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## ASX Release

### Merchant Energy presentation

**31 May 2013**

Attached is a presentation to be made today by AGL executives at Falls Creek, Victoria.

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#### About AGL

AGL is one of Australia's leading integrated renewable energy companies and is taking action toward creating a sustainable energy future for our investors, communities and customers. Drawing on 175 years of experience, AGL operates retail and merchant energy businesses, power generation assets and an upstream gas portfolio. AGL has one of Australia's largest retail energy and dual fuel customer bases. AGL has a diverse power generation portfolio including base, peaking and intermediate generation plants, spread across traditional thermal generation as well as renewable sources including hydro, wind, landfill gas and biomass. AGL is Australia's largest private owner and operator of renewable energy assets and is looking to further expand this position by exploring a suite of low emission and renewable energy generation development opportunities.

# Energy Market Update Falls Creek, Victoria



**175**  
YEARS  
SUPPORTING  
THE COMMUNITY

**AGL**

**Prof Paul Simshauser, Chief Economist**

**Anthony Fowler, General Manager Merchant Energy**

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# Agenda

- > **Electricity Demand: A global perspective** Prof Paul Simshauser
- > **Wholesale Electricity & Gas markets** Anthony Fowler
- > **Q&A session**

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## Electricity Demand:

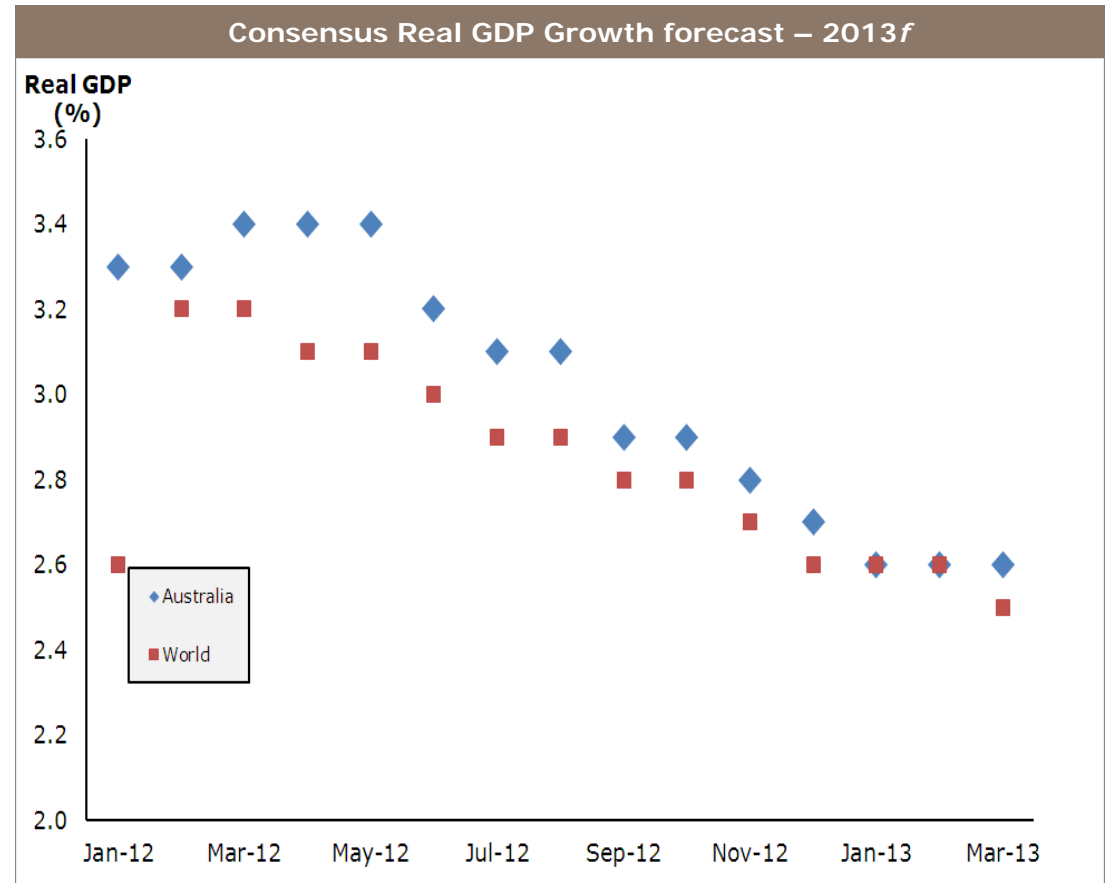
### Key thematic

- Effect of economic conditions on demand in the NEM
- Recent trends in AGL household energy demand
- Impact of Solar PV

# Economic growth

Global GDP growth forecasts for *2013f* have been trending down.

- › Consensus forecasts of 2013 real GDP growth have been trending down over the past 18 months
- › The US outlook is improving, although continues to face fiscal headwinds
- › Europe remains weak with conditions extremely varied by country
- › Consumer caution and deleveraging is occurring in many advanced economies, including Australia
- › These factors are affecting electricity demand



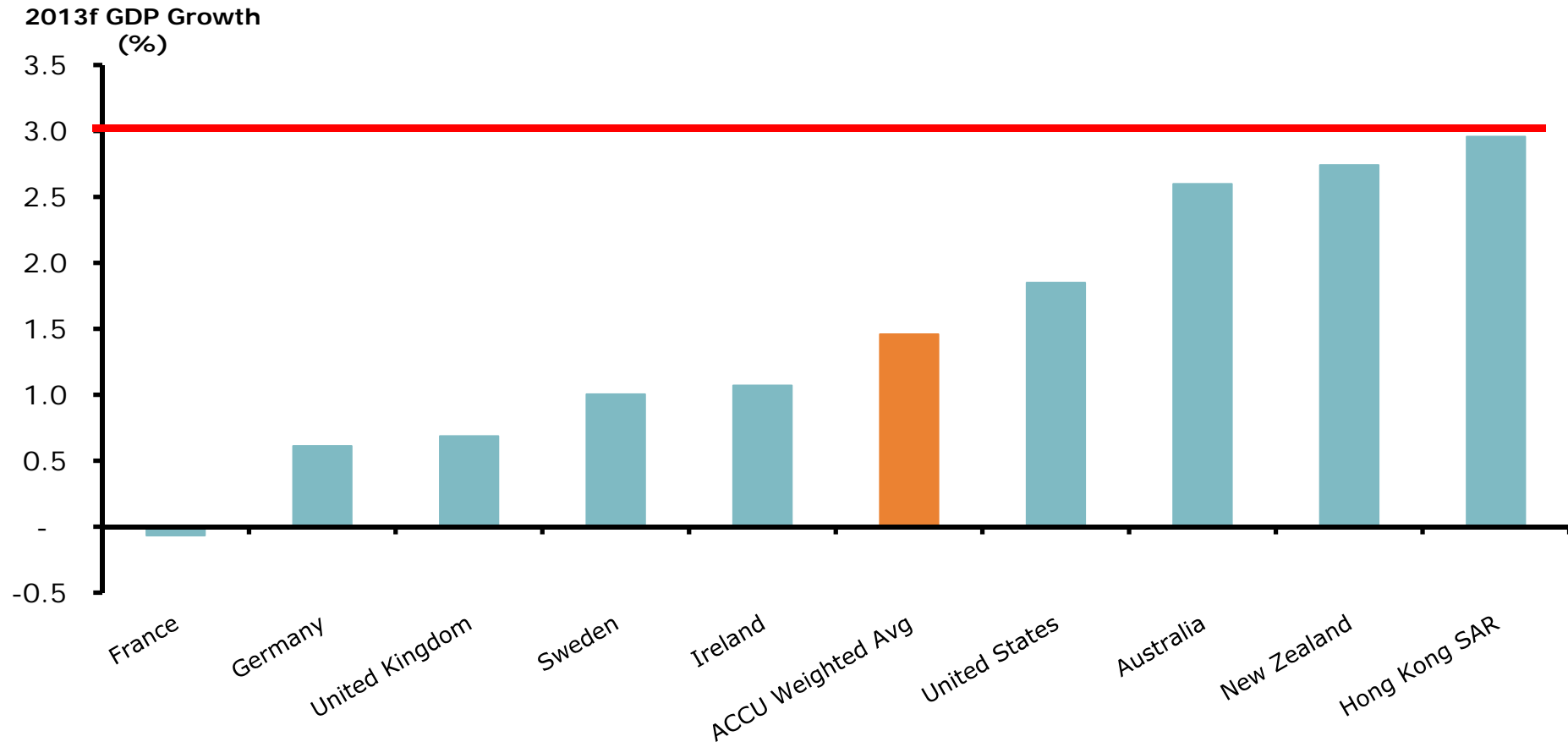
Source: Macquarie Securities (Australia) Limited, AGL.

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# Economic growth

Sub-par economic growth continues to be a drag on power production.

Economic Growth (%)



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Source: IMF, RBA.

ACCU – Advisory Customer Council – Utilities



Recovery from a financial crisis is a slow process. Empirical evidence confirms it is a mistake to assume a smooth return to economic growth. This has implications for power production and electricity demand growth

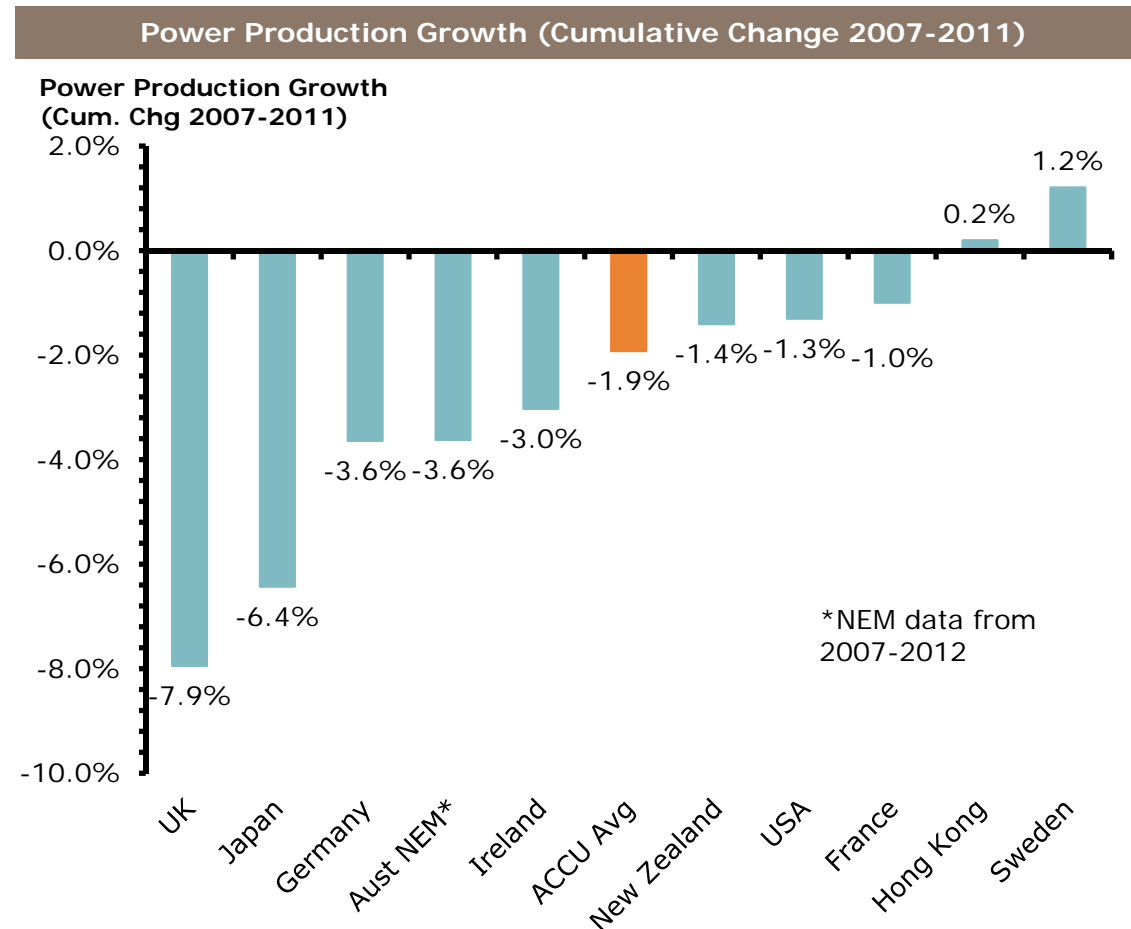




# Contracting power production

A common thematic amongst industrialised nations from about 2008.

