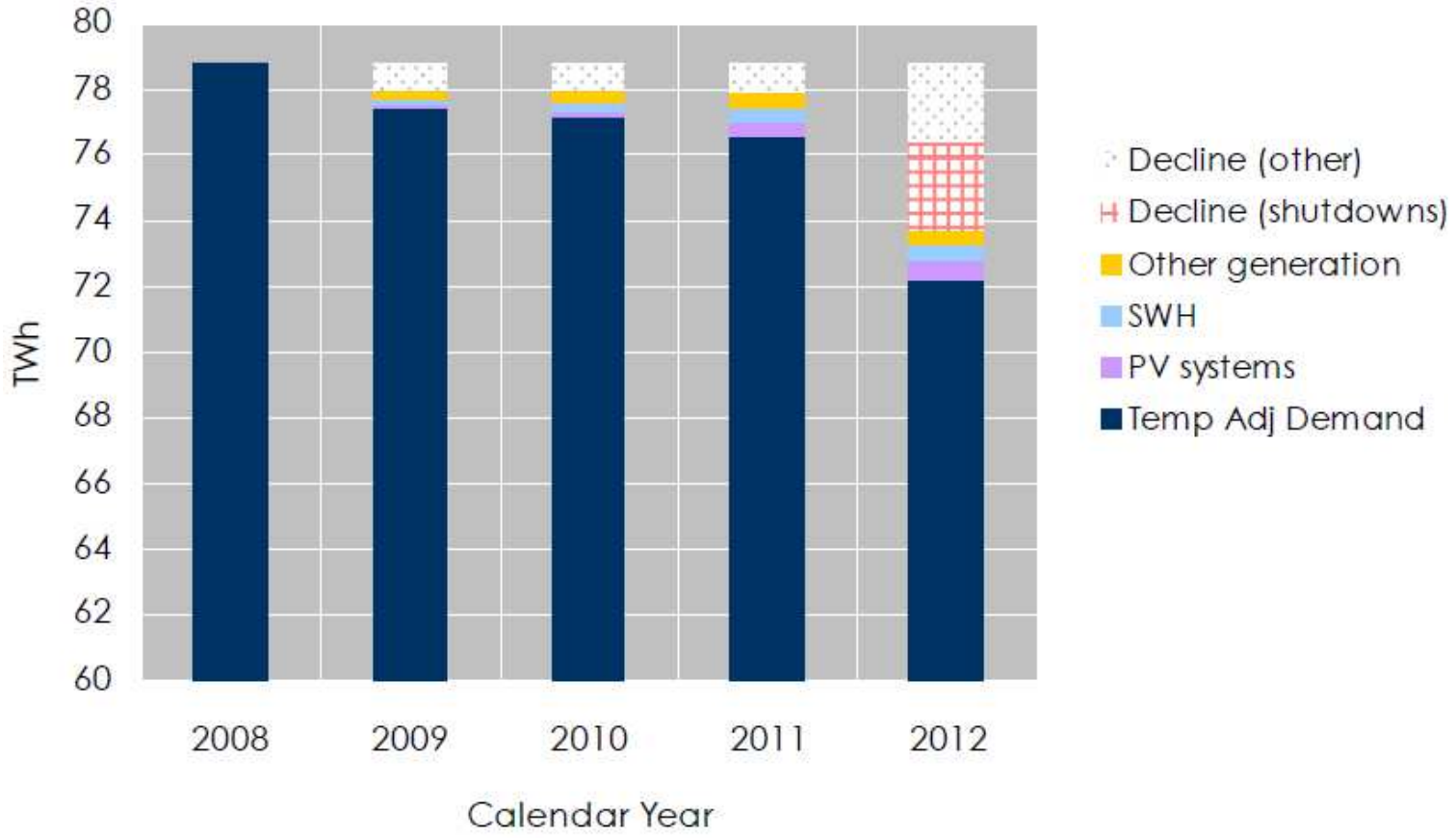
Source: ESAA (2013), Electricity Gas Australia 2013

Electricity consumption declining



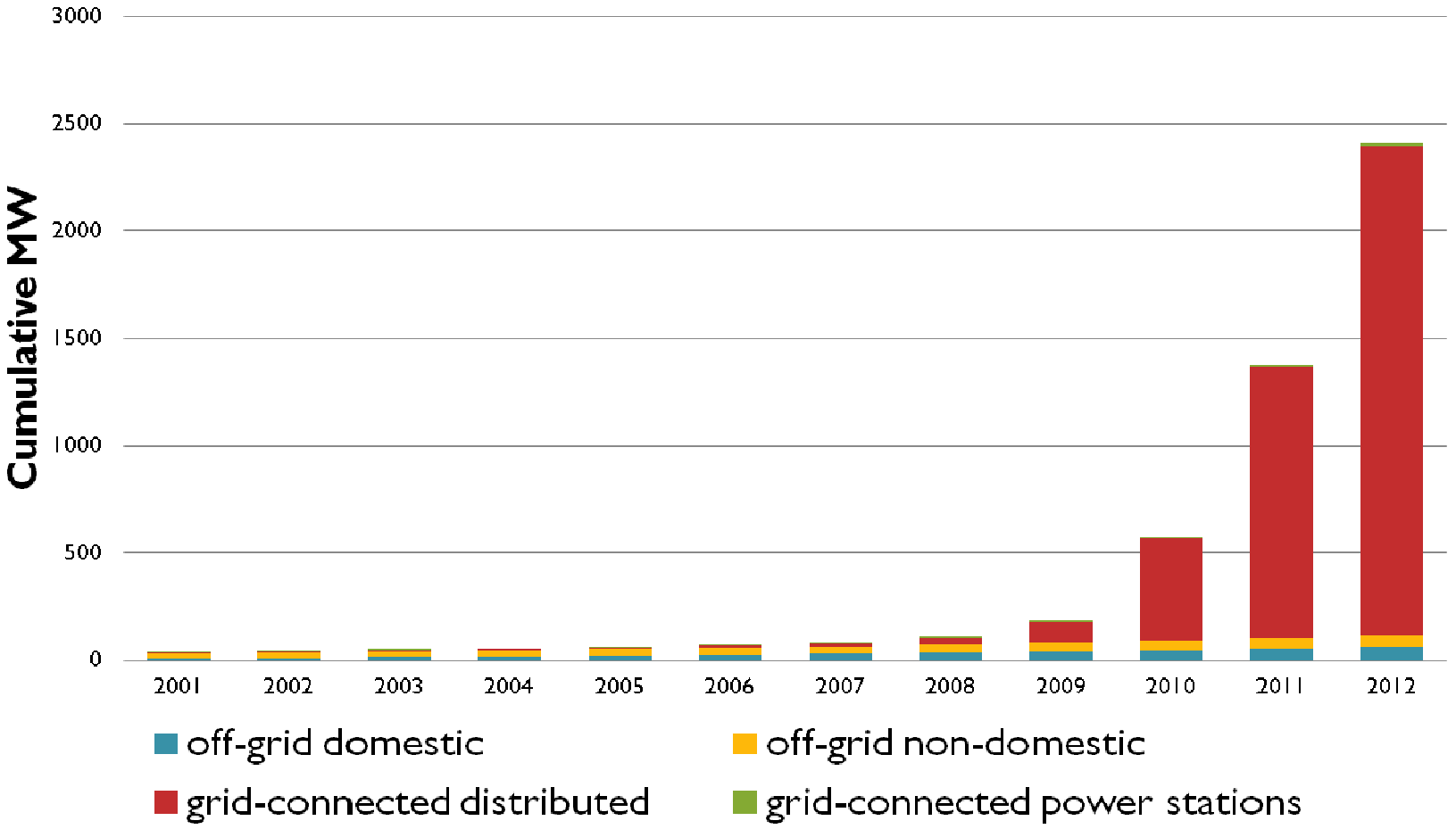
Source: ESAA (2013), Electricity Gas Australia 2013

Possible reasons for NSW



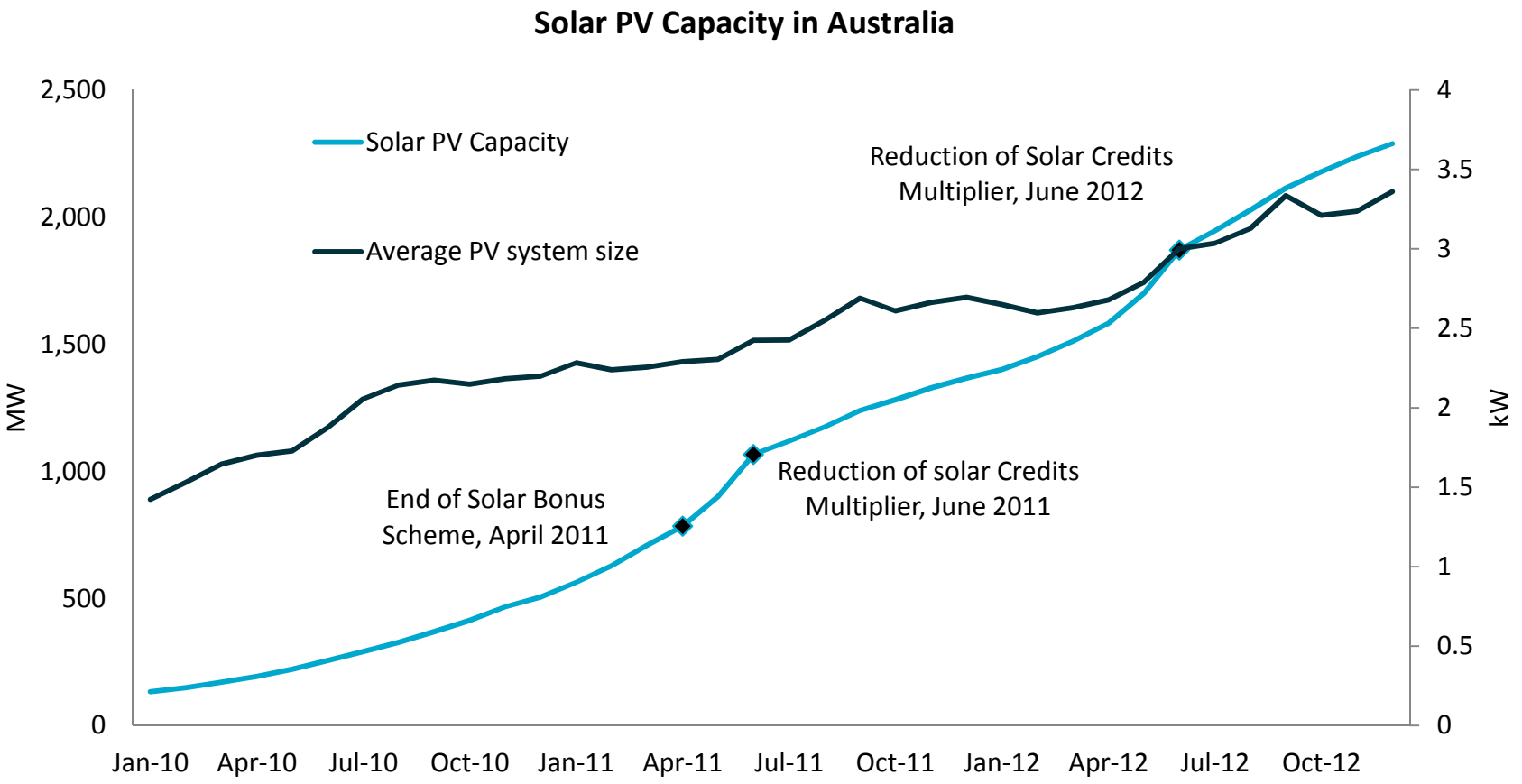
Source: Intelligent Energy Systems (2013), IES Insider, Issue No. 14