- > Following the financial crisis in 2008, power production growth rates have contracted in most western economies
- > NEM power production (between 2007-2012) has contracted by 3.6% in aggregate while NEM energy demand contracted by 1.1% (with the difference being driven by changes in the mix of generation losses and system losses)
- > While NEM electricity demand has contracted by 1.1% (2007-12), aggregate residential demand has contracted by 5.9% with the largest fall occurring in 2012 (27.7% share)
- > C&I 'demand destruction' appears to have stabilised (0.8% cumulative growth) with modest aggregate growth of 1.1% in 2012



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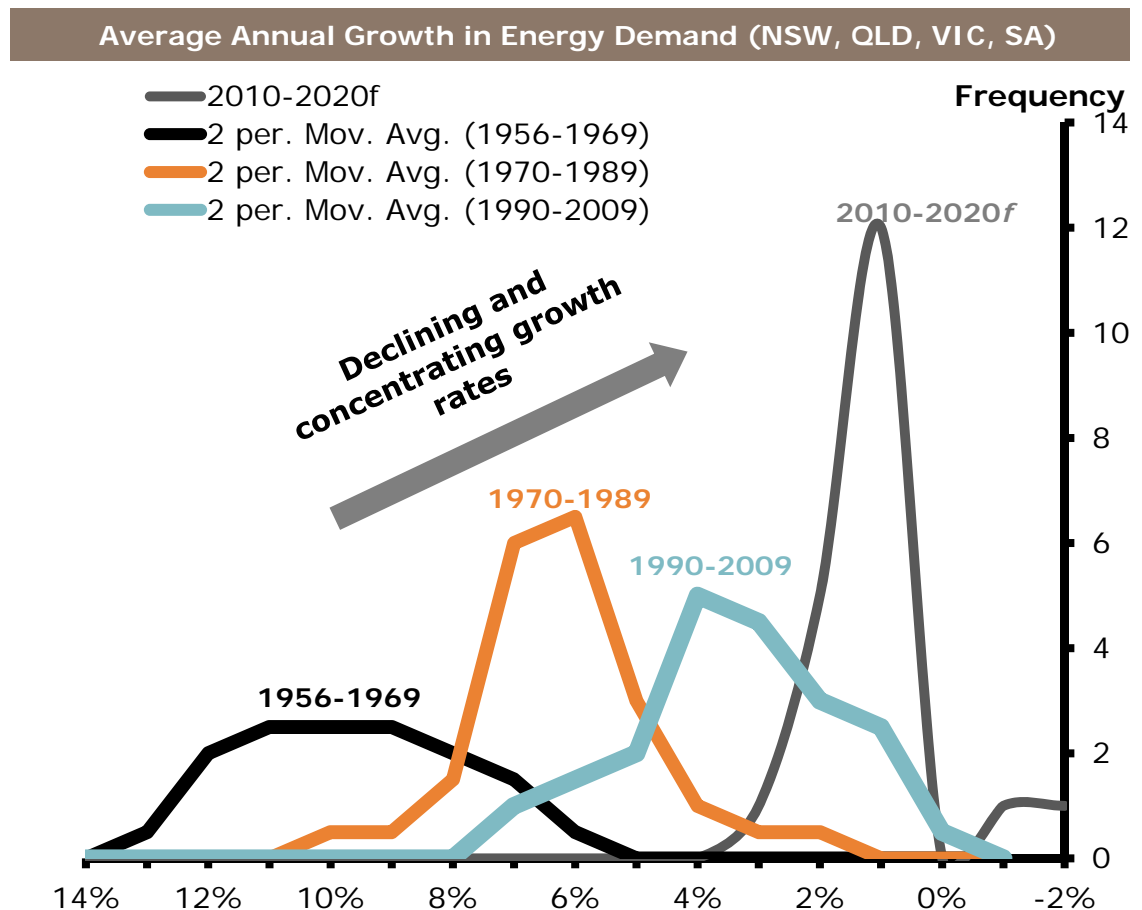
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Source: BP, AGL, AEMO, esaa

## Energy demand growth rates

NEM energy demand growth rates have been falling for decades.

- › Declining energy demand (as distinct from peak electricity demand) growth rates and a concentration of energy demand growth has been a multi-decade trend, and is unlikely to reverse based on current forecasts
- › This is a common characteristic amongst developed economies and reflects predictable structural shifts in the economic base
- › Throughout most of the 40-year period from 1955, NEM energy demand growth ran ahead of growth in Australia's real GDP
- › From 1996 onwards, energy demand growth shadowed real GDP growth, and more recently, has contracted

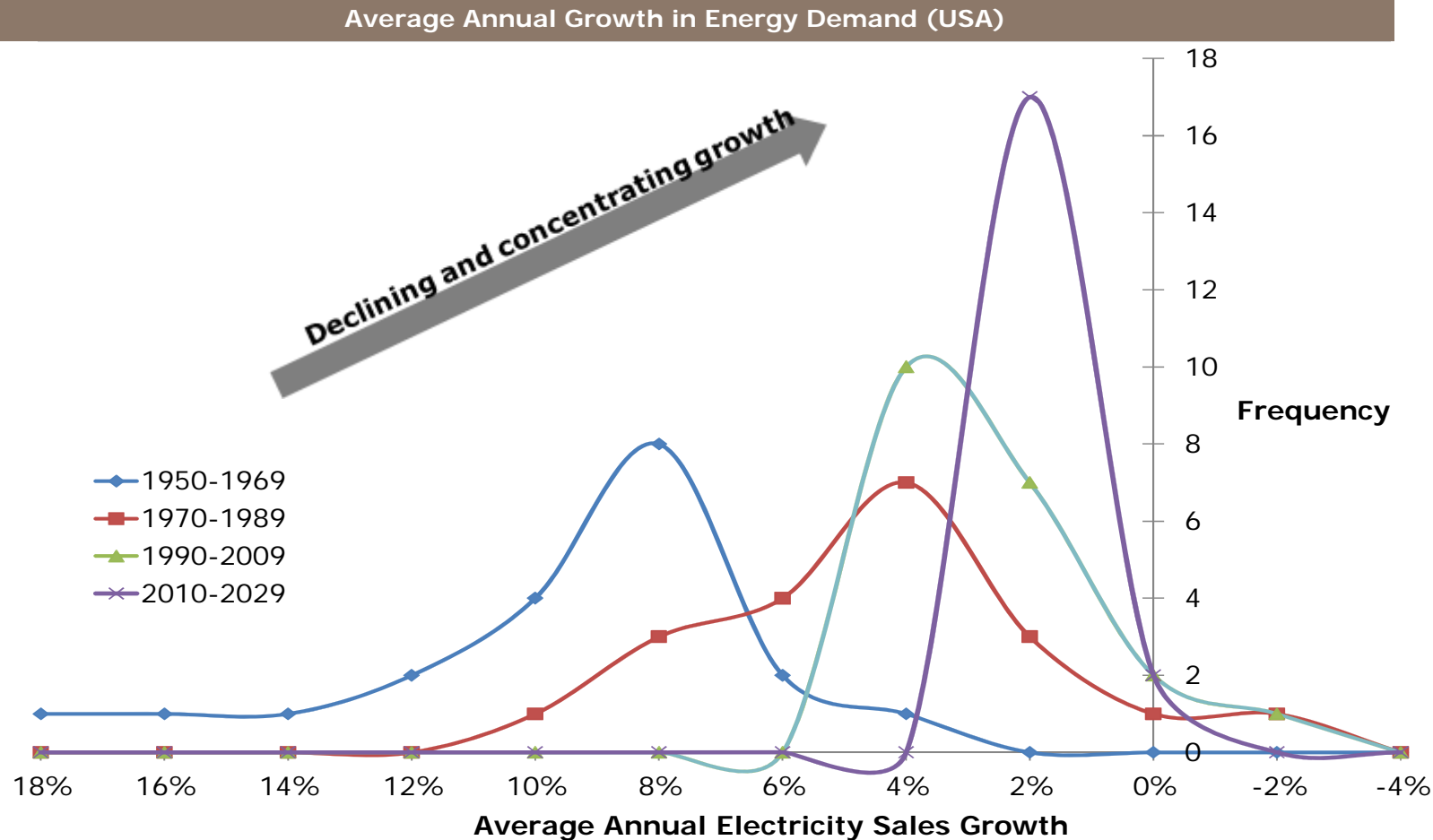


Source: Simshauser & Nelson

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# US electricity demand growth distribution: 1950-2029f

Electricity demand growth in the US shows a similar pattern.

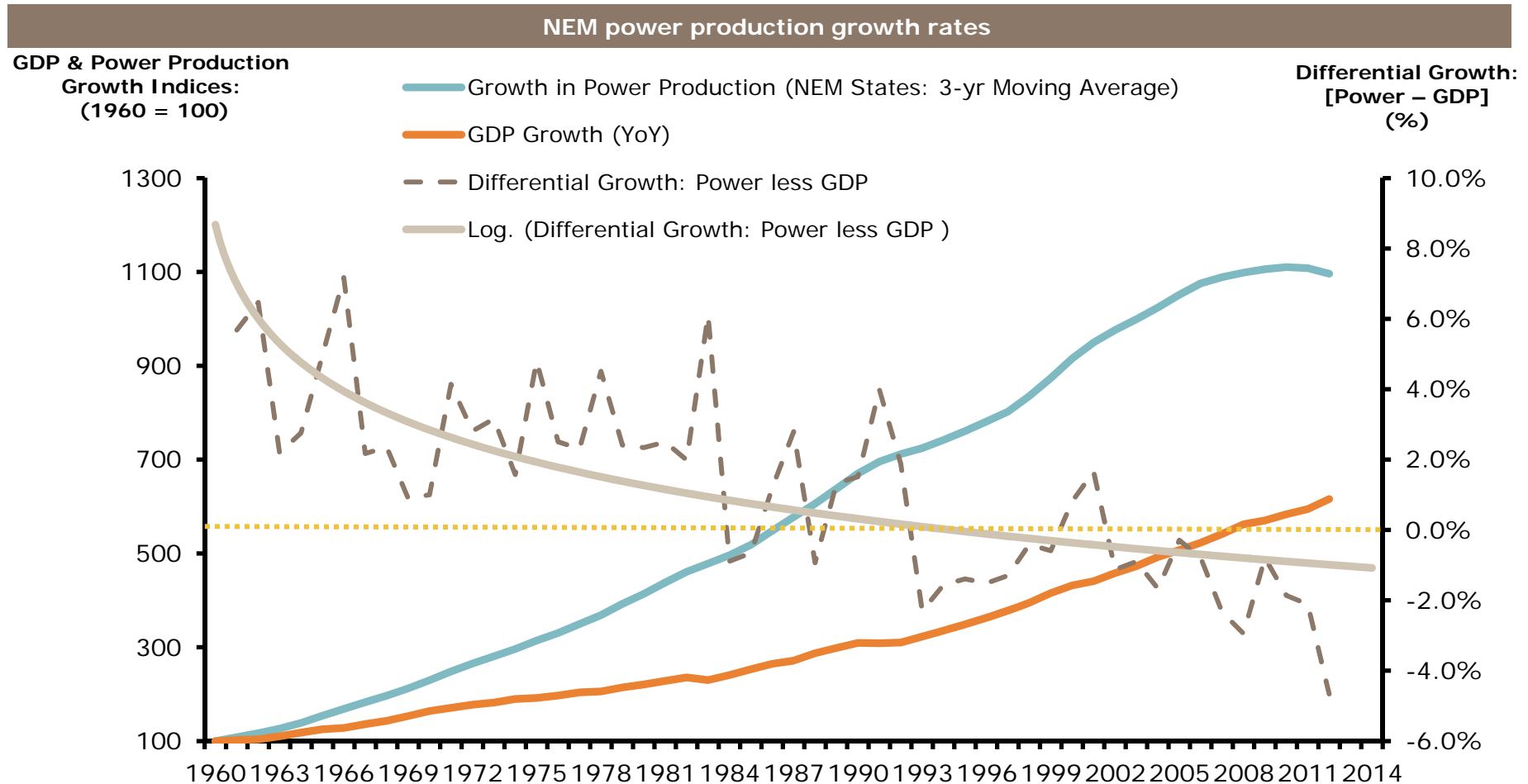


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Source: Brattle Group

# NEM power production growth

Growth rates fell below GDP growth in the mid-1990s, and stayed there.



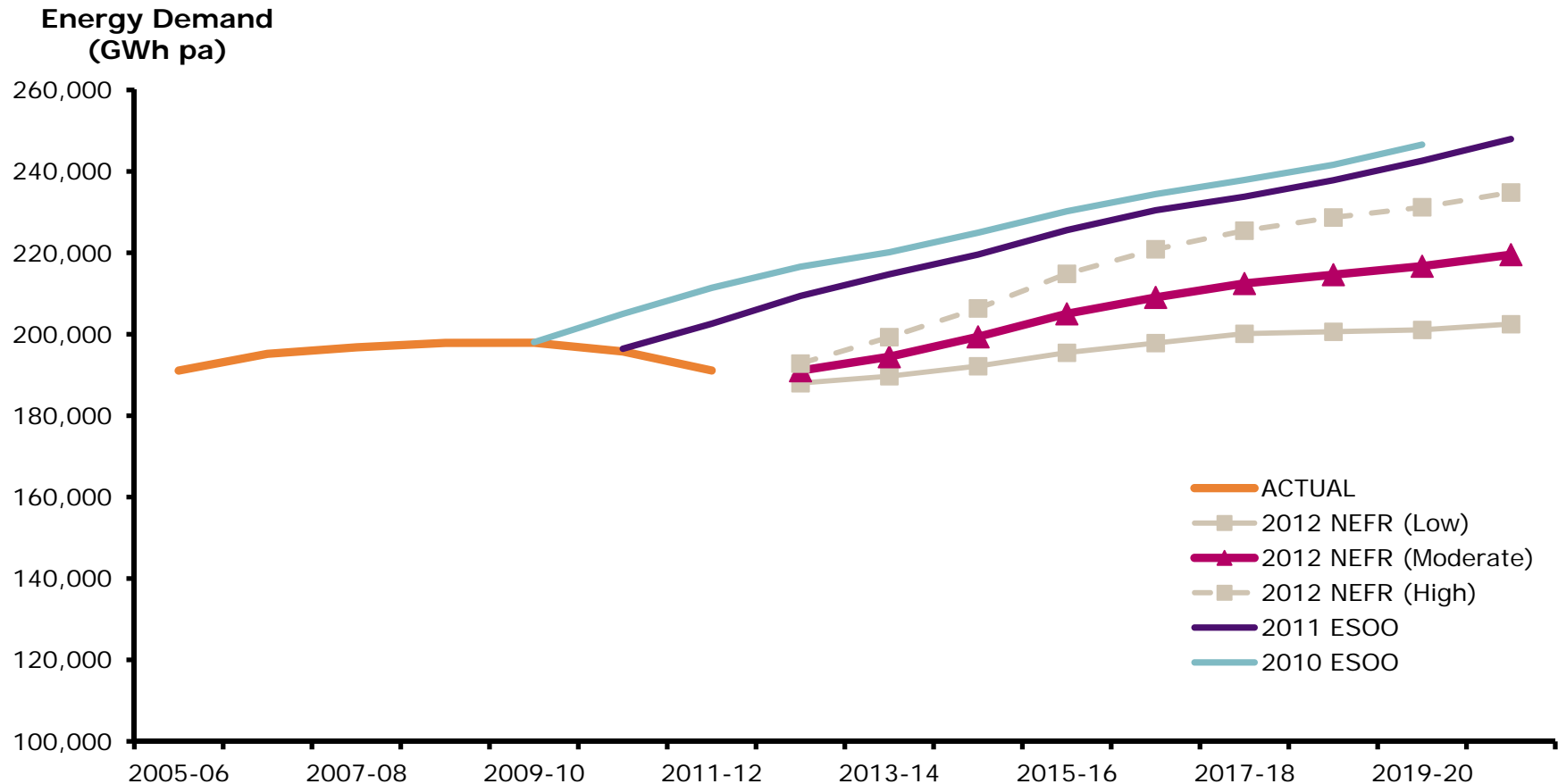
Source: Simshauser & Nelson

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# Energy demand

Demand is now harder to forecast, as AEMO's forecasts illustrate.

NEM Energy Demand: Actual & Forecast (GWh)



Source: AEMO

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The basic anatomy of a financial crisis is an important starting point when examining the drivers of electricity demand growth in the current environment



# Anatomy of a financial crisis:

## “The Run-up”

- › Financial crises are occurring more frequently, and their intensity has been rising. Globally, there have been 120 financial crises over the last 50 years
- › The 2008 financial crisis included more than 10 countries and included the USA, which by definition means it was a very large global economic shock
- › Financial crises have a common anatomy. They start with the rapid expansion in credit (usually bank credit)
- › Funds are invested into assets, most commonly shares and/or real estate. Weight of funds means that asset prices begin to rise rapidly
- › Investor enthusiasm becomes a perpetual motion machine. Participation becomes more widespread further reinforcing rising asset prices
- › Firms and households make excessive use of the expansionary credit environment
- › They borrow based on asset price inflation and asset recycling
- › Deep belief that this time is different - asset prices won't fall

# Anatomy of a financial crisis:

## “The Crash”

- › Aggregate asset prices (stocks & real estate) race ahead of GDP growth year-on-year, which defies economic gravity in the case of aggregate stock prices
- › Then aggregate economy-wide demand begins to slow – ‘event X’ occurs which flushes out the weakness in the economy
- › Smart/lucky investors/managers exit at the first sign of trouble and make a killing. Most households, and firms, hold on
- › Asset prices begin to fall
- › Banks observe the falls and credit rationing commences (accentuating the collapse when household and business facilities mature, or are marked-to-market, and require refinancing)
- › Earnings from suboptimal investments fail to meet debt obligations, assets are then forced to market
- › Liquid asset prices plunge first (stocks), followed by illiquid assets (real estate)
- › Firms and households end up with reduced asset holdings (i.e. wealth) and are over-leveraged – and at this point a ‘crisis of confidence’ sets in, further accentuating the downward spiral



# Anatomy of a financial crisis:

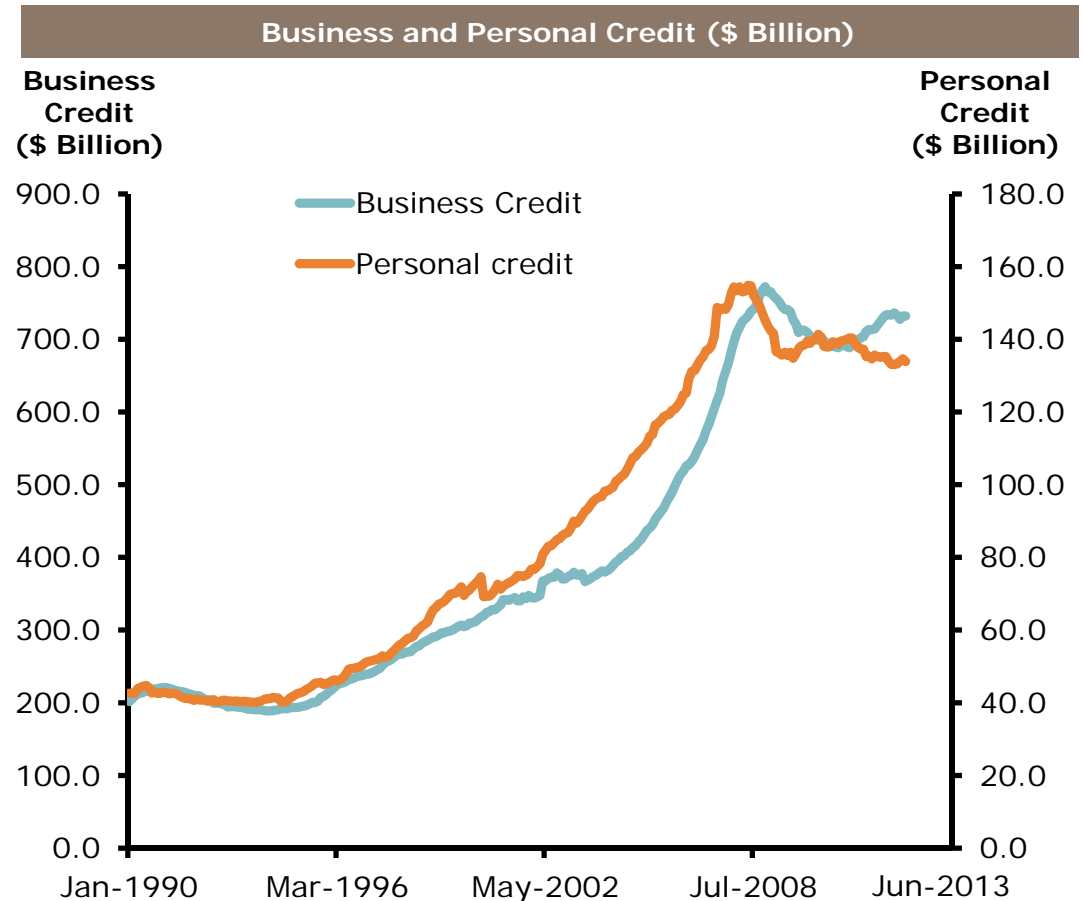
## “The Fall-out”

- › Firms and households are by this stage demonstrably over-leveraged and are forced to urgently repair their business and personal balance sheets
- › In 1991 and in 2007, Australian firms went into the financial crisis with about 40% debt. They exited the cycle with about 30% debt
- › Household savings rates rise, finance growth decelerates, and consumption growth rates decline as households try to get their balance sheets in order
- › Economic activity becomes subdued (nb. consumer spending typically comprises 50-60% of growth in real GDP)
- › As a result, firms cancel expansion plans, and the existing productive capacity utilisation rates of firms declines, and unemployment starts to rise
- › Australia avoided recessionary conditions but this basic anatomy of financial instability has implications for electricity demand over the medium term

## Business & Household credit

Rapid credit expansion during the run-up, then, deleveraging.

- › Following the financial crisis in 2008, business and personal credit, which form important components of economic growth (and therefore electricity demand growth), have contracted
- › The use of credit essentially pulls forward future economic activity to the current period and thus any contraction in credit dampens growth rates
- › In the four years to Sept 2008, business credit expanded by average compound growth rate of 17.2% pa and has since contracted by 1.2% pa over the following four years
- › Similarly, in the four years to Sept 2008, personal credit expanded by compound growth rate of 9.8% pa and has since contracted by 2.4% pa



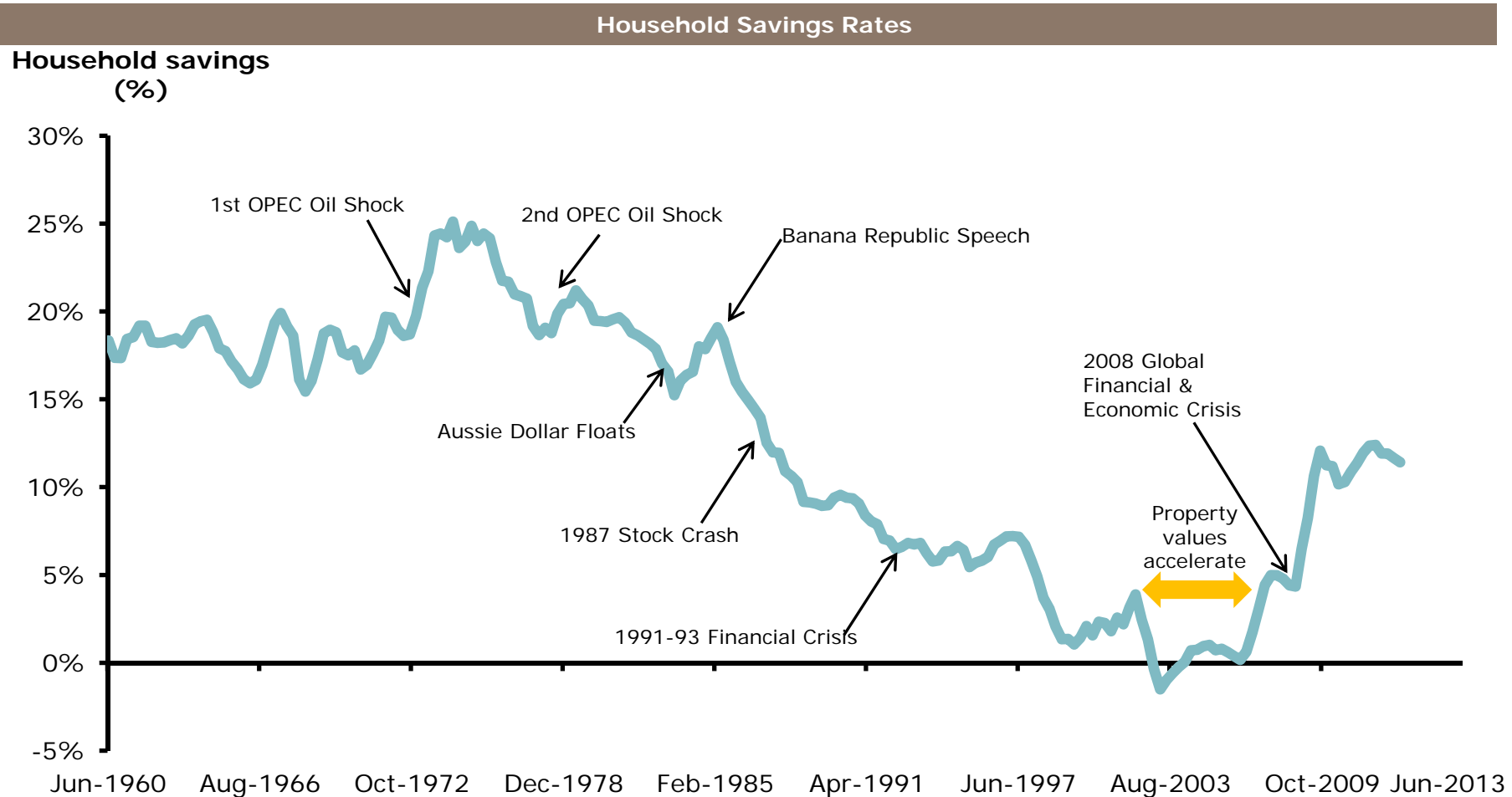
Source: Simshauser & Nelson

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# Household savings

Consumer caution drives increases in savings rates.



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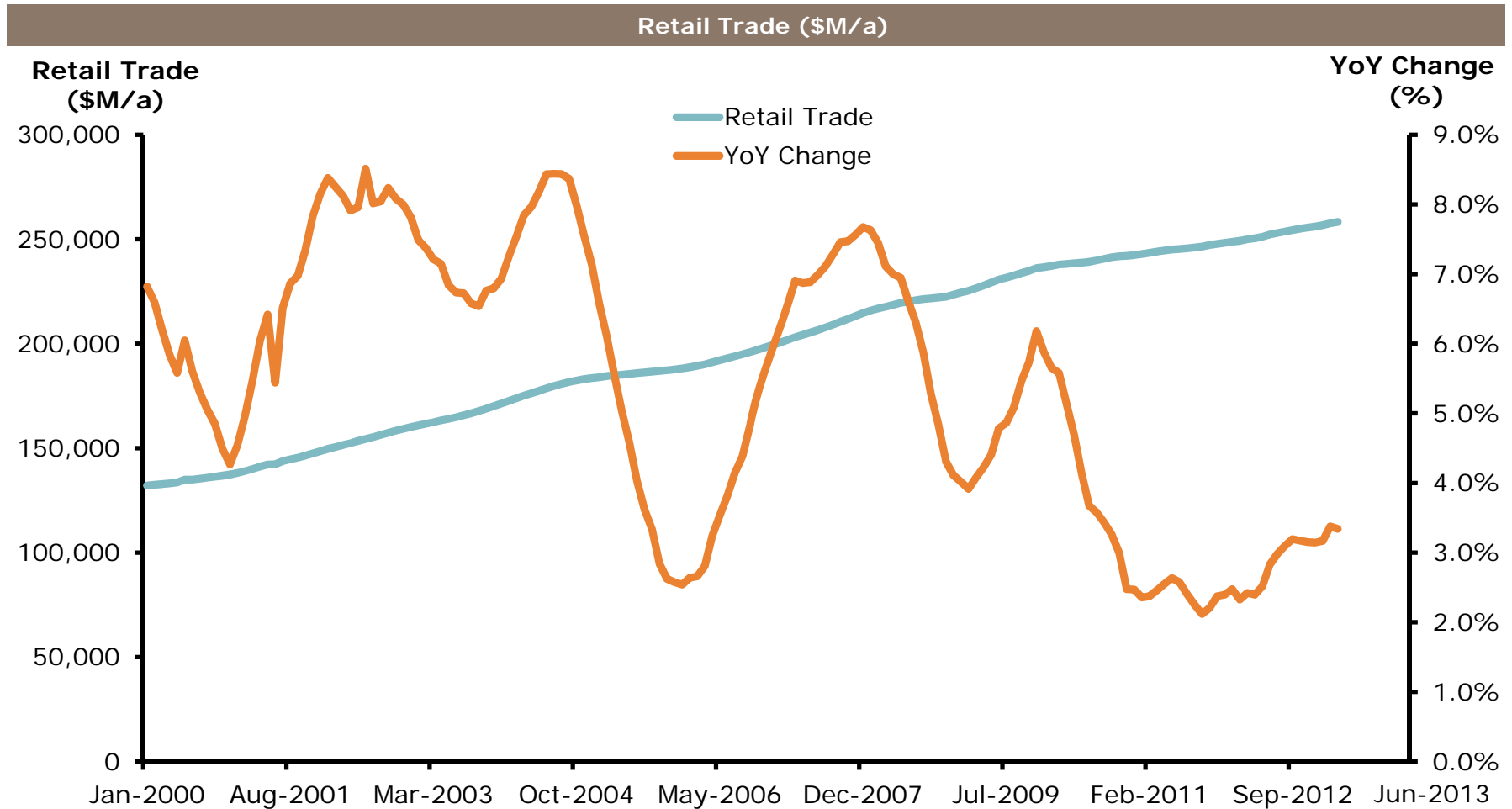
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Source: Simshauser & Nelson

# Retail trade

Rising savings has a dampening effect on Retail Trade.