Solar PV



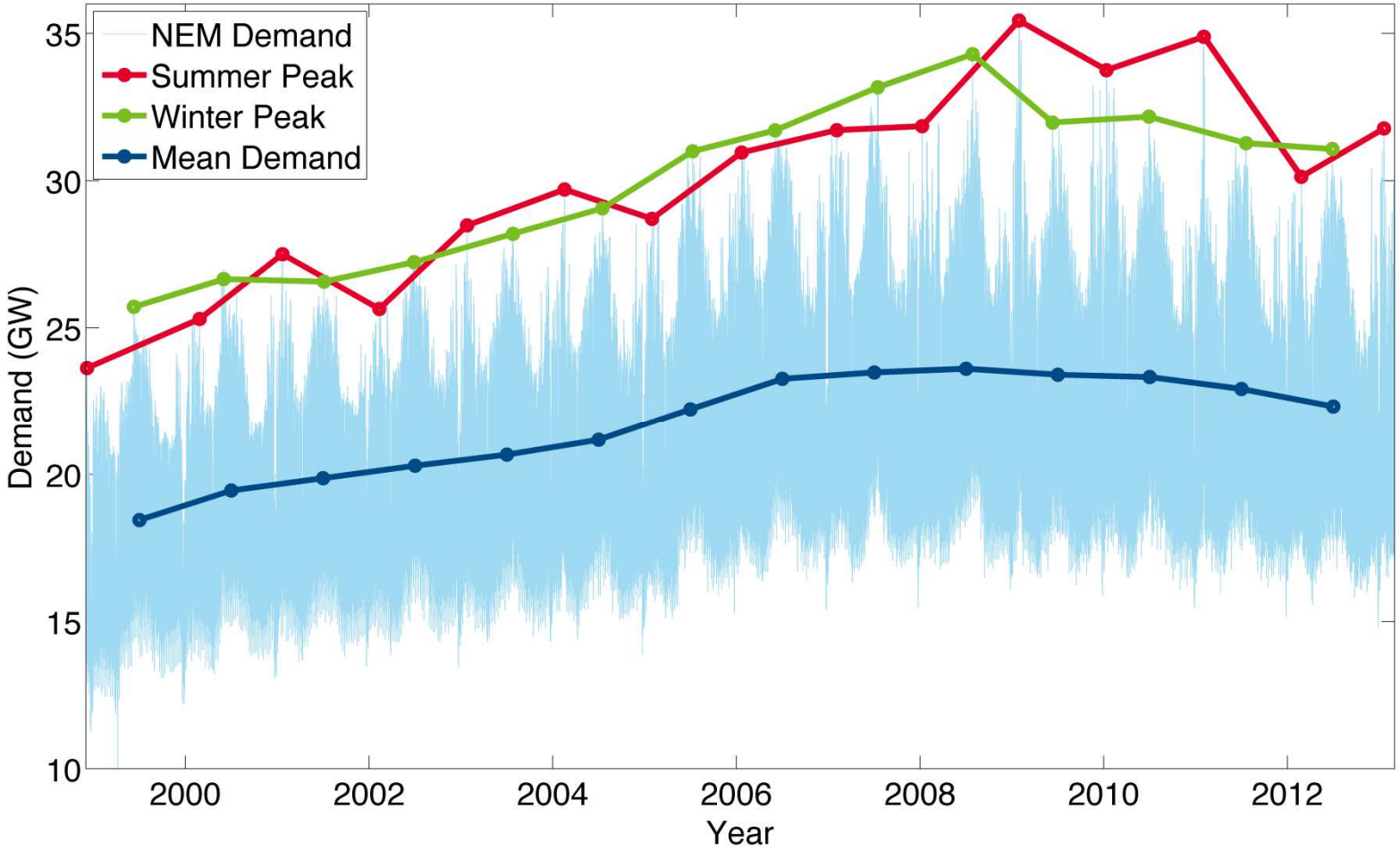
Source: Australian PV Association

Solar PV



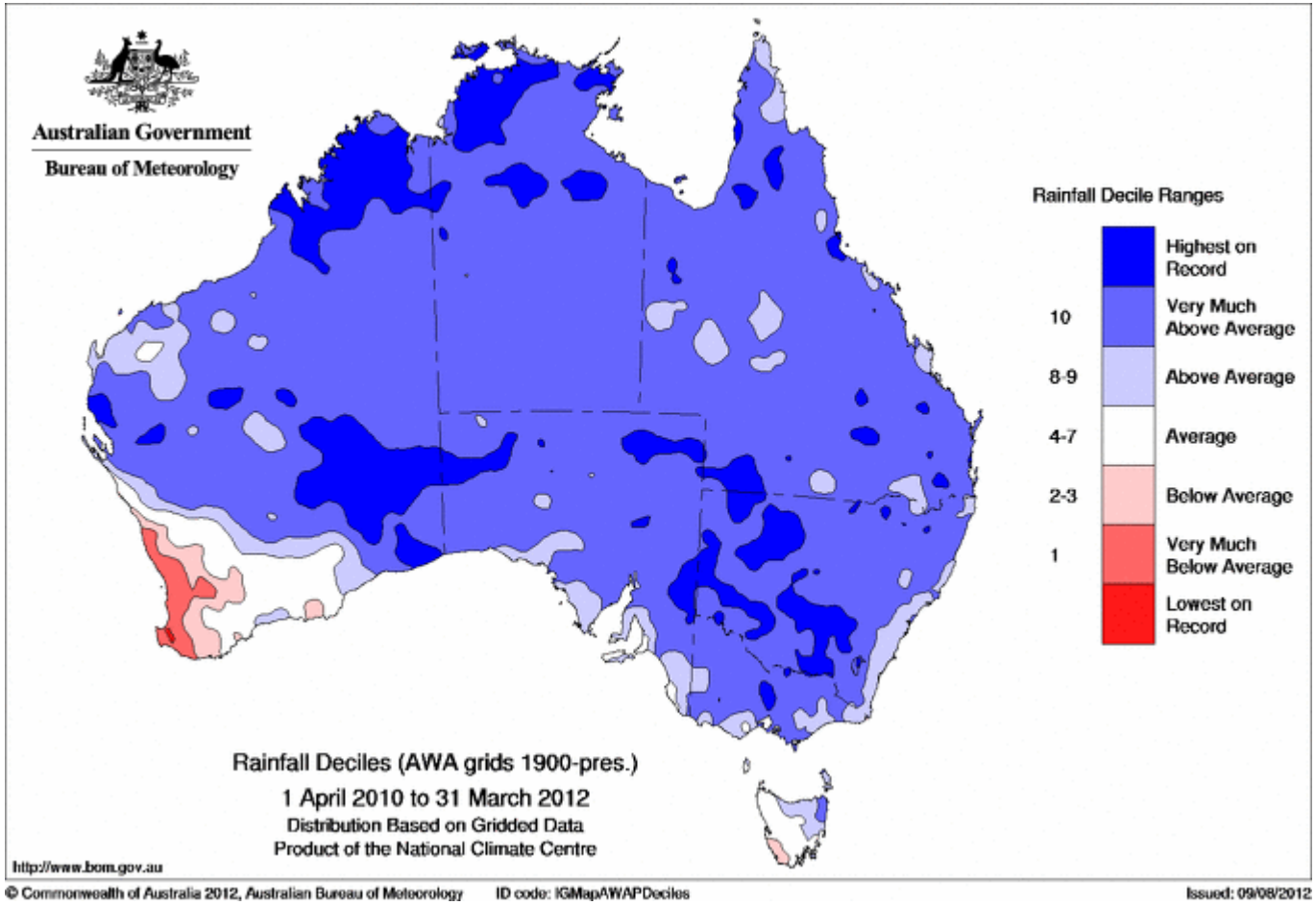
Source: Clean Energy Regulator

Peak demand



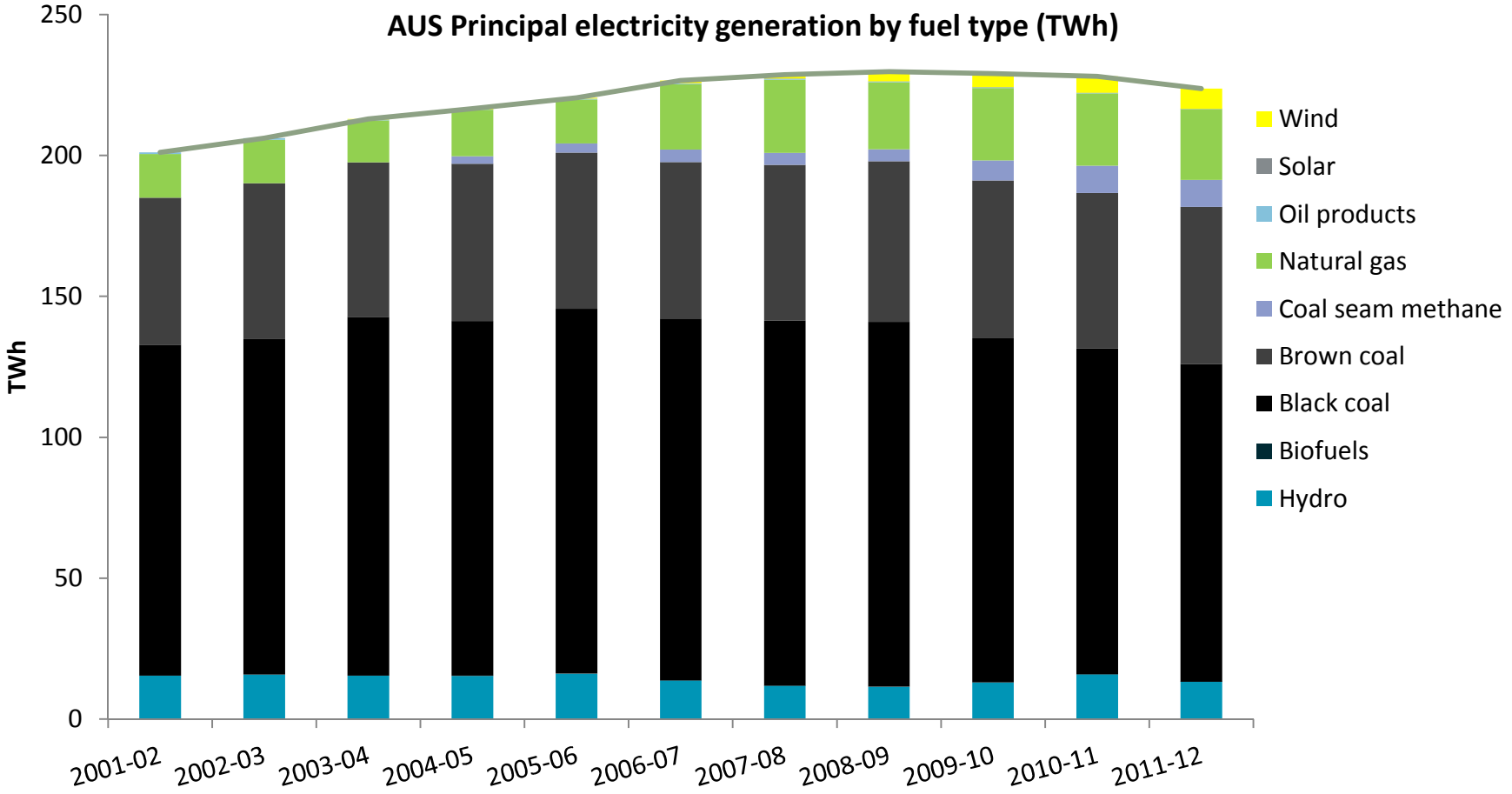
Source: CSIRO calculations from AEMO data

‘Strong’ La Nina on the east coast



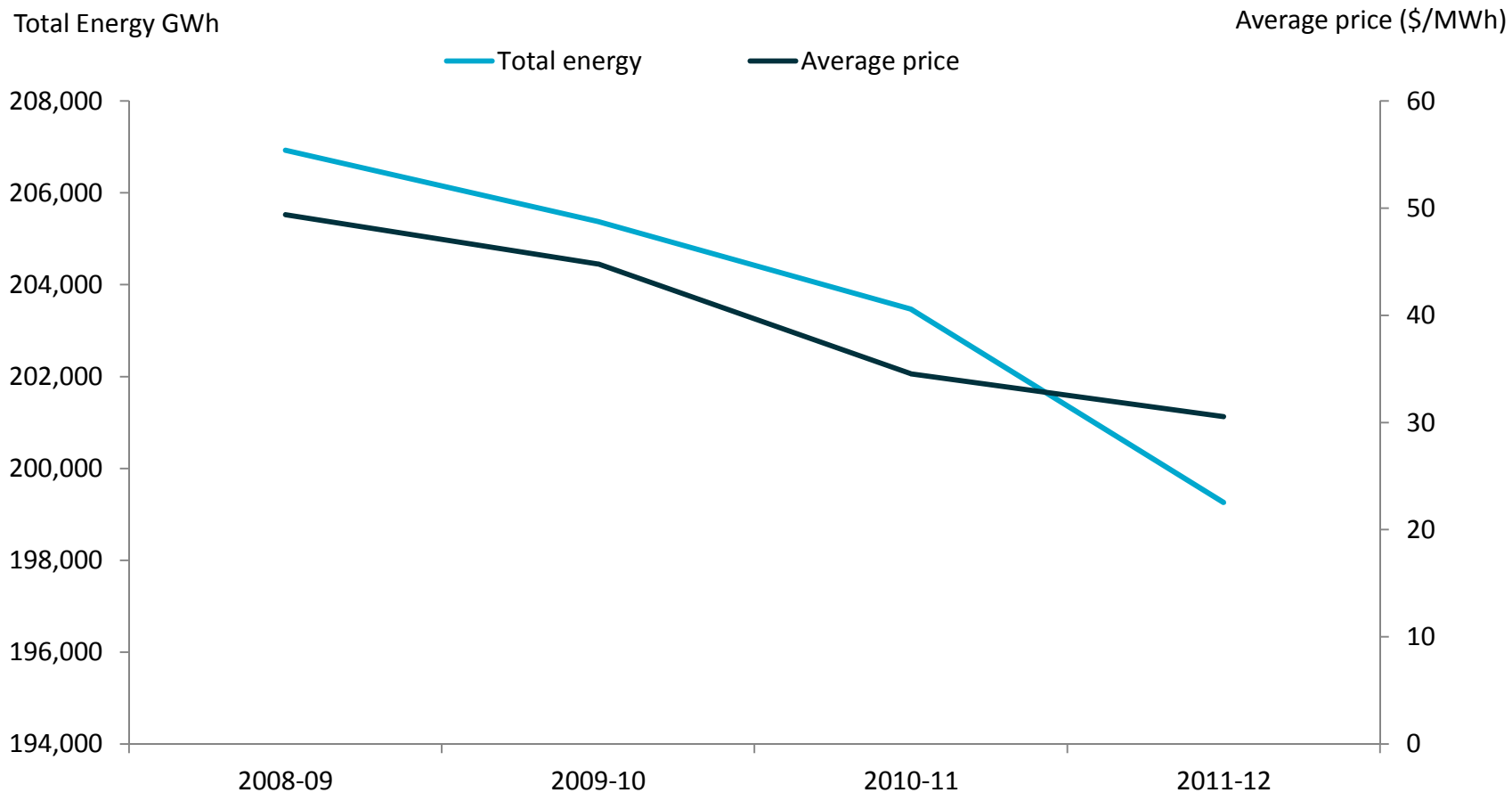
Source: Bureau of Meteorology

Electricity generation



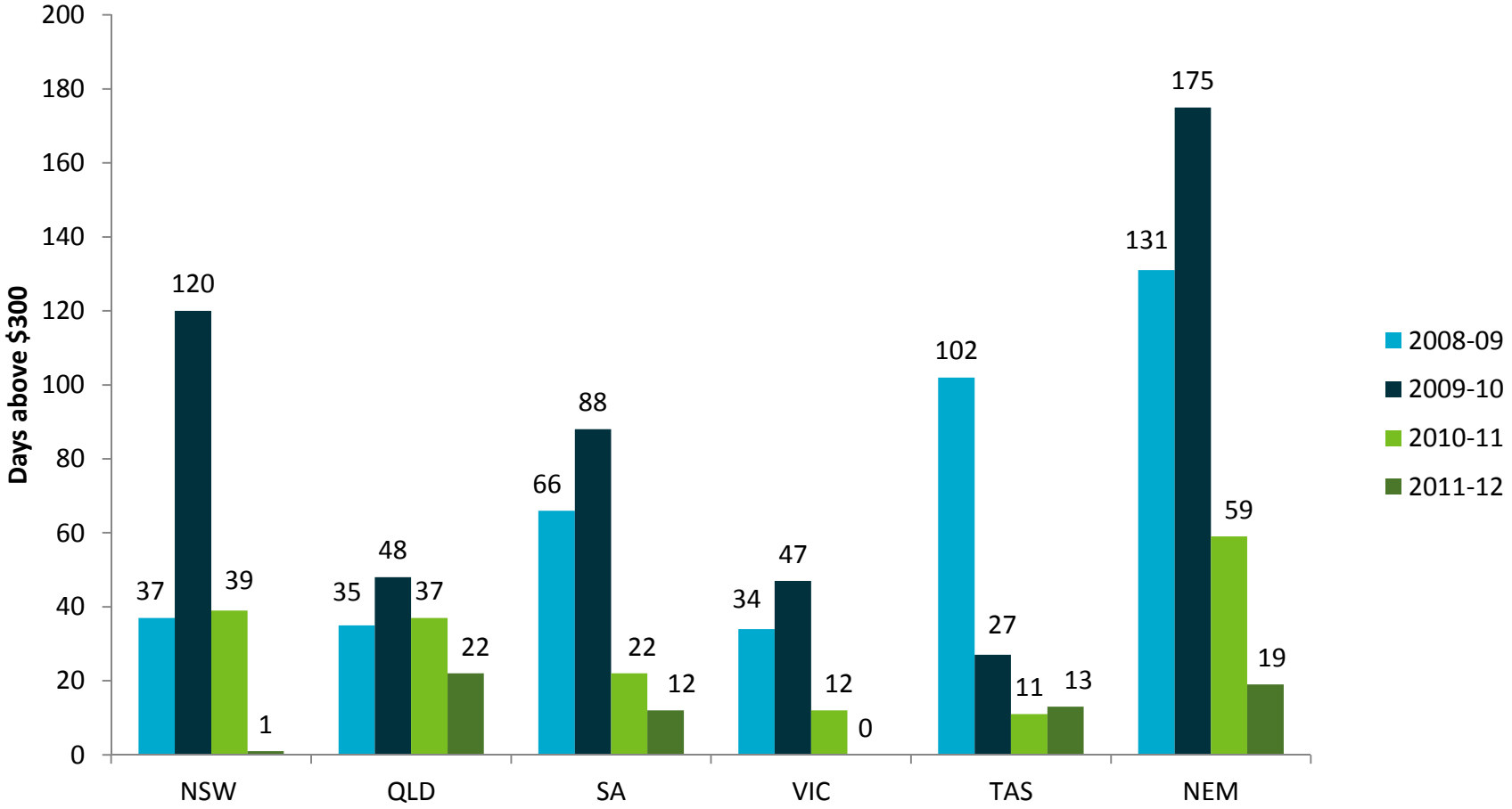
Source: ESAA (2013), Electricity Gas Australia 2013