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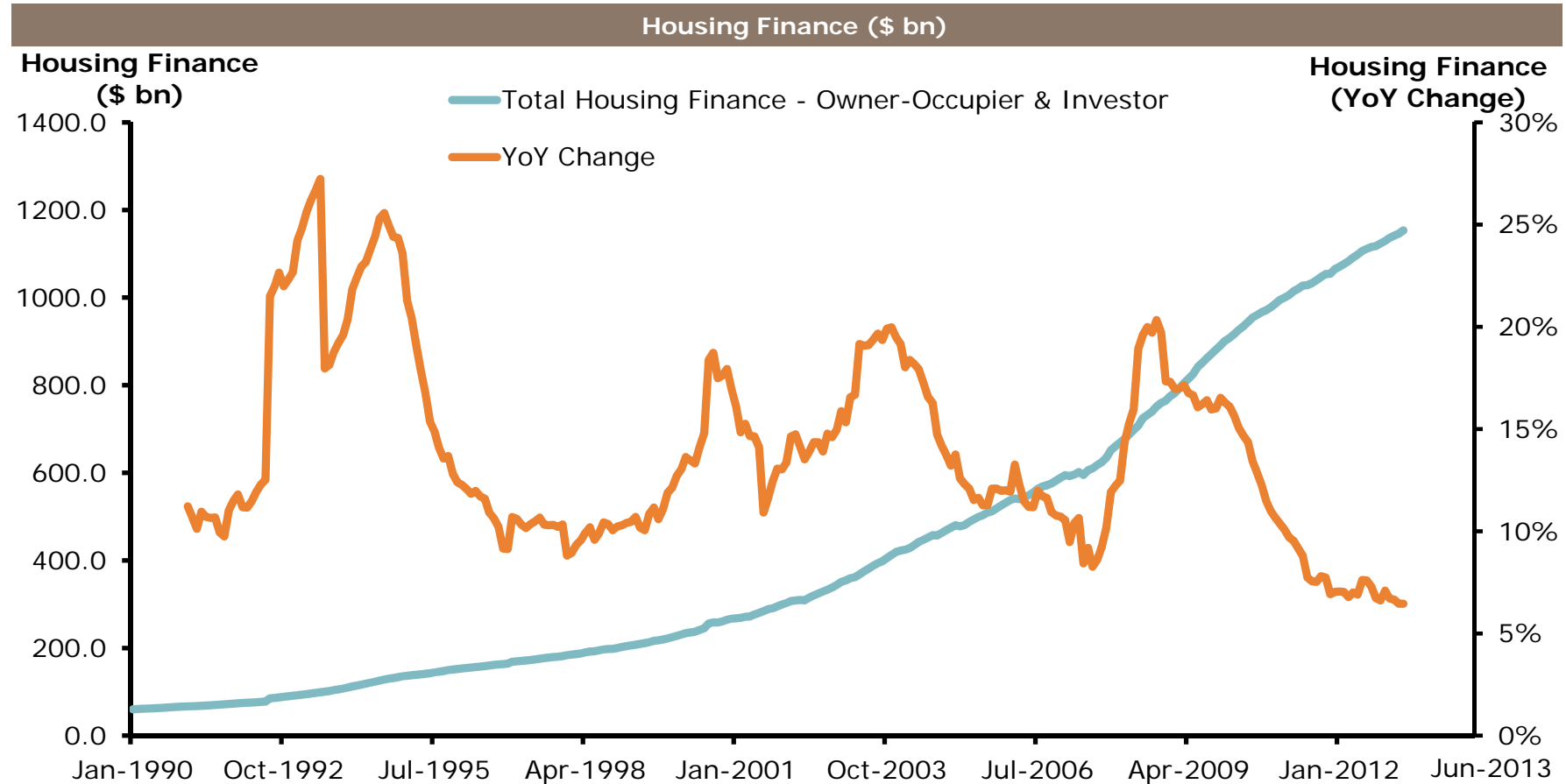
Source: RBA, AGL



# Housing finance

Consumer caution has also dampened housing finance and renovations.

- » Housing formation remains an important source of structural electricity demand growth



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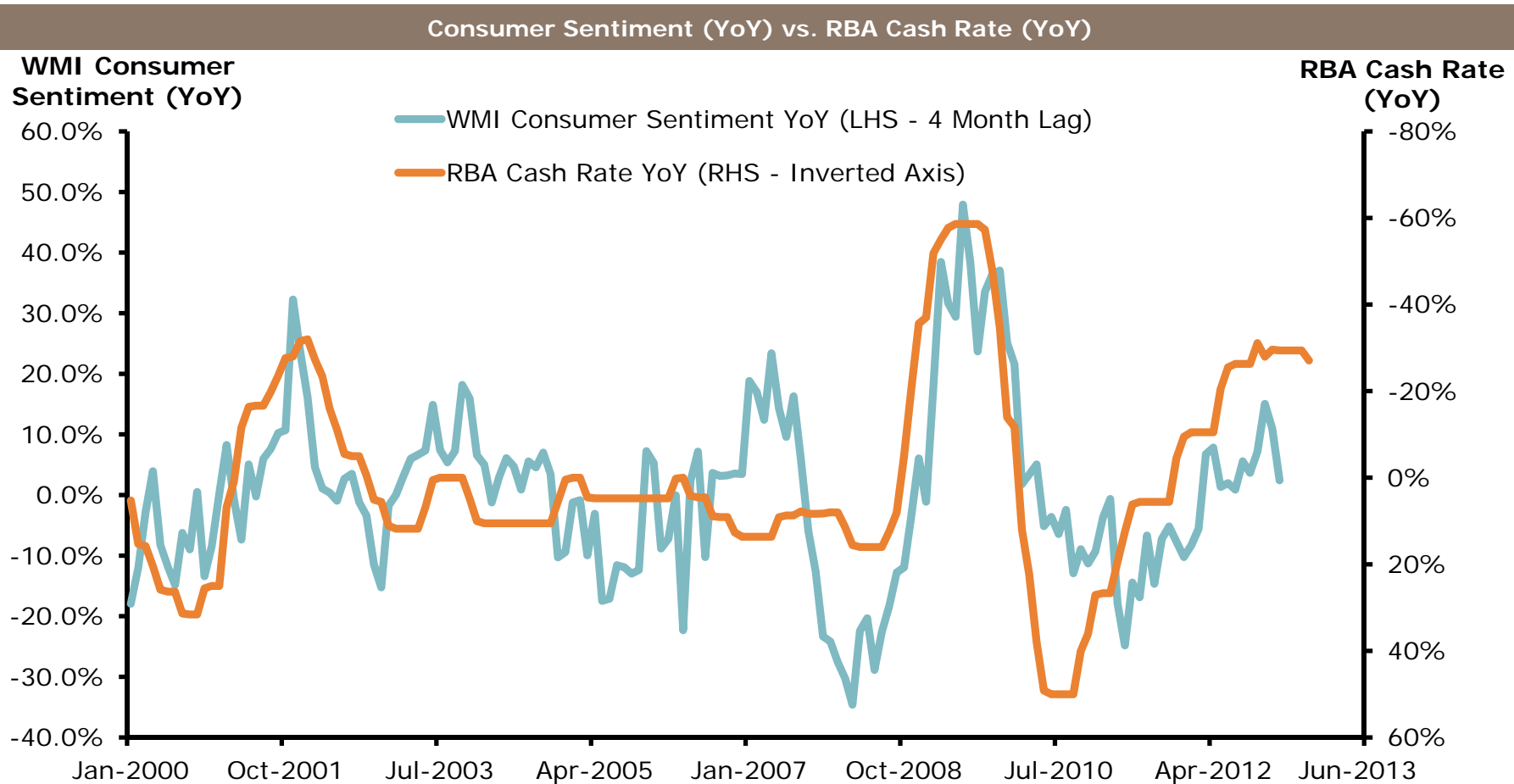
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Source: RBA, AGL

# Official Rates and Consumer Sentiment

Interest rate cuts are helping sentiment recover, with a lag of ~4 months.



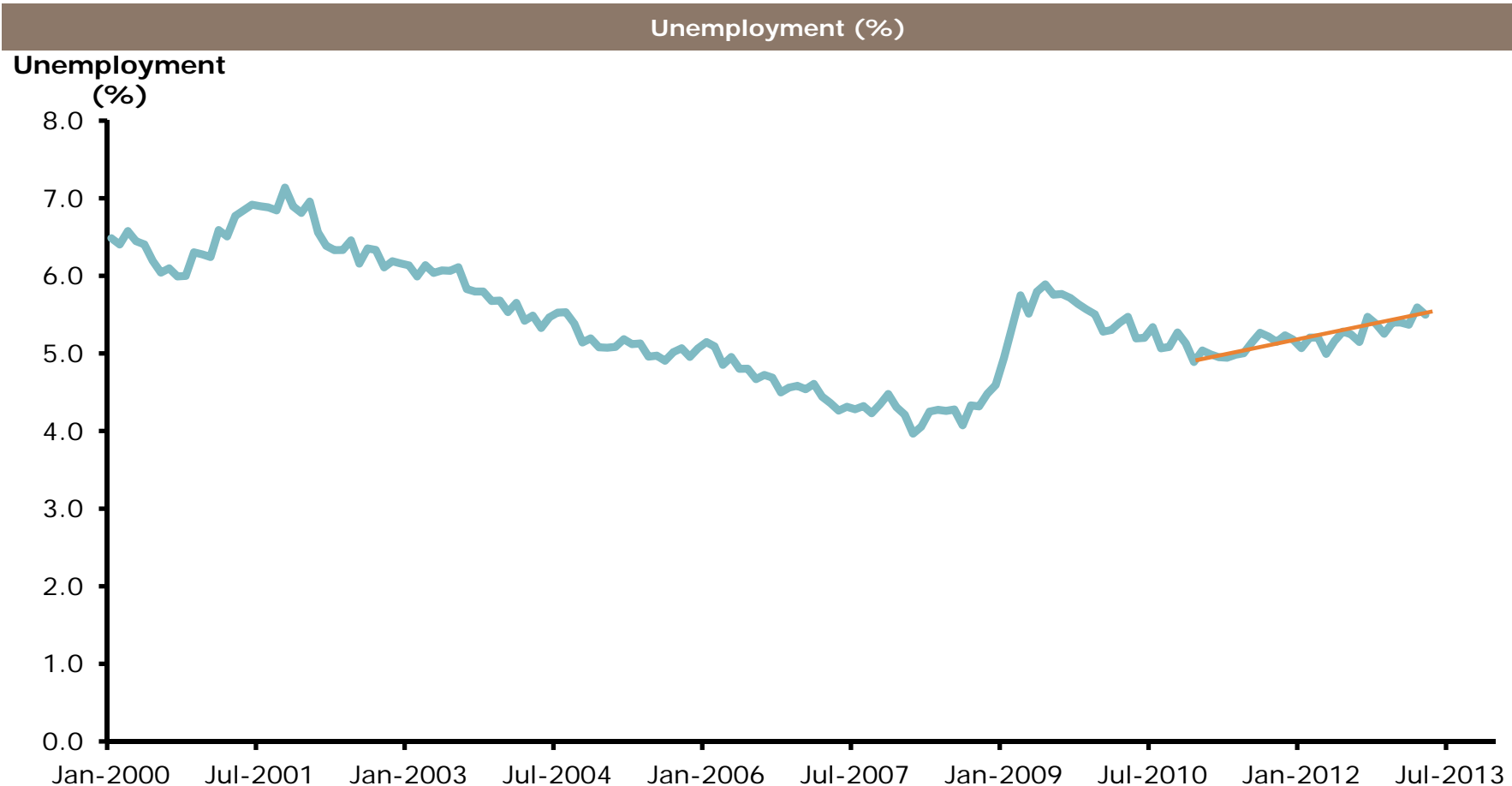
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Source: CSLA Aust. Pty Ltd, RBA, AGL



# Unemployment Rate

But the unemployment rate trend is unlikely to help consumer sentiment.