Average wholesale prices down



Source: ESAA (2013), Electricity Gas Australia 2013

Wholesale price spikes subdued



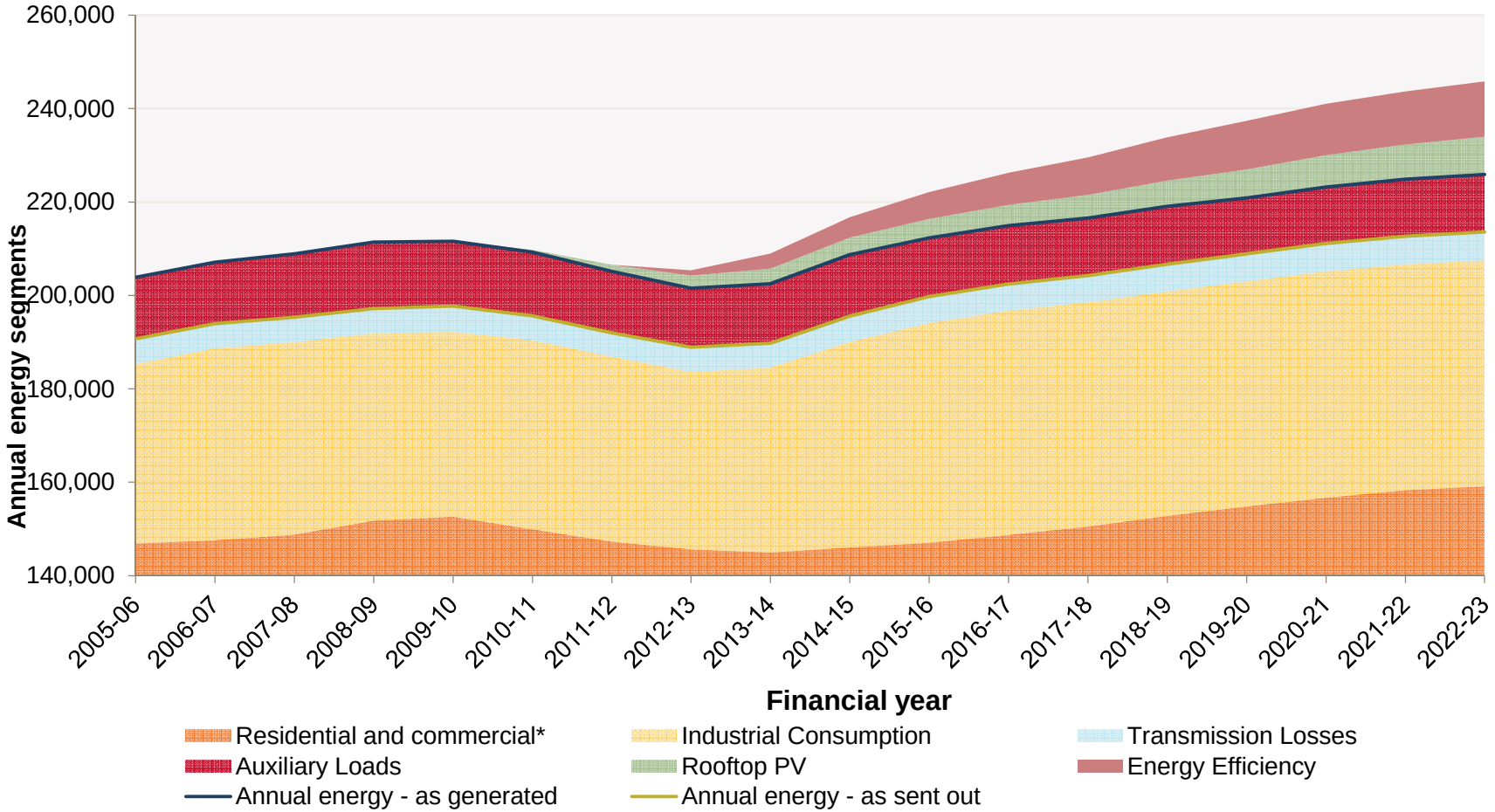
Source: ESAA (2013), Electricity Gas Australia 2013

The next 10-20 years

The next 10-20 years

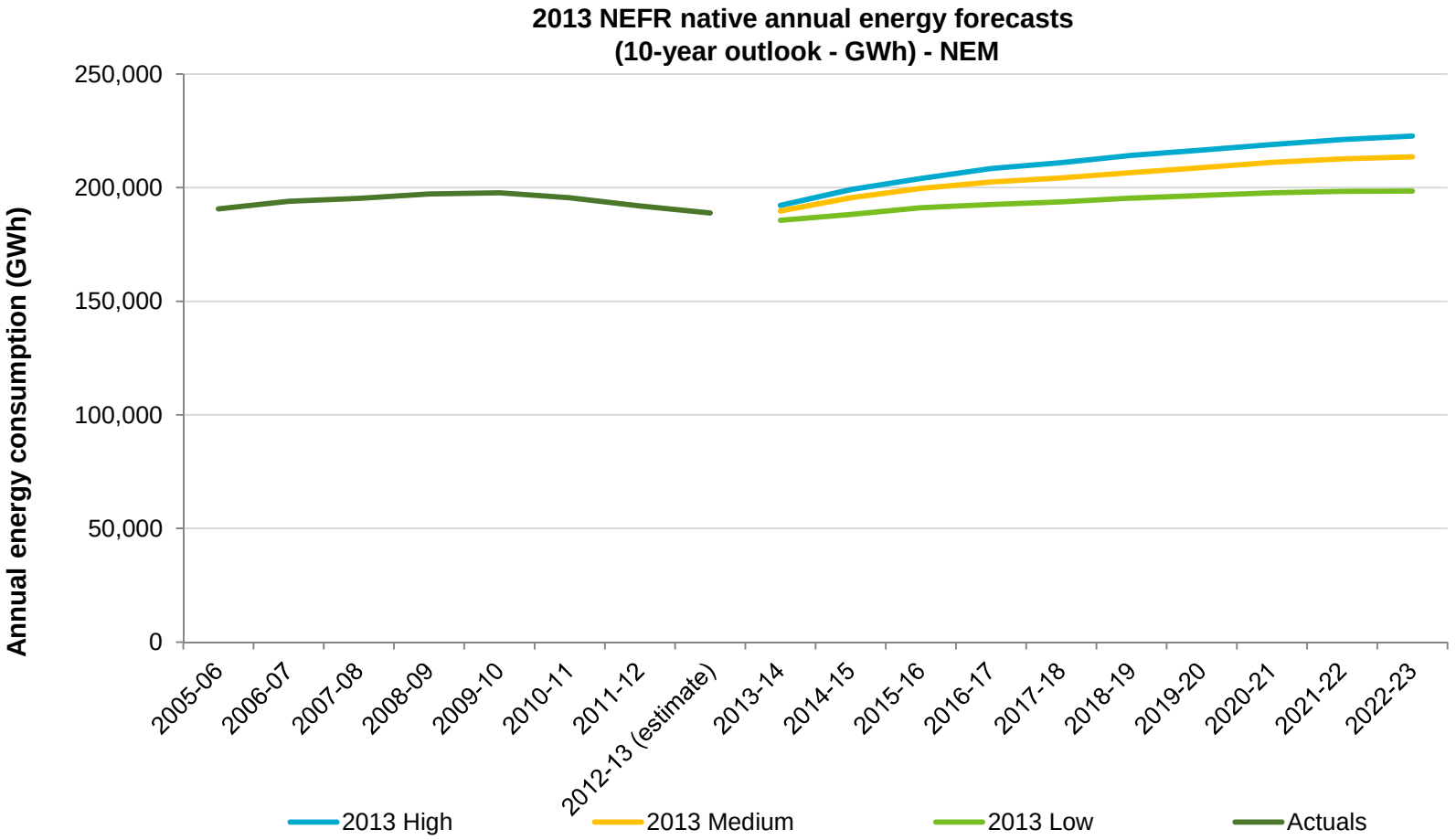
- Will electricity consumption continue to decline?
- Will peak demand rebound?
- What about centralised generation?
- More PV?
- Prices rising?
- What about storage and EVs?
- Can retailers keep their customers?

Electricity consumption forecast



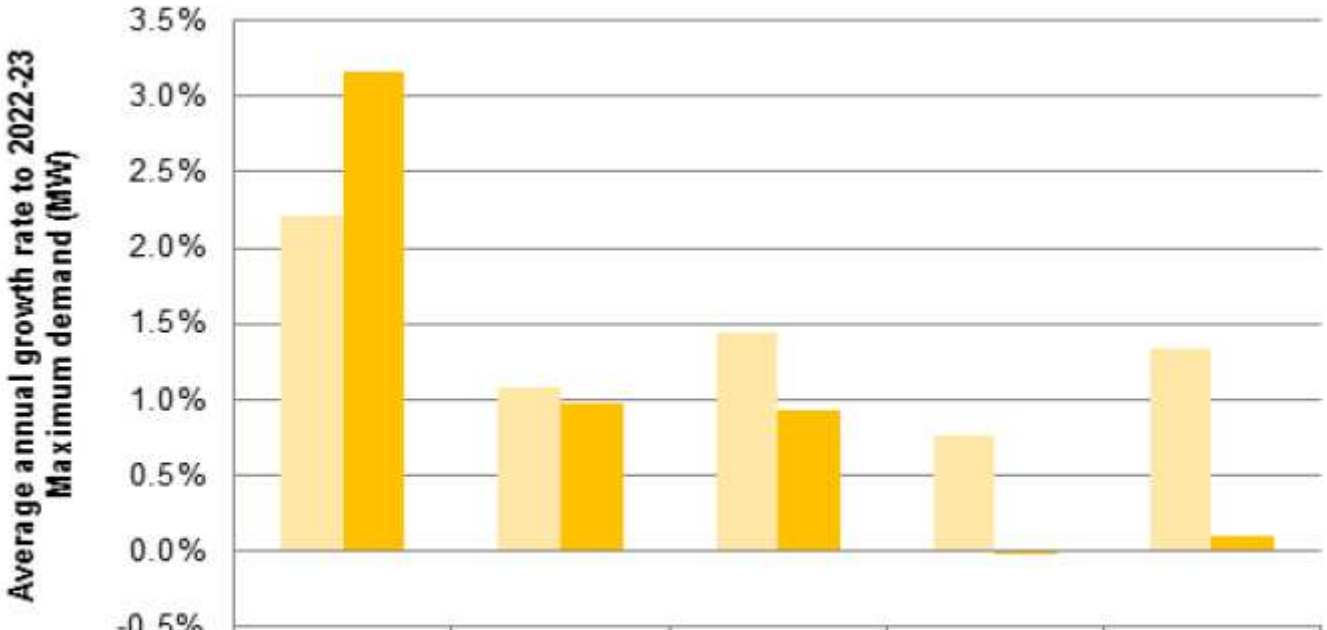
Source: AEMO, National Electricity Forecasting Report 2013

Electricity consumption growth, some uncertainty



Source: AEMO, National Electricity Forecasting Report 2013

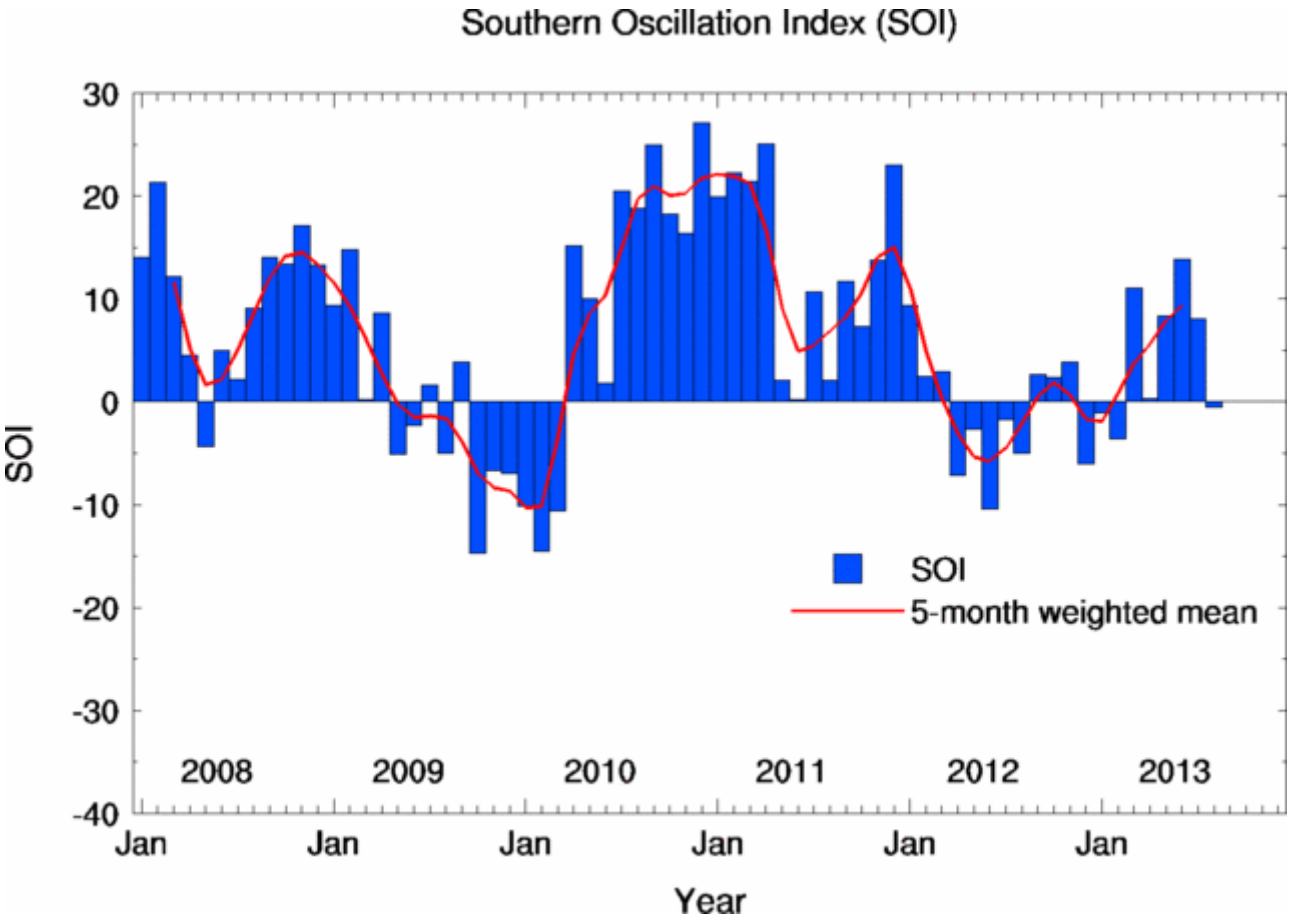
Peak demand rebound



	QLD	NSW	VIC	SA	TAS
2012 NEFR	2.2%	1.1%	1.4%	0.8%	1.3%
2013 NEFR	3.2%	1.0%	0.9%	0.0%	0.1%

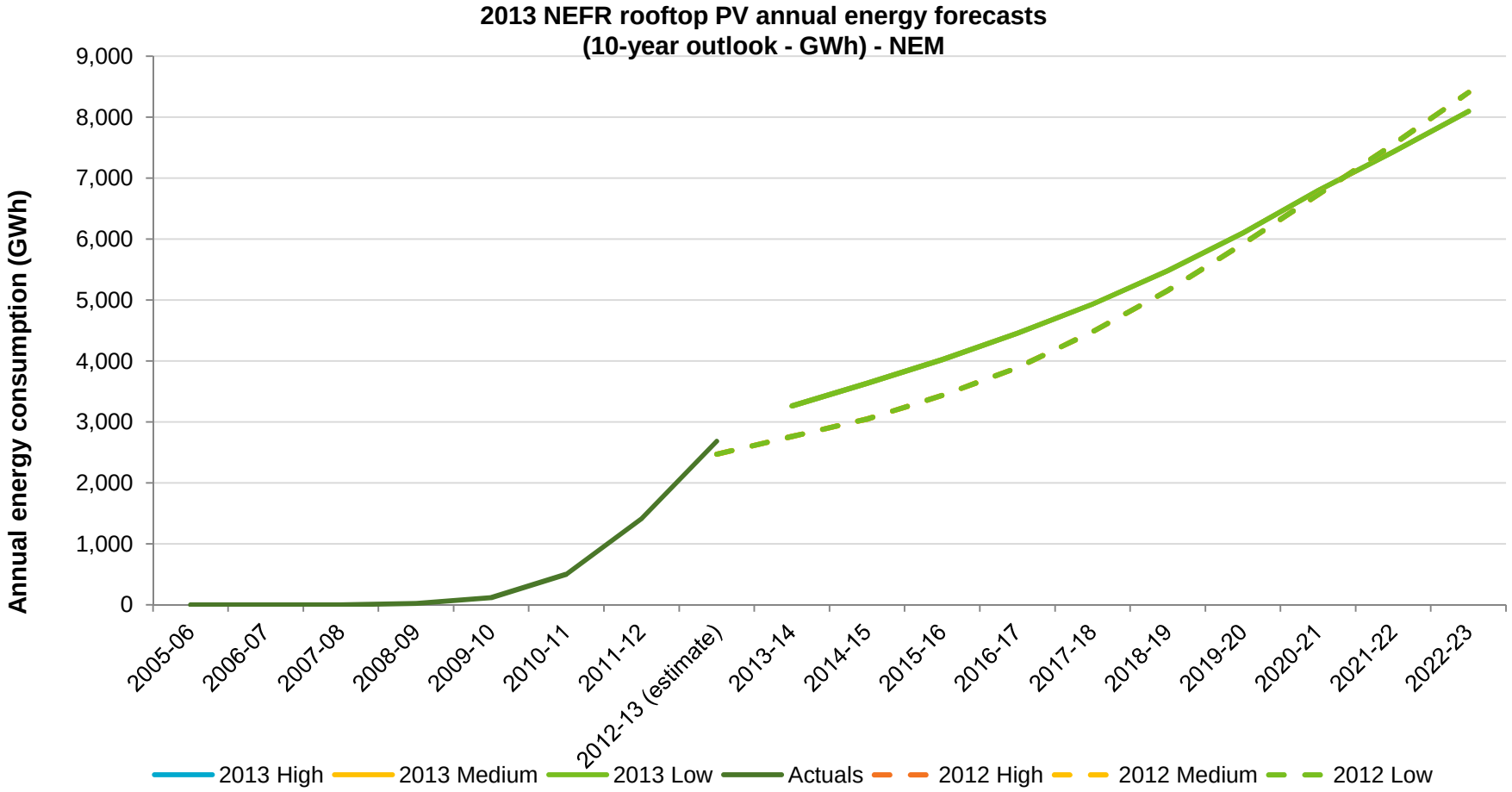
Source: AEMO, National Electricity Forecasting Report 2013