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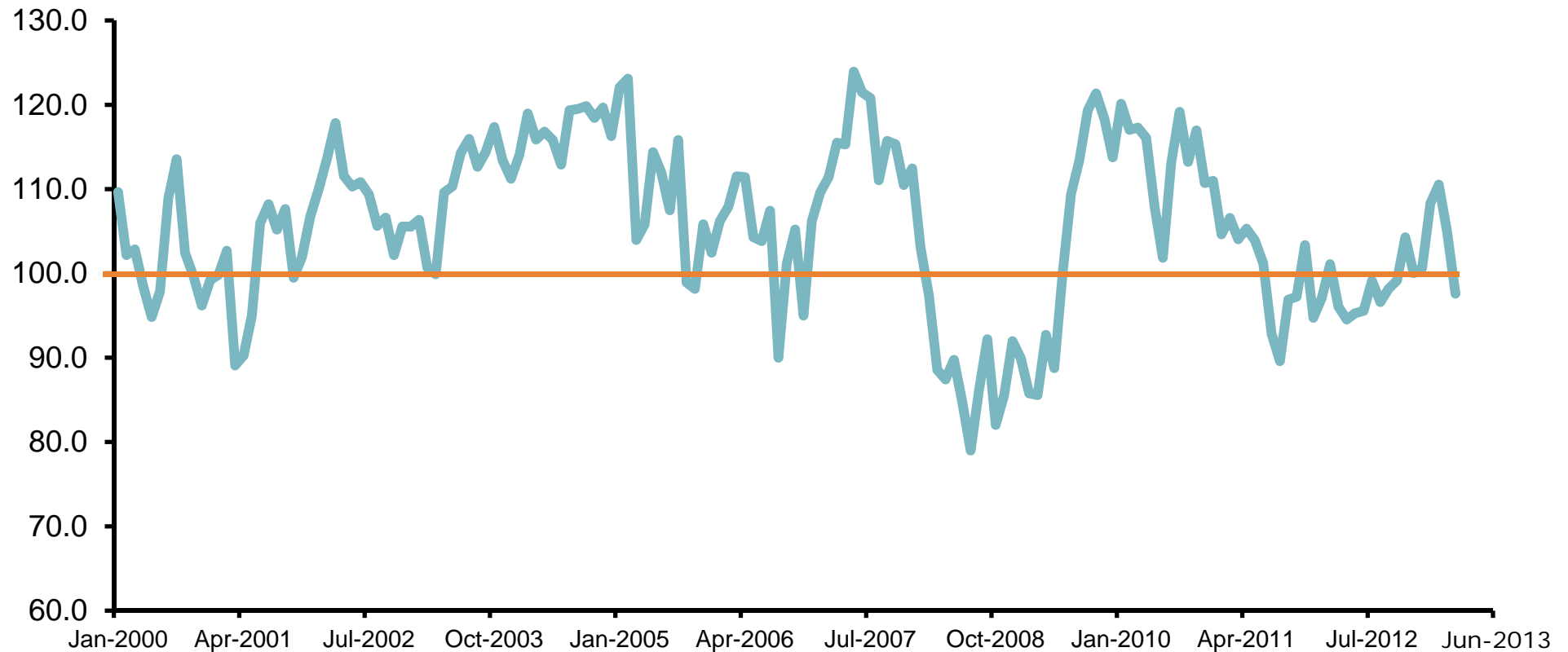
Source: RBA, AGL

# Consumer sentiment

Sentiment remains volatile, oscillating around the neutral line.

## WMI Consumer Sentiment

### WMI Consumer



Source: WMI, RBA

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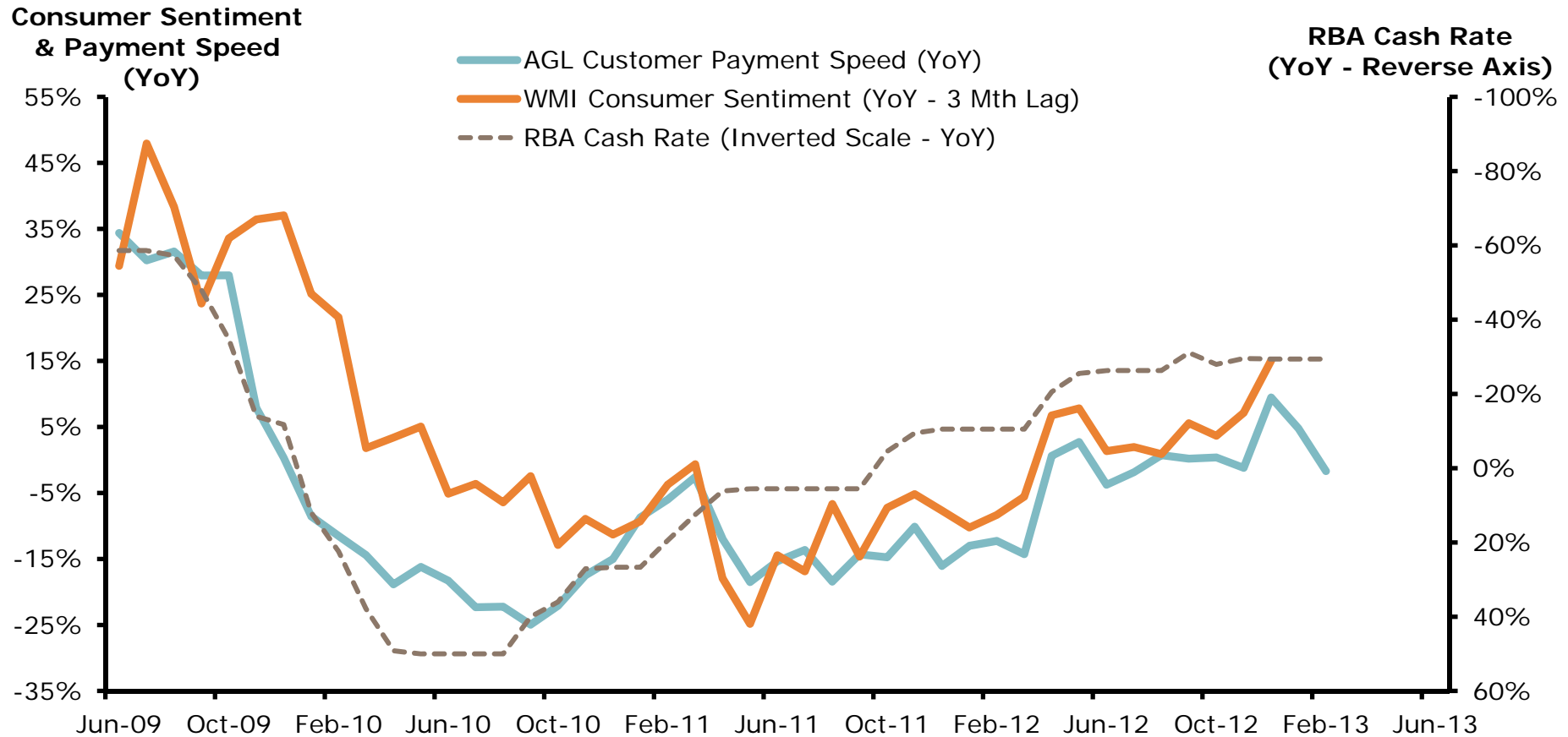




# AGL customer payment speed index

Sentiment affects AGL's customer payment speed index.

AGL Payment Speed Index (YoY) vs. WMI Consumer Sentiment (YoY) & RBA Cash Rate (YoY)



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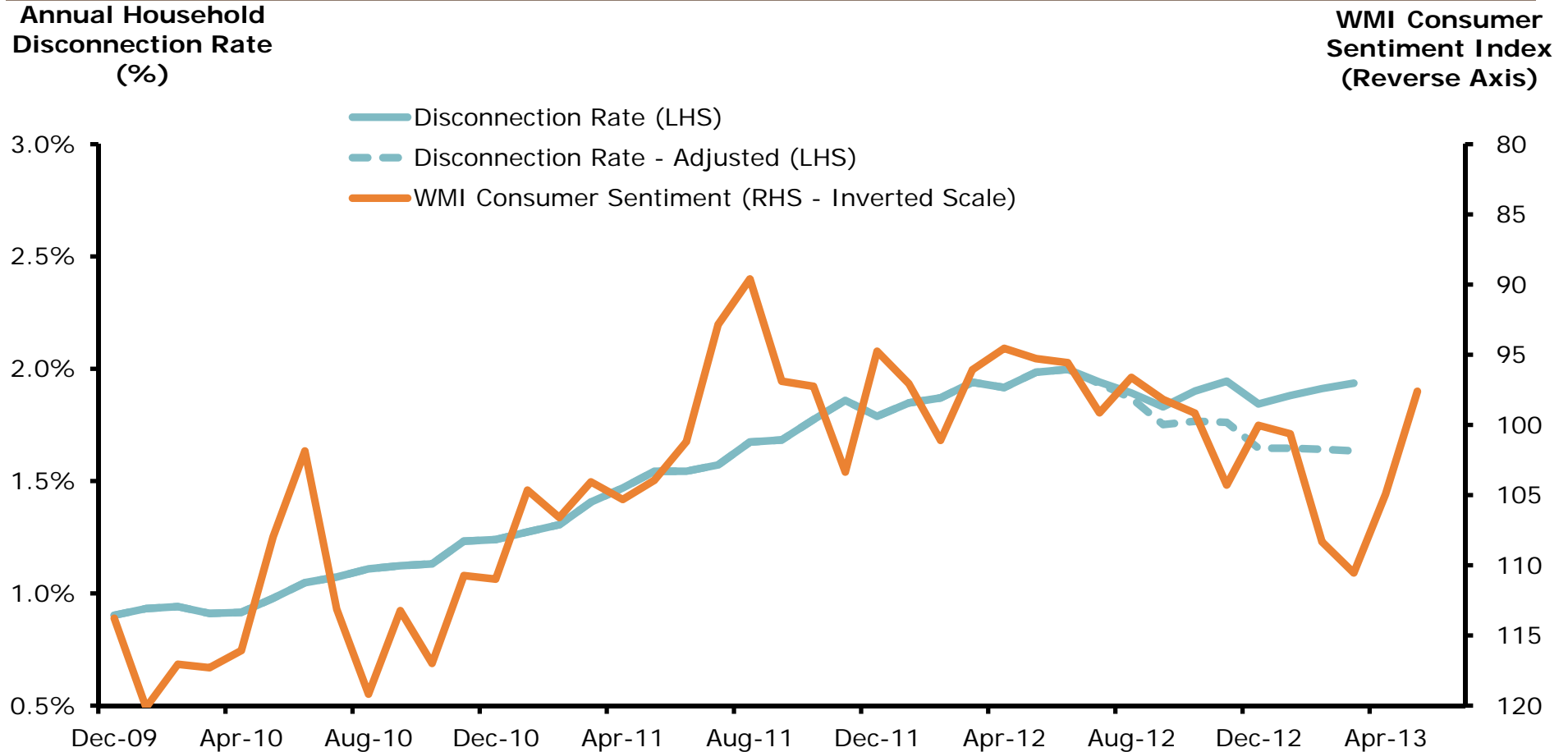
Source: Simshauser and Nelson



# Customer disconnection rates

Customer disconnection rates have followed sentiment.

Disconnection Rates vs WMI Consumer Sentiment



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Source: Simshauser and Nelson



# Electricity demand growth

Underlying drivers of residential demand appear to be changing.

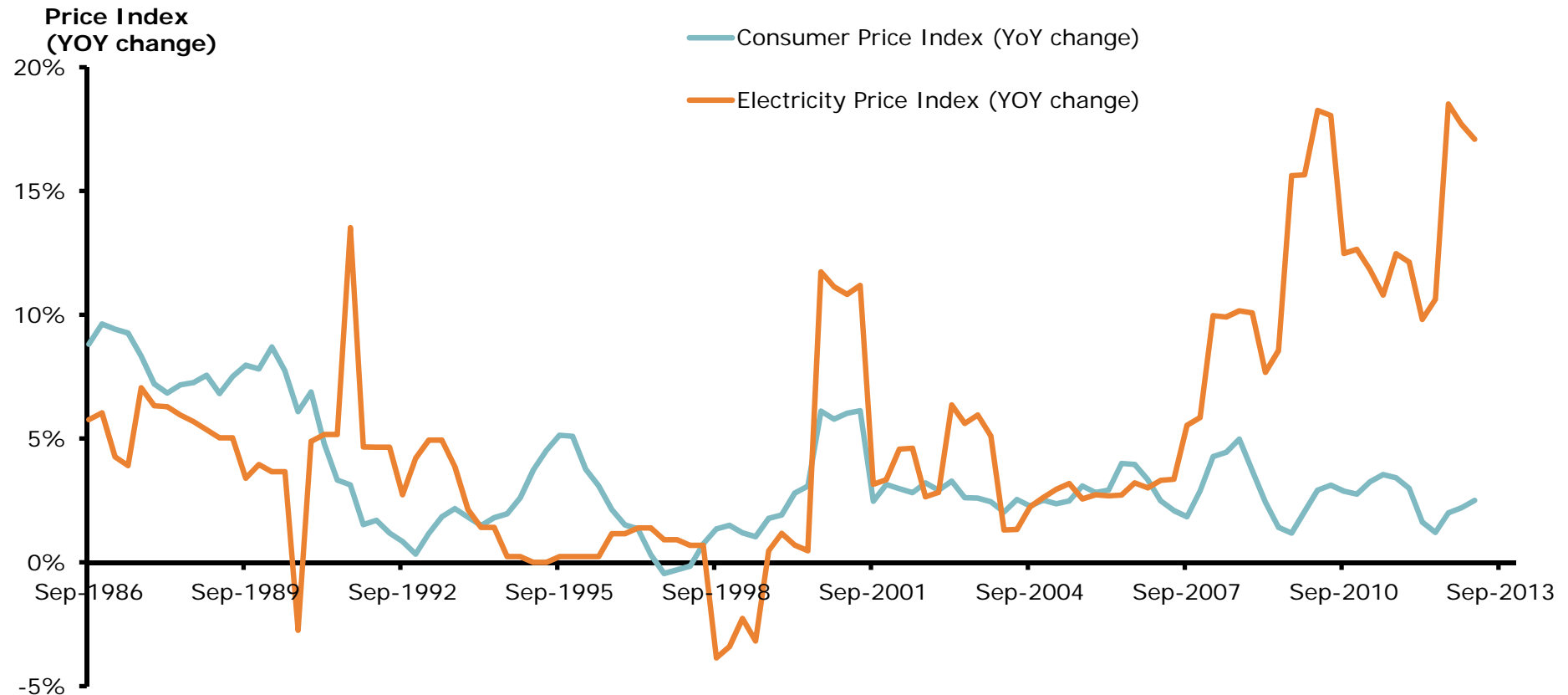
- › At the household level, long run electricity demand growth has been driven by three separate factors:
  - » Structural growth: population growth, house renovations, housing commitments and other new connections – historically contributing about 1.9% energy growth pa
  - » Cyclical growth: composition of households and the appliance stock – historically contributing about 1.4% energy growth pa (and has increased the sector's sensitivity to weather over time)
  - » Productivity: rising appliance efficiency and changes in building materials and building standards – historically thought to be about -0.9% pa
- › Recent household consumption data reveals that these trends have changed, at least in the current economic and energy policy environment.