Peak demand rebound



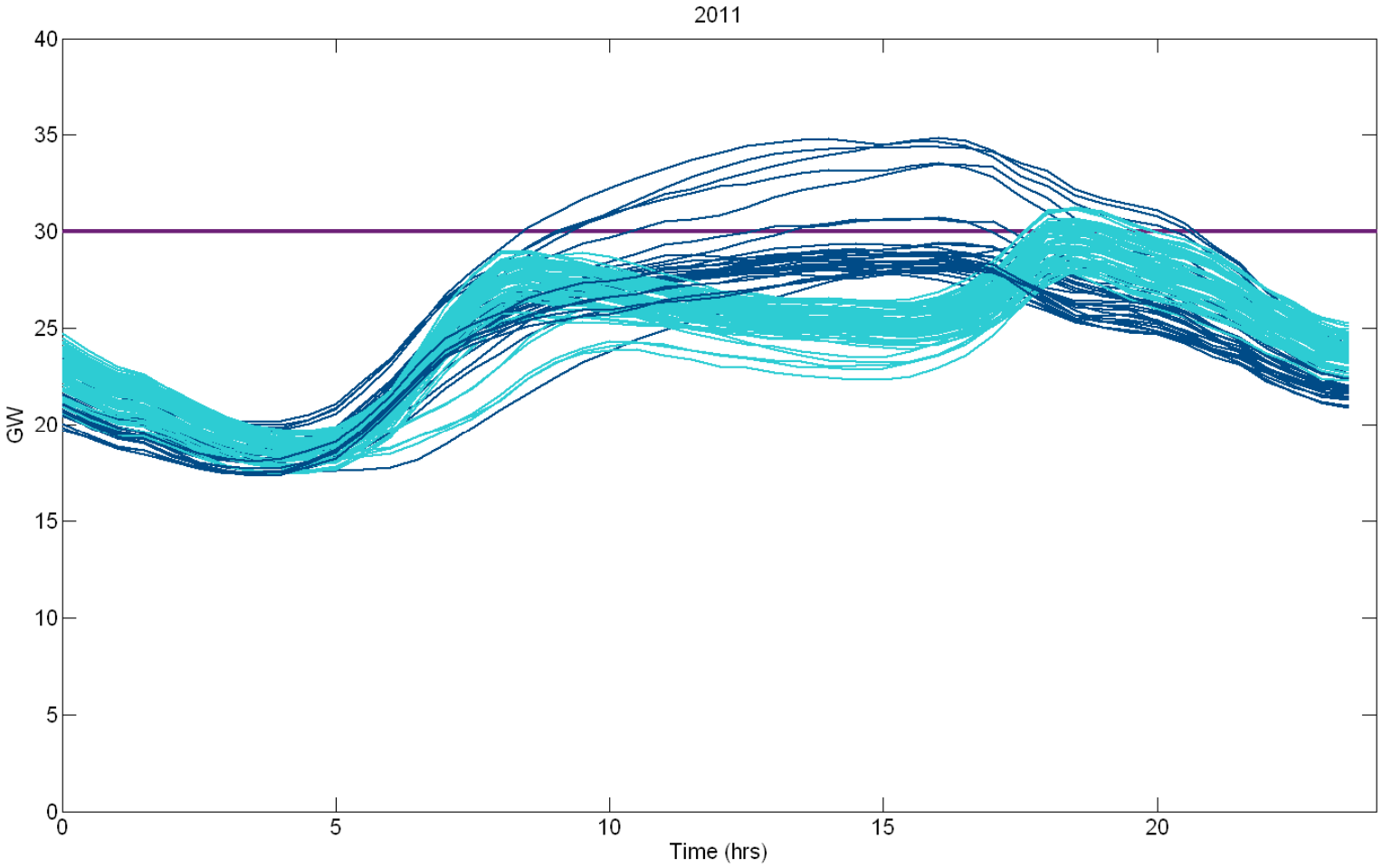
Source: Bureau of Meteorology

More rooftop PV



Source: AEMO, National Electricity Forecasting Report 2013

Peak demand and solar PV: market level



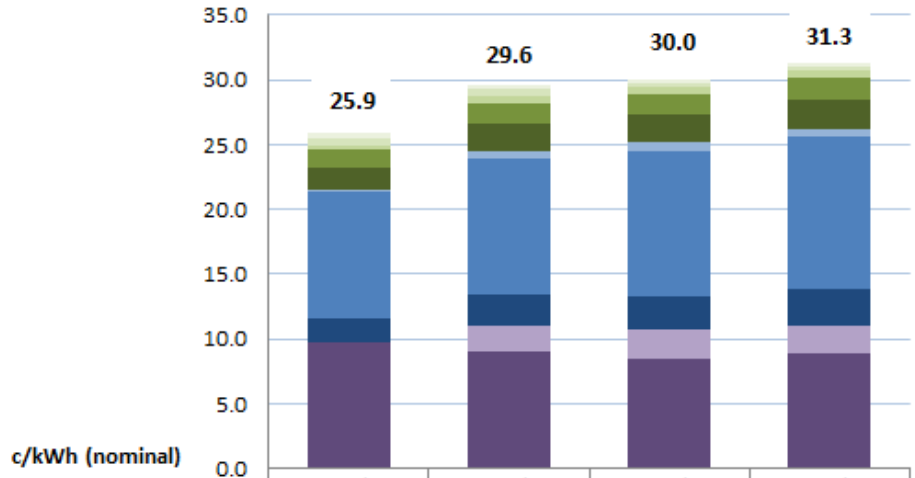
Source: CSIRO calculations from AEMO data

Peak demand and solar PV: network level

DNSP	State	Summer peak time	Summer peak day	Summer CLF adjustment	Winter peak time	Winter peak day	Winter CLF adjustment
Citipower	Vic	**13:00**	**Tuesday**	**44%**	18:30	Tuesday	2%
Powercor	Vic	**16:30**	**Sunday**	**1%**	18:00	Tuesday	0%
Jemena	Vic	**13:00**	**Tuesday**	**52%**	18:30	Tuesday	0%
SPAusNet	Vic	**17:30**	**Sunday**	**5%**	18:00	Tuesday	0%
United Energy	Vic	**13:00**	**Tuesday**	**46%**	18:00	Tuesday	0%
ETSA Utilities	SA	**17:30**	**Monday**	**3%**	18:30	Tuesday	5%
AusGrid	NSW	18:30	Saturday	1%	**18:30**	**Tuesday**	**1%**
Essential Energy	NSW	**17:30**	**Tuesday**	**4%**	18:00	Wednesday	0%
Endeavour Energy	NSW	**17:00**	**Tuesday**	**2%**	18:00	Wednesday	0%
ActewAGL	ACT	18:30	Monday	1%	**18:30**	**Wednesday**	**1%**
Ergon Energy	Qld	**16:00**	**Monday**	**0%**	18:00	Thursday	0%
Energex	Qld	**18:30**	**Sunday**	**7%**	18:00	Thursday	0%
Aurora Energy	Tas	18:00	Thursday	0%	**18:00**	**Sunday**	**0%**
Western Power	WA	**16:00**	**Wednesday**	**0%**	18:00	Tuesday	0%

Source: SKM (2013), Assessment of Economic Benefits of a National Energy Savings Initiative

Retail prices up some more



c/kWh (nominal)	2011/12	2012/13	2013/14	2014/15
State Schemes	0.4	0.3	0.3	0.3
Small Scale Renewable Energy Scheme	0.6	0.5	0.2	0.2
Large Scale Renewable Energy Target	0.4	0.5	0.6	0.6
Retail Margin	1.3	1.6	1.6	1.6
Retail	1.7	2.1	2.2	2.3
Feed-in Tariffs	0.1	0.7	0.7	0.7
Distribution	9.8	10.4	11.1	11.7
Transmission	1.9	2.4	2.6	2.8
Carbon costs	0.0	2.1	2.2	2.2
Wholesale	9.7	9.0	8.5	8.8

Source: AEMC (2013), Electricity Price Trends Report

The ‘death spiral’

- Networks have fixed costs because they build capacity ($/kVA)
- They recover their costs through energy charges (c/kWh)
- If energy consumption falls (e.g., PV, energy efficiency), fewer kWh to recover fixed costs
- Creates a revenue shortfall
- In the next round, the network charge (c/kWh) has to rise
- This feeds through to higher retail prices
- This leads to greater incentive to reduce consumption
- And so on…

Storage, just around the corner?

PowerSmart Home

Energy: cents/kWh	Ex GST	Inc GST
Peak: 2pm – 8pm on working weekdays	47.7700	52.5470
Shoulder: 7am – 2pm and 8pm – 10pm working weekdays and 7am – 10pm on weekends and public holidays	19.4000	21.3400
Off Peak: all other times	11.9000	13.0900
Service Availability Charge (cents/day/connection point)	74.7000	82.1700

SUNTECH

SUNTECH SOLAR PANELS
78¢ PER WATT (1 Pallet min)

Model	Minimum Quantity	Price Per Watt
Specs: STP285- 24/Vd	1 Pallet (21 Panels)	78¢/W

ERGON ENERGY

CAPEX costs:
Urban ~ $1.2-2K/kVA
SWER ~ $6-10K/kVA

Excitingly Powerful A 123 20ah PRISMATIC CELLS

Market price:	~~$38.53~~
Shop price:	**$32.11**
NO.:	000468
Brand:	A123
Weight:	568gram

Following the purchase of goods to reach the number that they can enjoy a range of preferential prices:

number
20
1000

909 Generator Promo 720W

Write a review

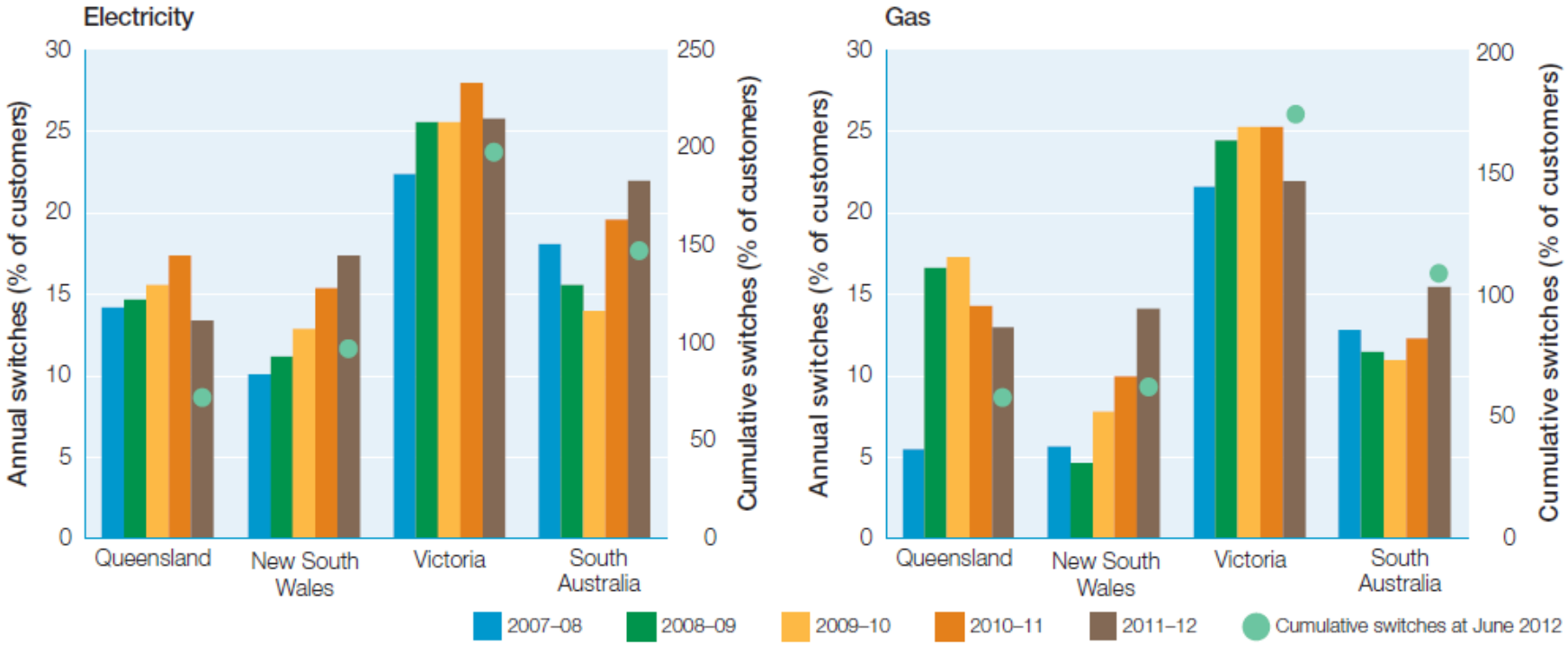
$60.00

- 720W Peak powerideal for camping and homeuse applications
- Large 4.2L fuel tank ensures up to 6 hours of continious operation

Quantity

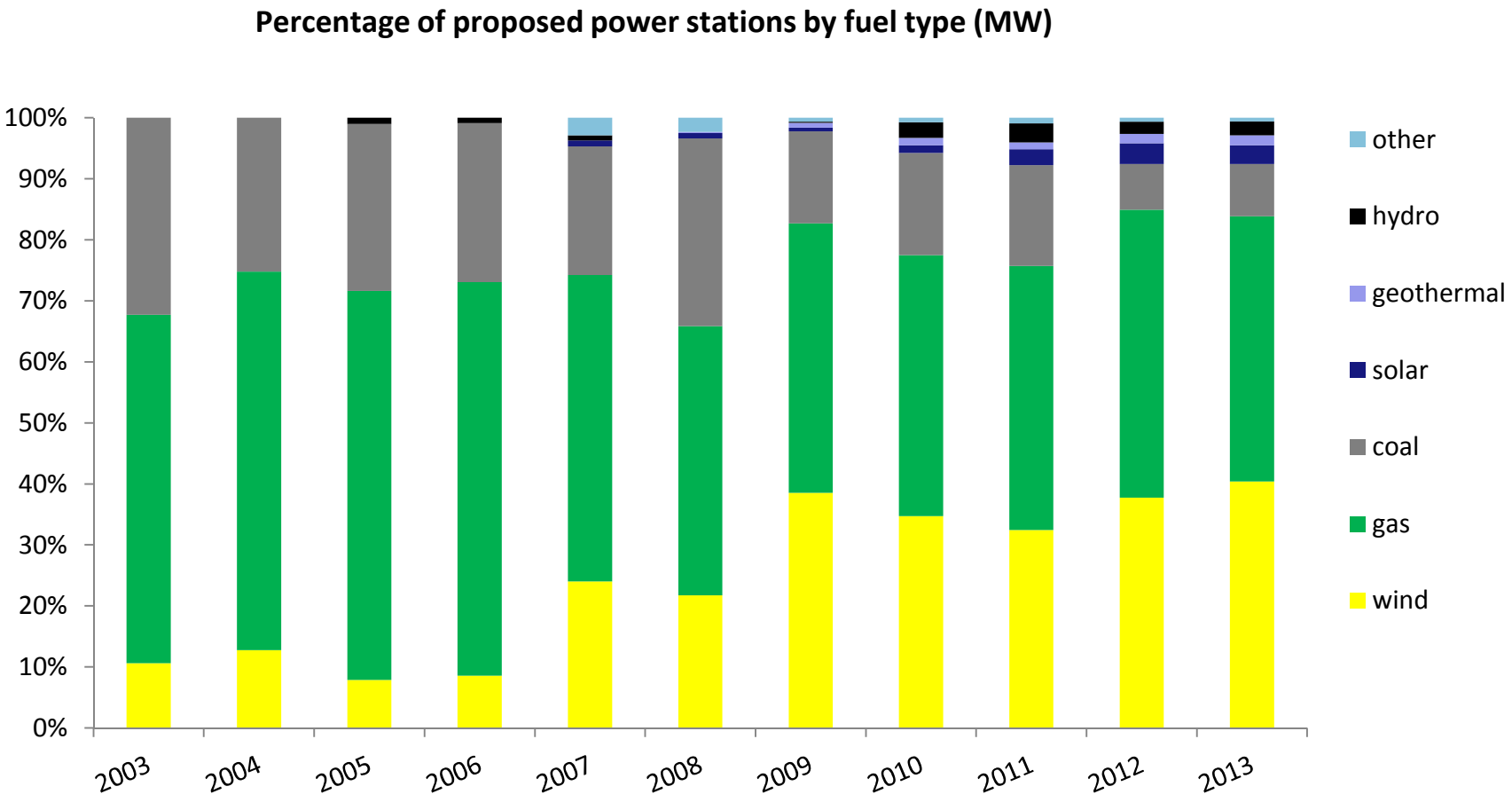
CSIRO

Can retailers keep their customers?



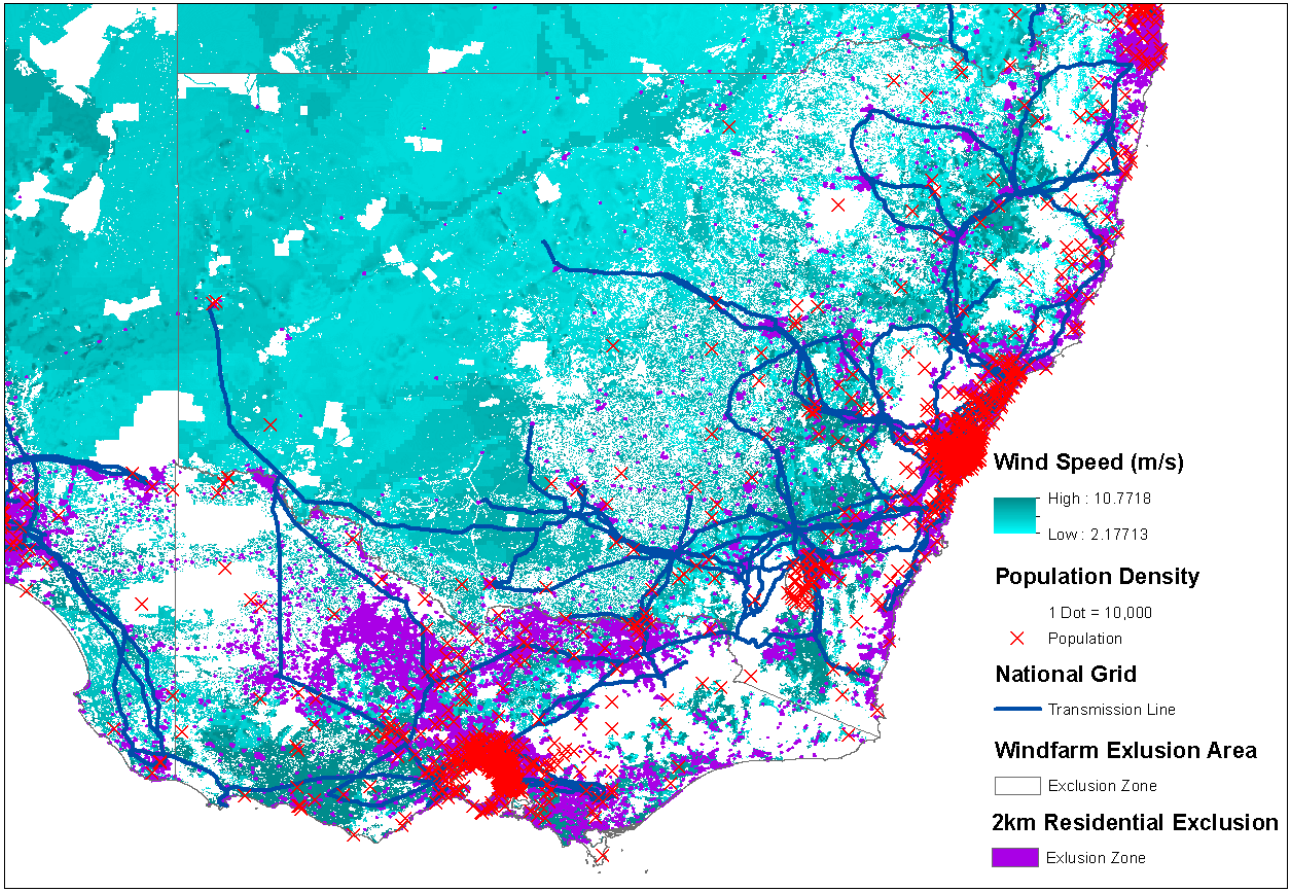
Source: AER (2012), State of the Energy Market 2012

Likely investment



Source: ESAA (2013), Electricity Gas Australia 2013

More wind, but…



Source: Reedman et al. (2012), 'Quantifying the Impact of Setback Limits on the Possible Deployment of Wind Farms in Australia', Paper presented at the International Energy Workshop.

Large scale solar coming, PV…

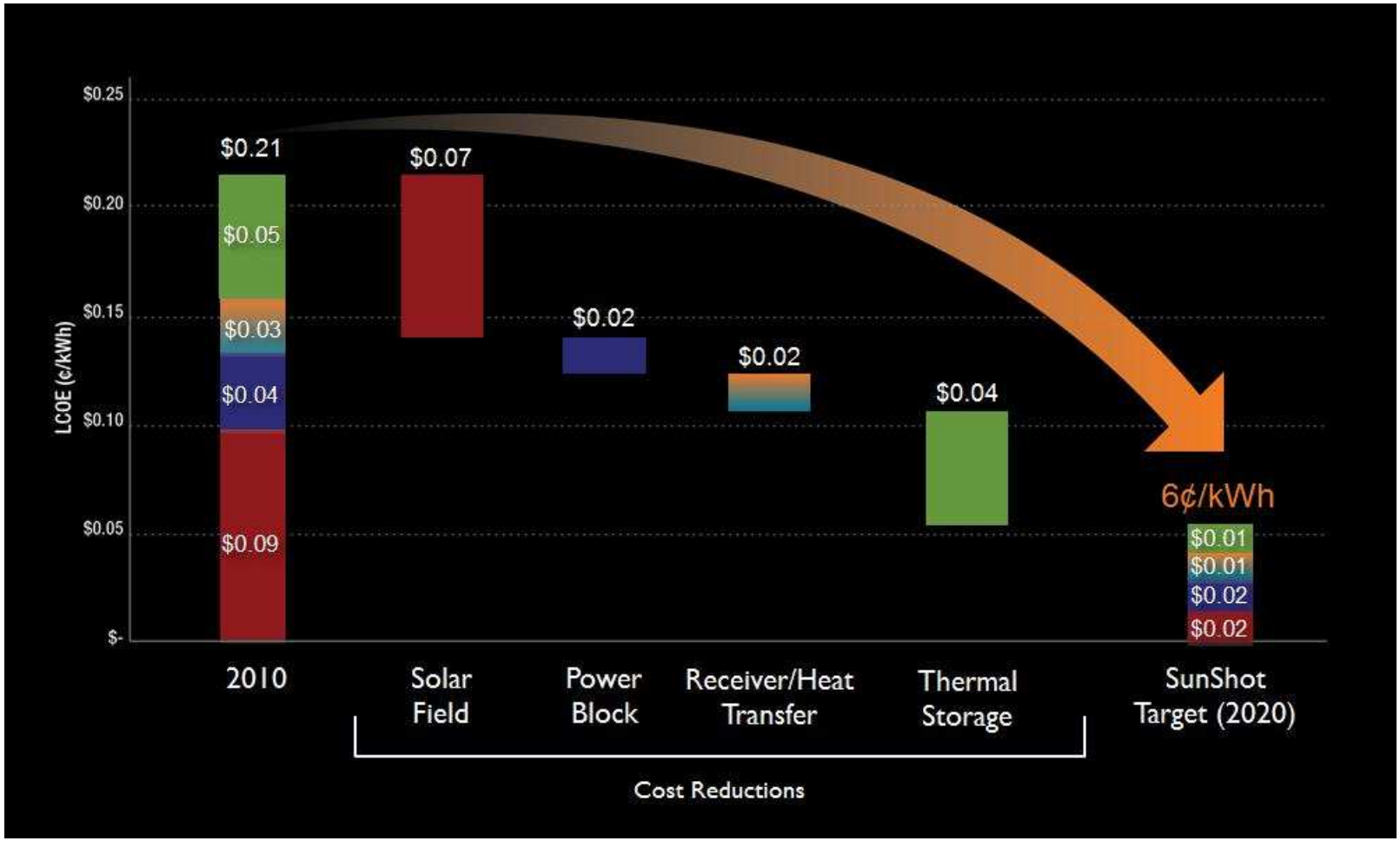
2007 - 305 kW_p on Alice Springs Crown Casino
Photo provided by SunPower Corporation