# Electricity Price Index vs. Consumer Price Index

Electricity demand is not perfectly inelastic.

- › Price growth from 2007 has undoubtedly delivered a non-trivial demand response

Electricity Price Index and Consumer Price Index (YOY)



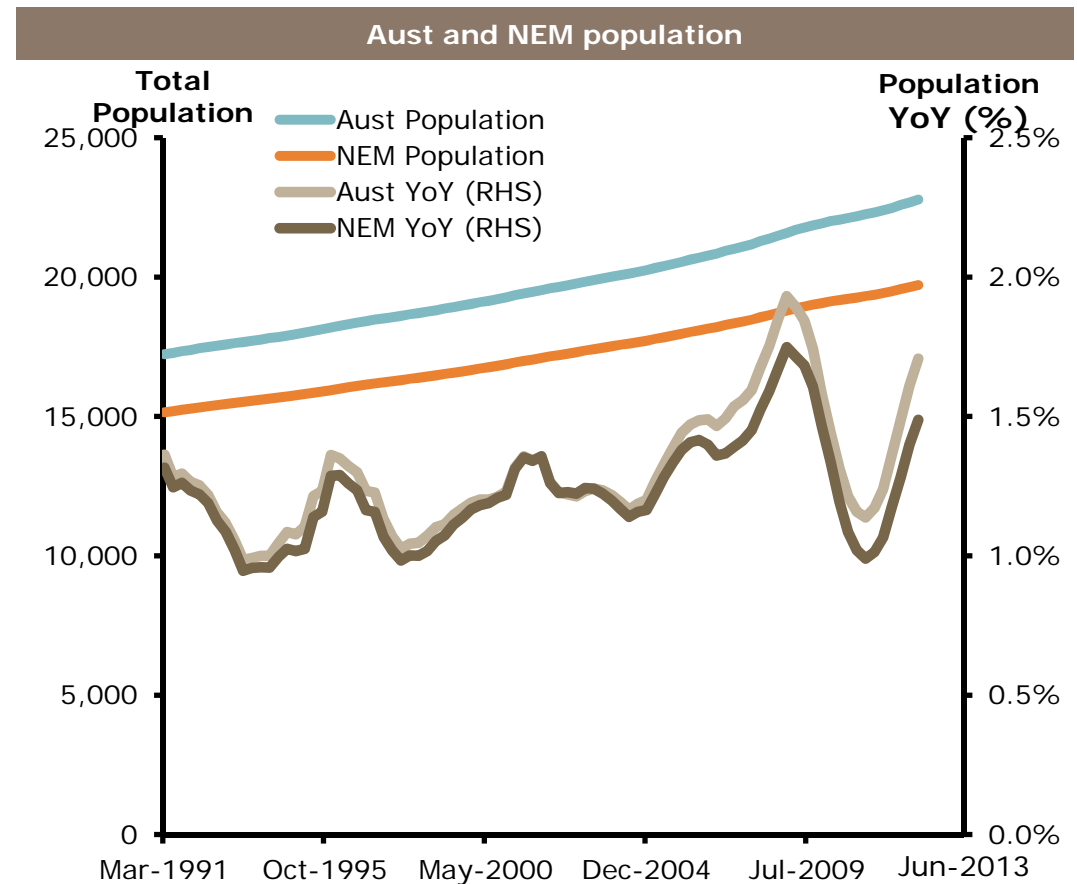
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Source: Simshauser and Nelson

## NEM population

Growth rates fell during FY10-12.

- > Population growth rates in Australia have been gradually rising over the last two decades, although a visible deceleration occurred during FY10-12 with growth rates returning by the first Quarter of 2012
- > However, population growth in NEM regions separated from the national rate from 2005, and the gap between the national and NEM-region average has been progressively widening
- > This is largely due to the solid population growth rates experienced in WA of around 2.8% per year from 2007 onwards



Source: ABS, AGL

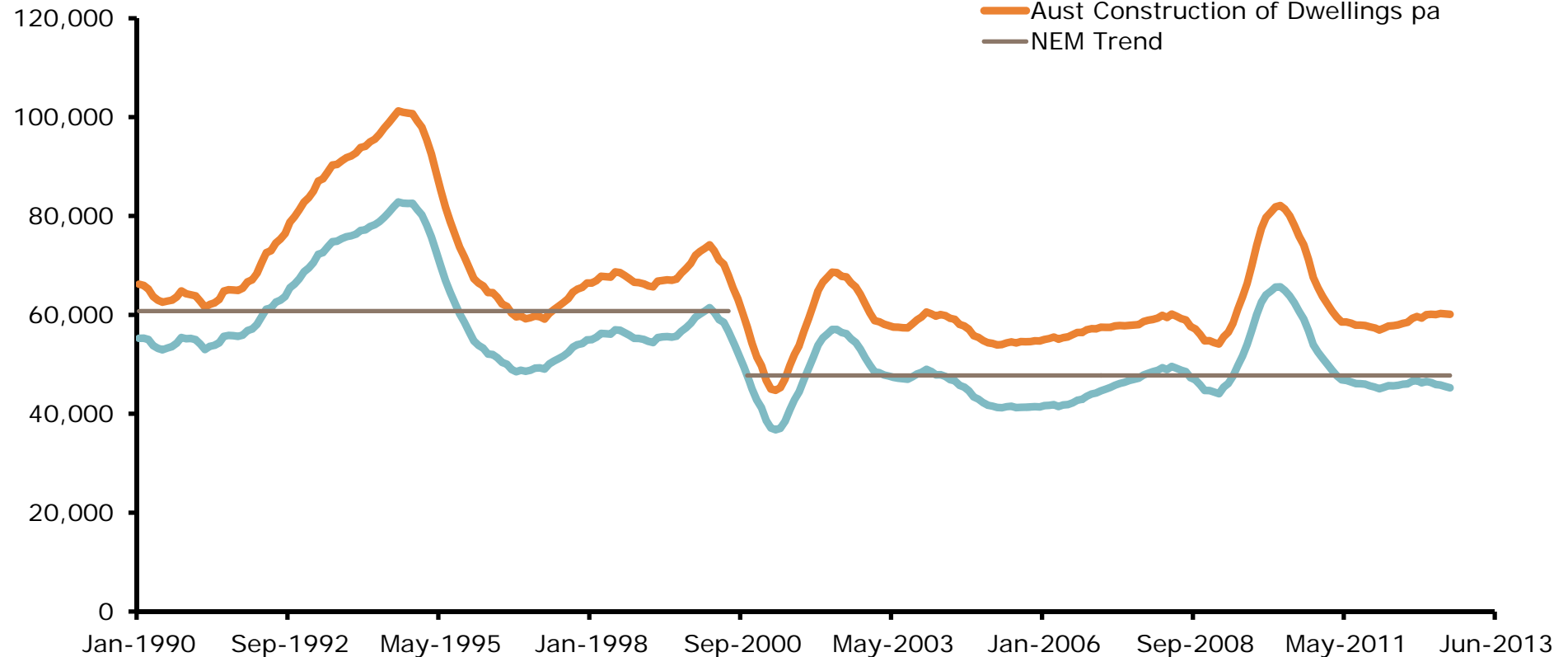
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# Construction of dwellings

Subdued construction is also weighing on structural electricity growth rates.

Construction of Dwelling pa

## Construction of Dwellings (#)



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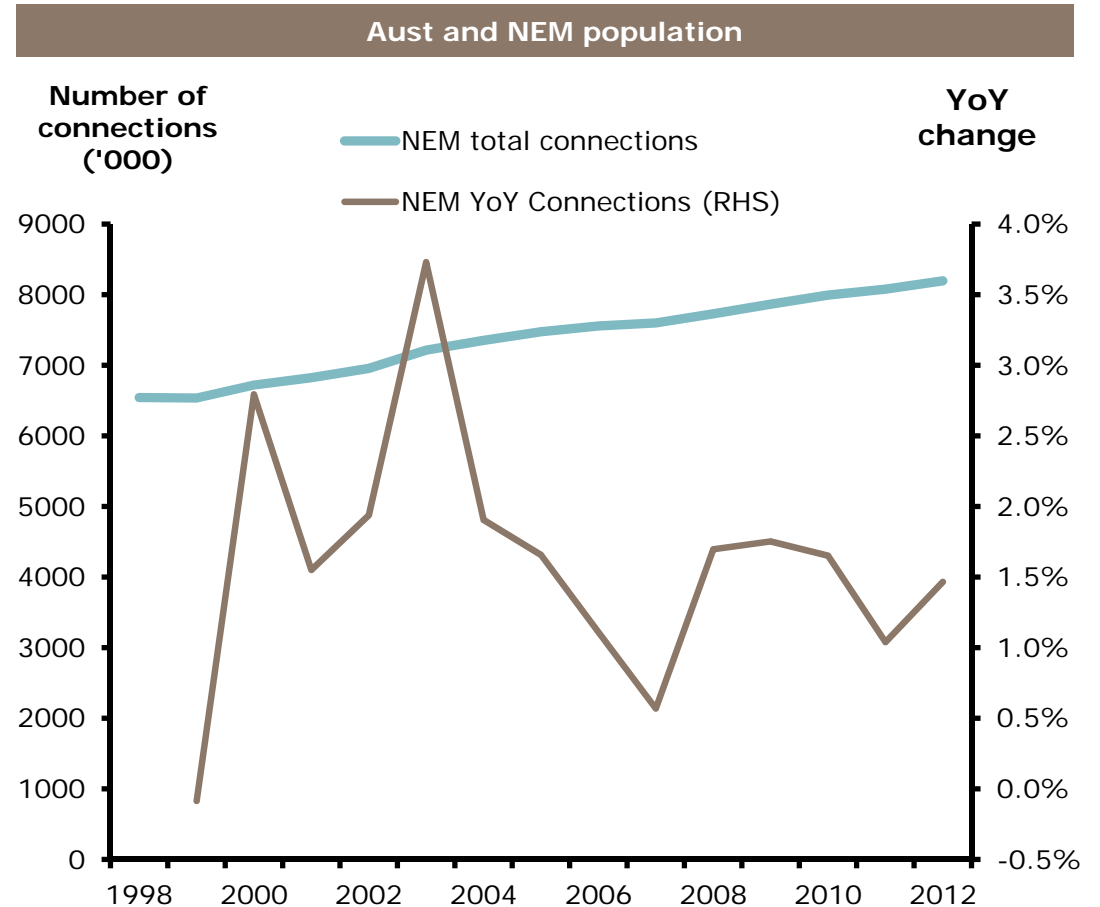
Source: ABS, AGL



## Customer connections

Growth in customer connections has been running below growth in dwellings.

- > Growth in new connections averaged 2.0% YoY over the 20 year period to 2007, just prior to the start of the financial crisis
- > Since 2007, growth in customer connection rates have fallen to 1.4%

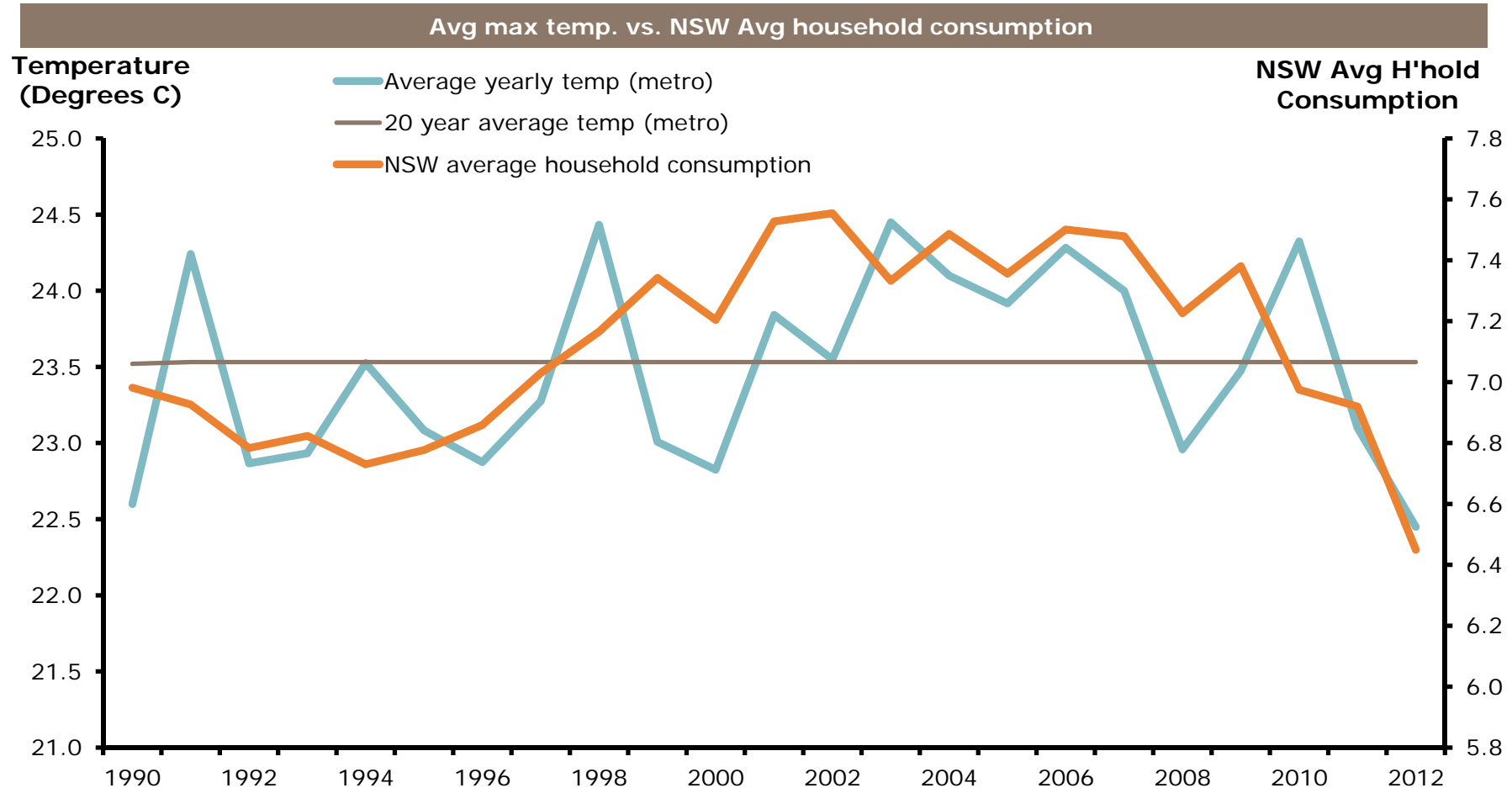


Source: ABS, esaa, AGL

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# Weather is an important driver of short run demand

Household consumption analysis needs to be weather corrected.



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Source: esaa, BoM, AGL HANA



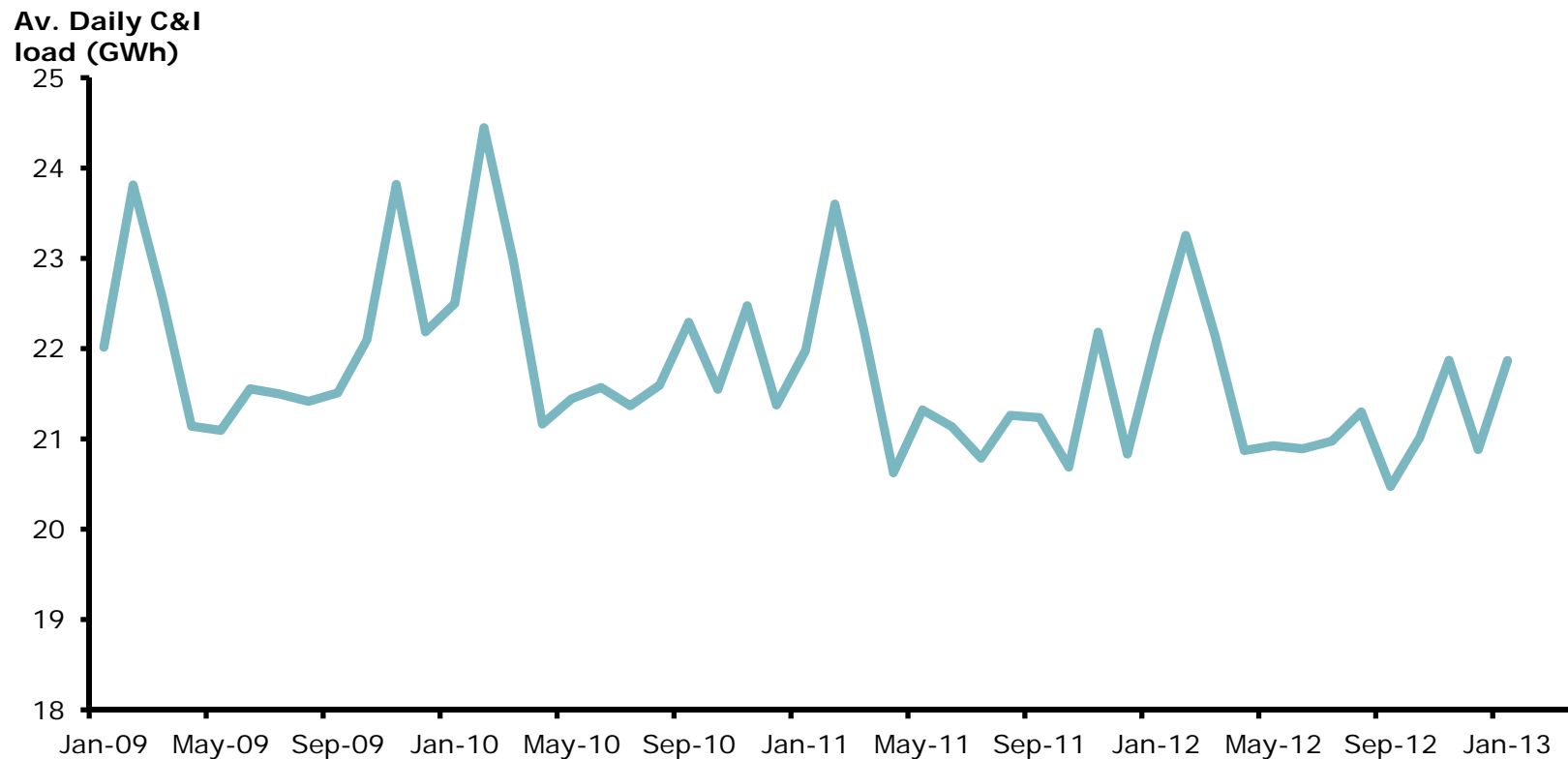


## AGL 'C&I survey' demand

C&I loads declined post-GFC, but stabilised in 2012 at 1.1% growth (YoY).

- › However, C&I demand remains susceptible with the most adverse trends occurring in the NSW region (-2.1% YoY) following a number of manufacturing site closures

AGL Avg. Daily C&I Load



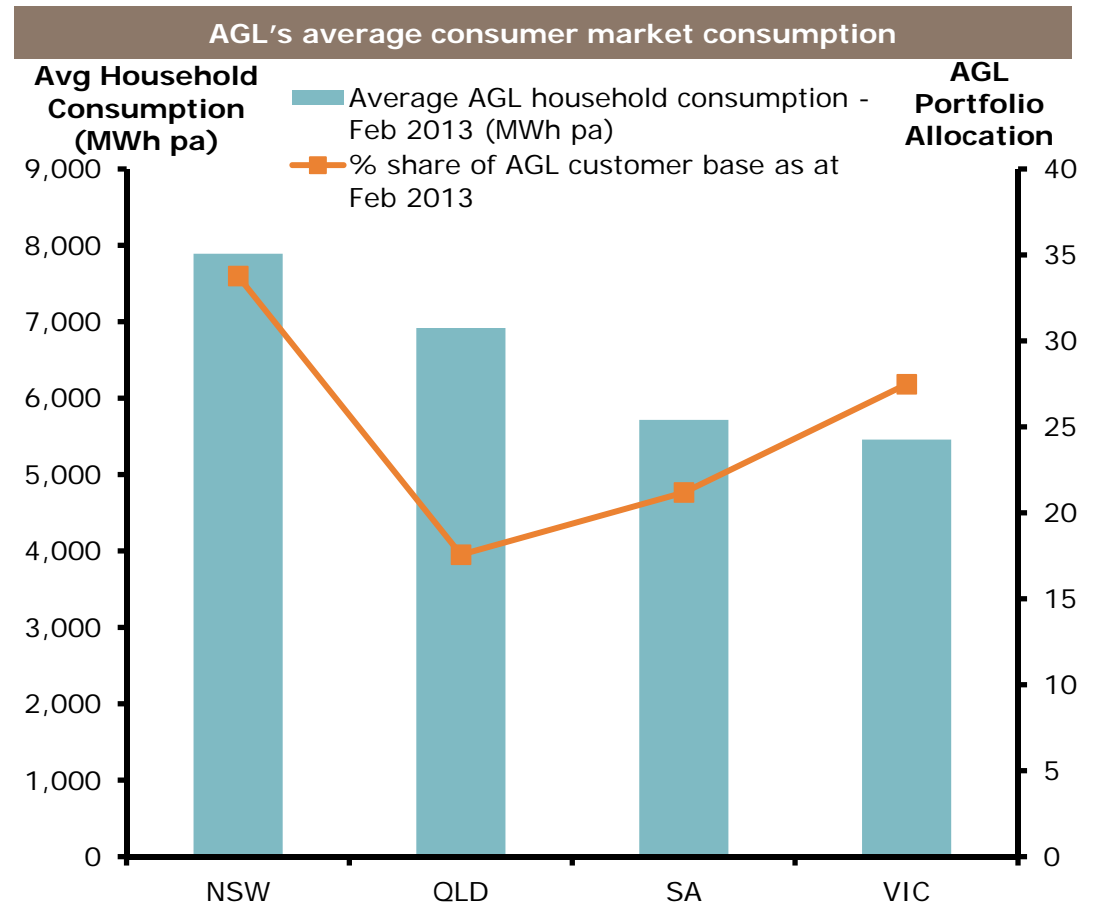
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Source: AGL HANA

## AGL's consumer market

AGL's NSW customers are the largest consumers of electricity.

- › AGL's NSW customer base has increased substantially over the past 12 months
- › Despite milder weather conditions, NSW residents have still consumed more on average than other states in the 12 months to February 2013
- › The contraction in Queensland residential demand has been very significant over the past two years (down by more than 14% in aggregate)
  - » Some portion may be an incorrect allocation of non-residential loads by the industry
- › The largest electricity customers in the NEM are in Tasmania, at ~8.7 MWh pa on average

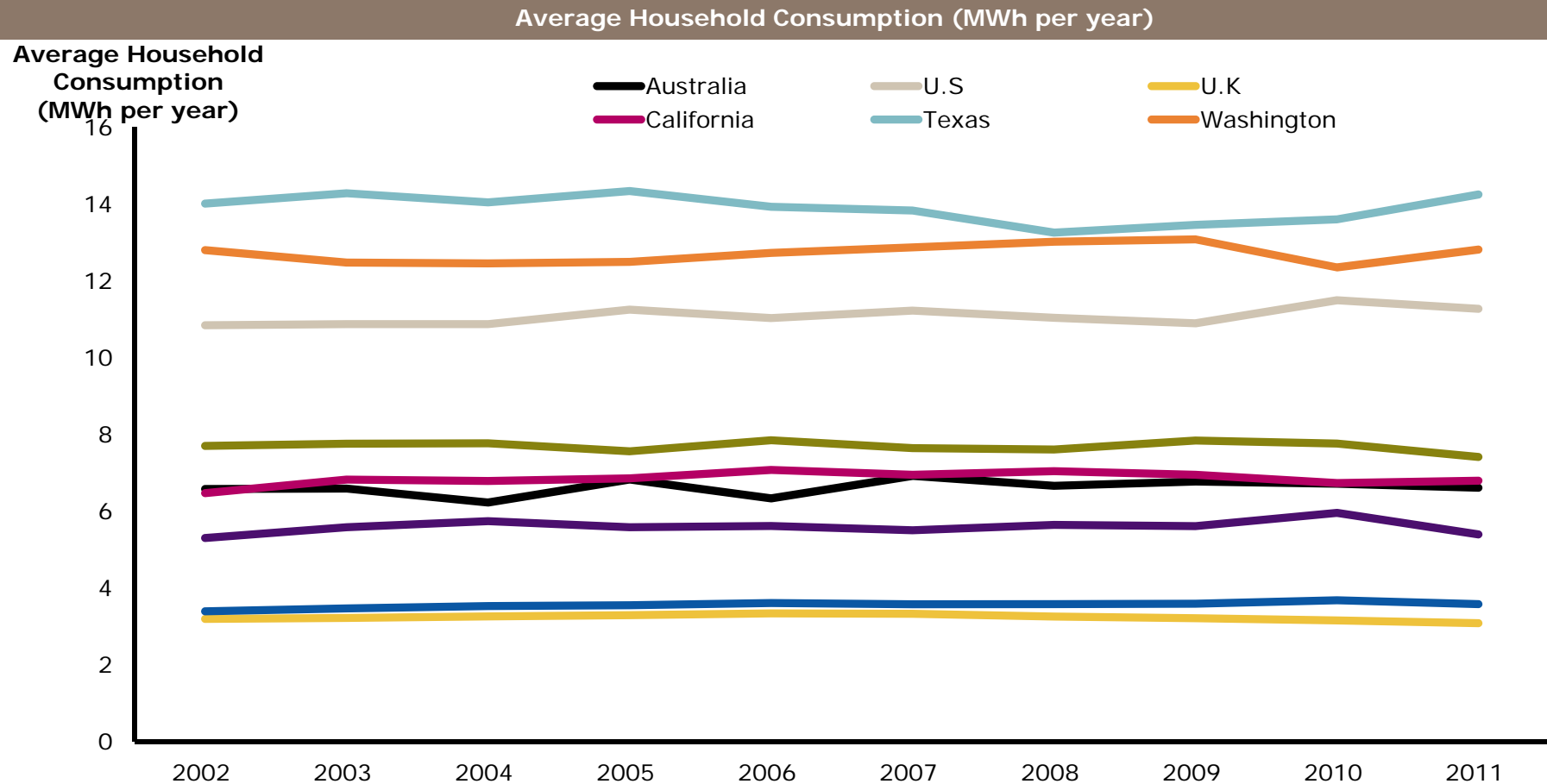


Source: AGL HANA

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# Household electricity consumption

Appears relatively stable from 2002-2011 across many jurisdictions.