2009 - 1.0 MW_p on Adelaide Showground

2012 - 1.22 MW_p at University of QLD

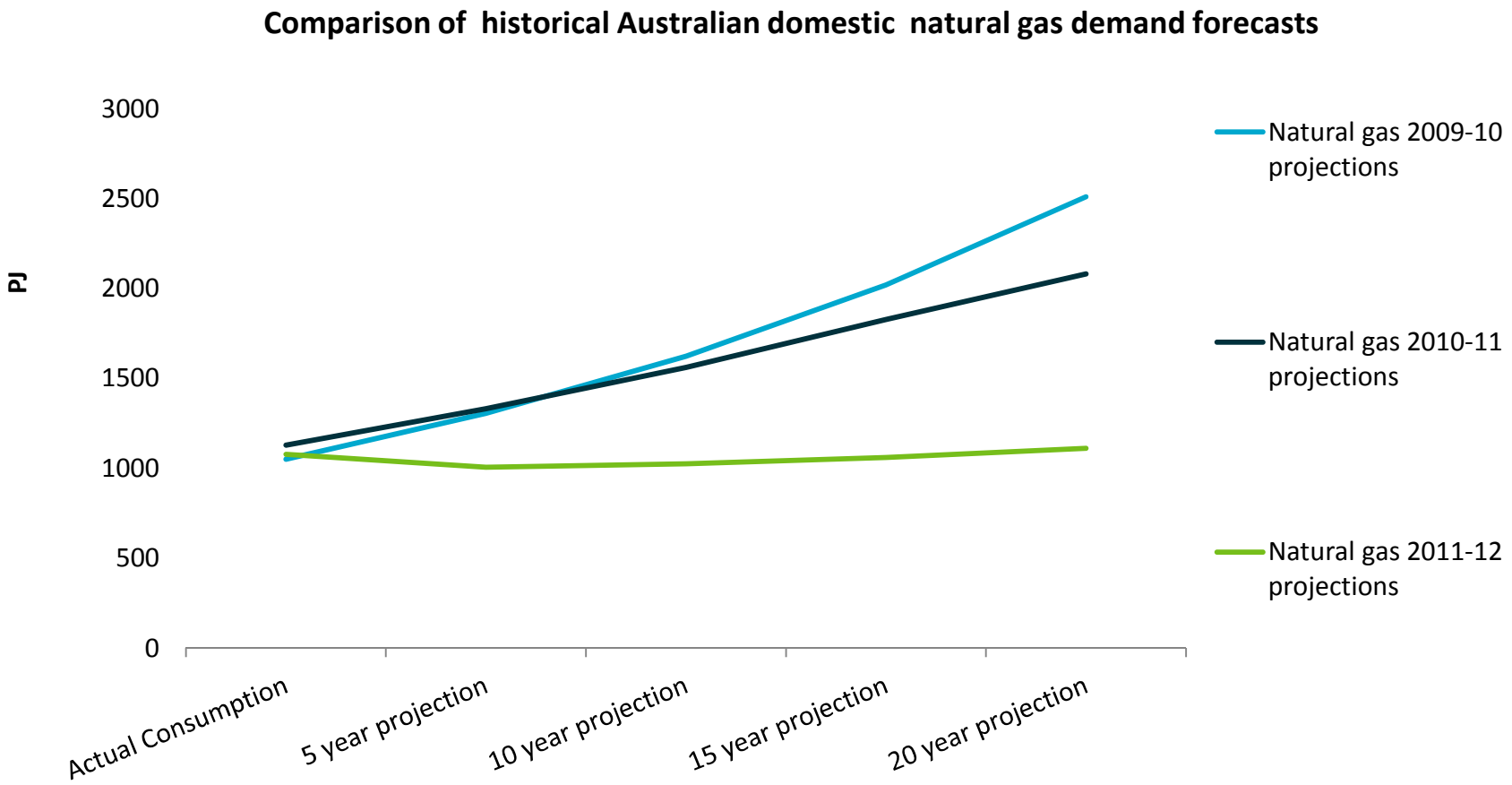
2013 - 10 MW_p at Greenough River, WA
Photo provided by First Solar

… can solar thermal fight back?



Source: U.S. Department of Energy

What about gas?



Source: ESAA (2013), Electricity Gas Australia 2013

CCS and nuclear

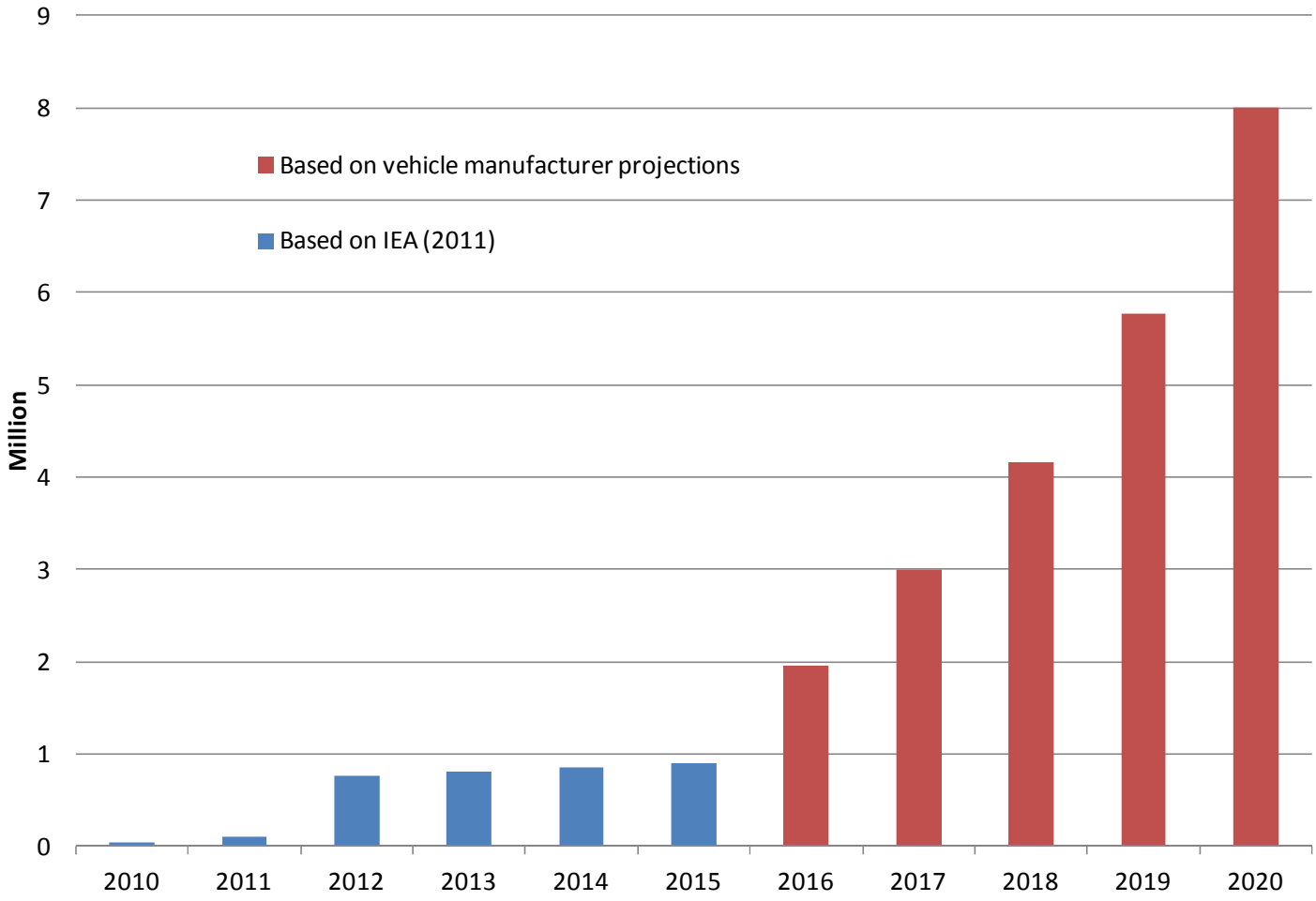
CCS

- Number of technologies being investigated
- Delays in timeline
- CCS expected to be at commercial scale in 2020 at the earliest

Nuclear power

- Currently prohibited in some states
- No local experience
- Lack of community acceptance
- Environmental issues and catastrophic risk

New demand: electric vehicles



The take away

- Considerable uncertainty
- Demand has changed and will continue to change
- More modular centralised supply
- Less network build, but still needs spend
- Decreasing utilisation needs to be tackled (‘death spiral’ in the extreme case)
- Pricing needs to change, challenge is consumer buy-in

Questions?

Thank you

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Acknowledgments

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