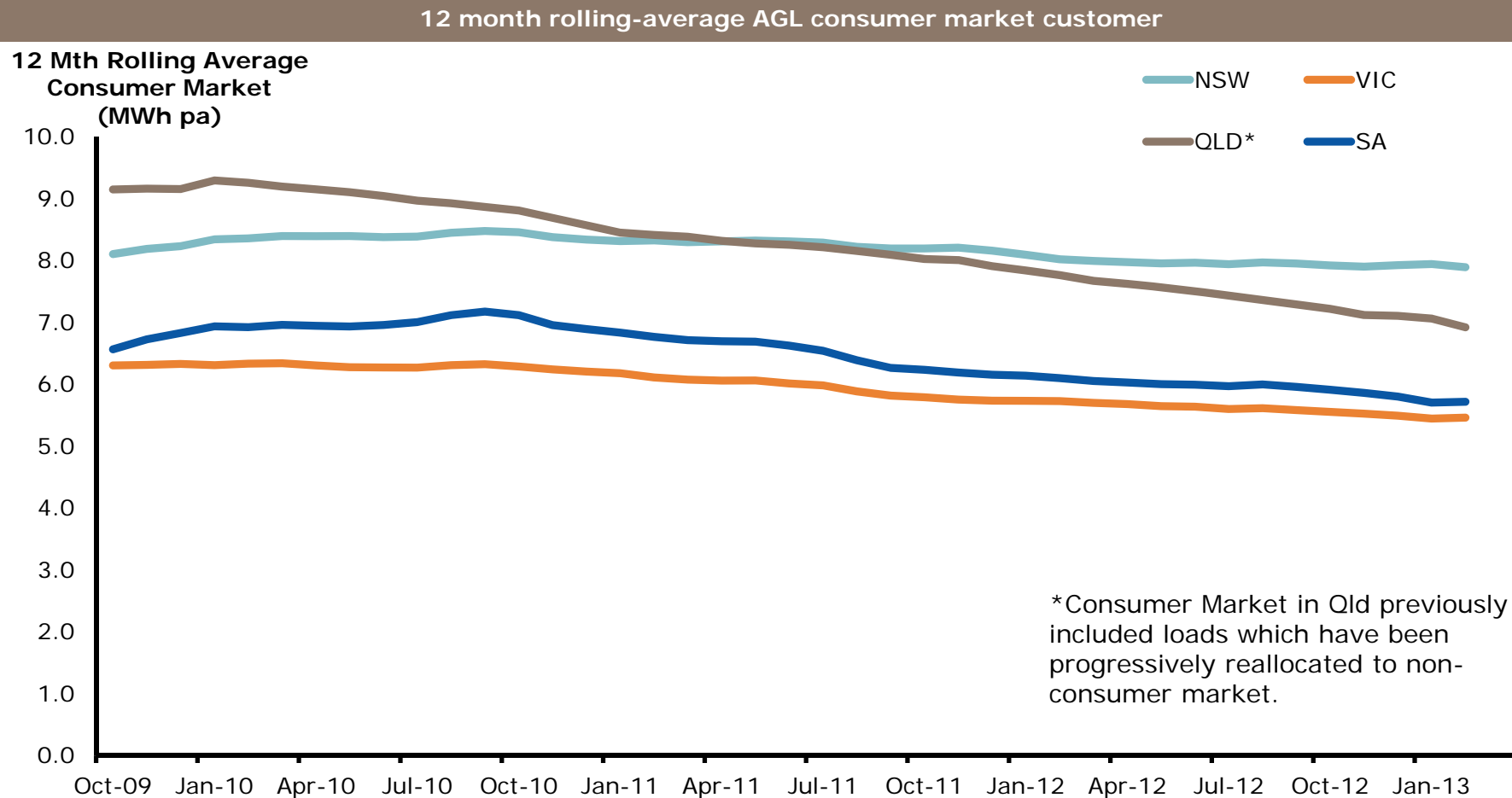
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Source: EIA, Eurostat, UK DECC, esaa, NZ Ministry of Economic Development



# AGL consumer market demand

A more granular analysis from 2009 shows NEM demand trending down.



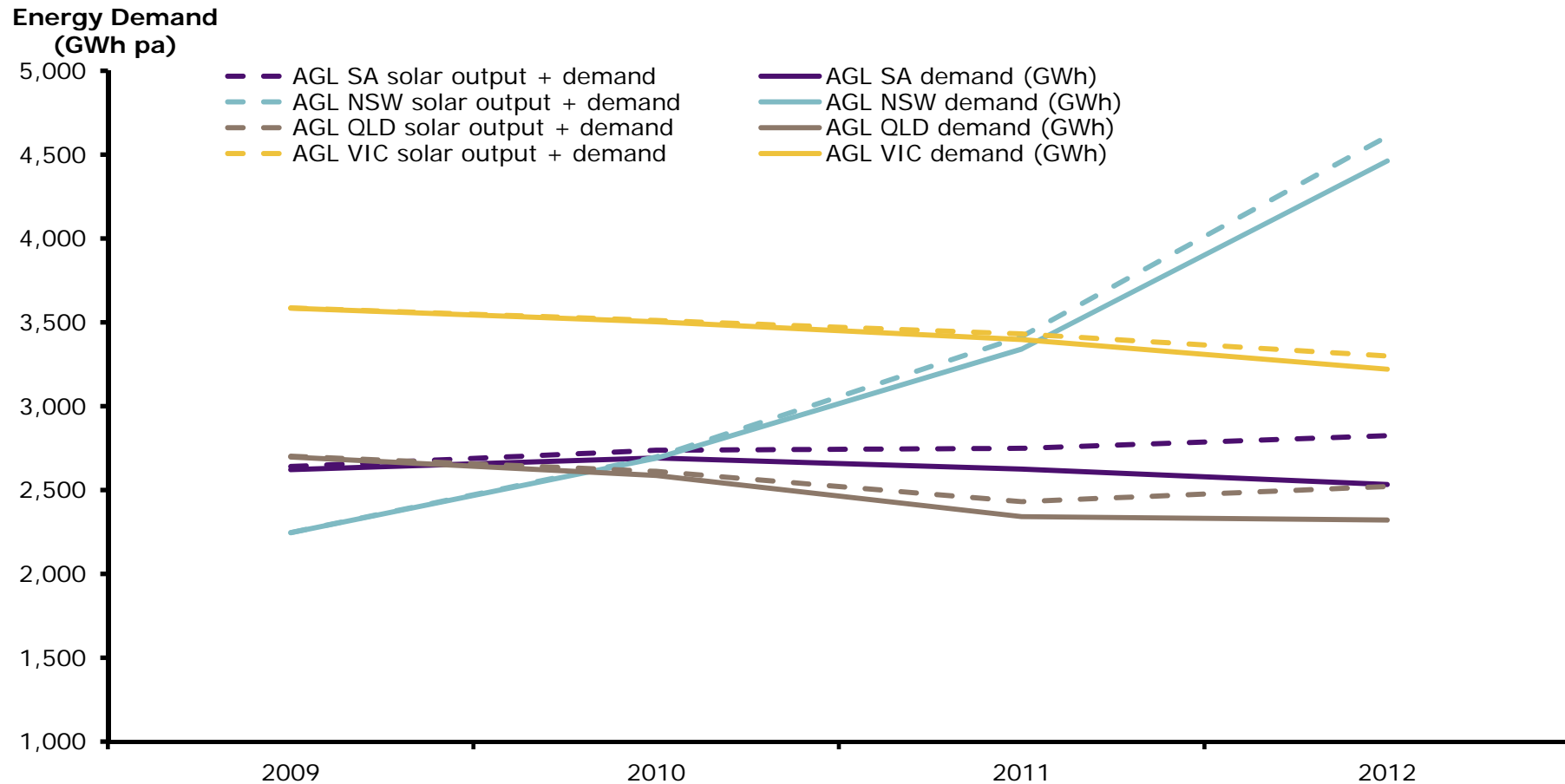
Source: AGL HANA

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# Solar PV and consumer market demand

AGL data shows that Solar PV is having an impact at the margins.

Solar output from AGL customers vs consumer market demand by State



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Source: AGL HANA, AEMO

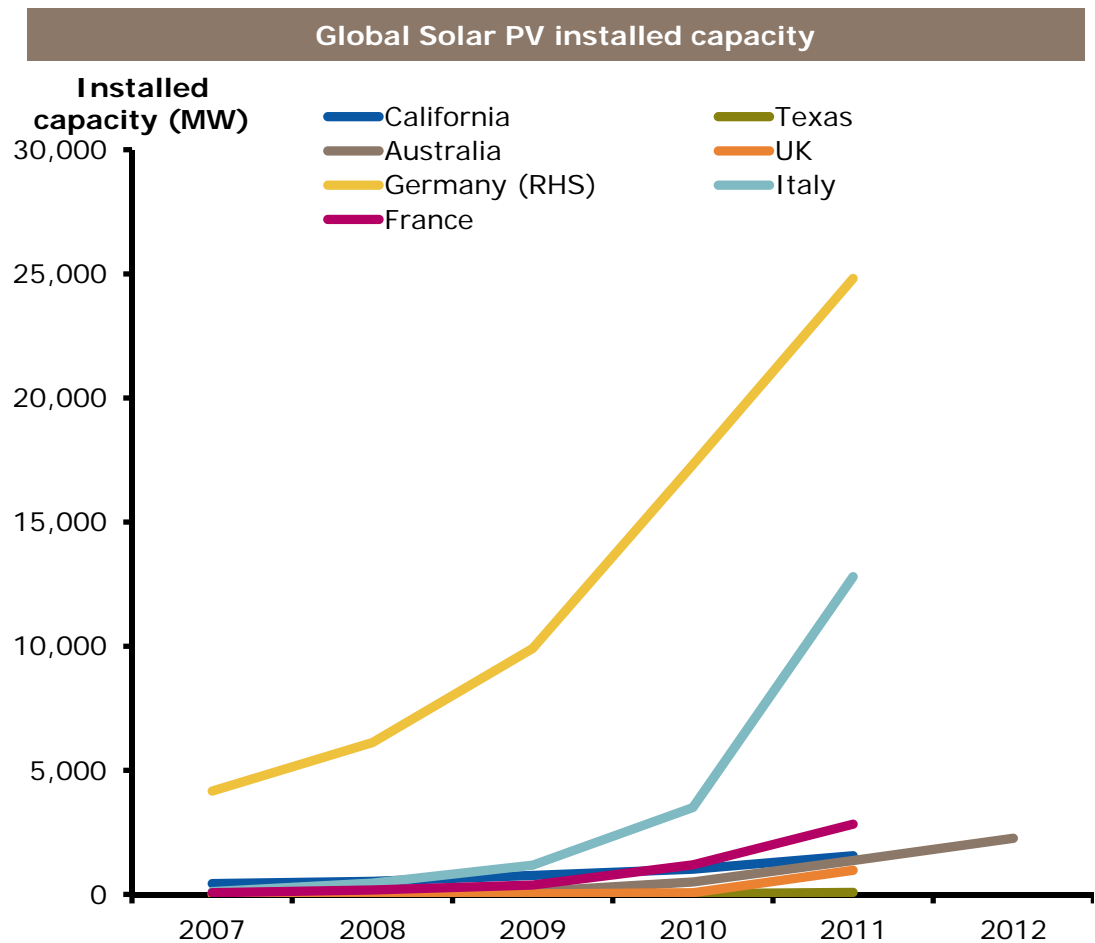
Solar PV installation growth rates have slowed, but installation sizes have increased.



# Global Solar PV capacity

Capacity reflects sharp falls in panel costs & accommodative Feed-in Tariffs.

- > Global Solar PV manufacturing capacity in 2012 was about 70GW/a
- > Aggregate Solar PV panel demand was about 31GW/a\* in 2012
- > Solar PV panel prices of c.US\$0.86/W (down from c.US\$3.80/W in 2008\*) are likely to remain below the long run cost of supply due to an overhang of manufacturing capacity



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\*See Electricity Journal (2013), Edison Electric Institute.

Source: IEA, Sherwood US Solar Market Trends, CER REC registry database



## Solar PV output

Solar PV in Australia now represents almost 2% of aggregate energy demand.

	MW installed (data to 2011)	kW installed per head population	Solar output as % of total electricity consumption
Germany	24,678 MW	0.31	8.3
Italy	12,754 MW	0.21	7.4
France	2,659 MW	0.04	1.2
Australia	2,300 MW (to 2012)	0.09	1.9*

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Source: Eurostat, CER, esaa

\*assuming average capacity factor of 20%

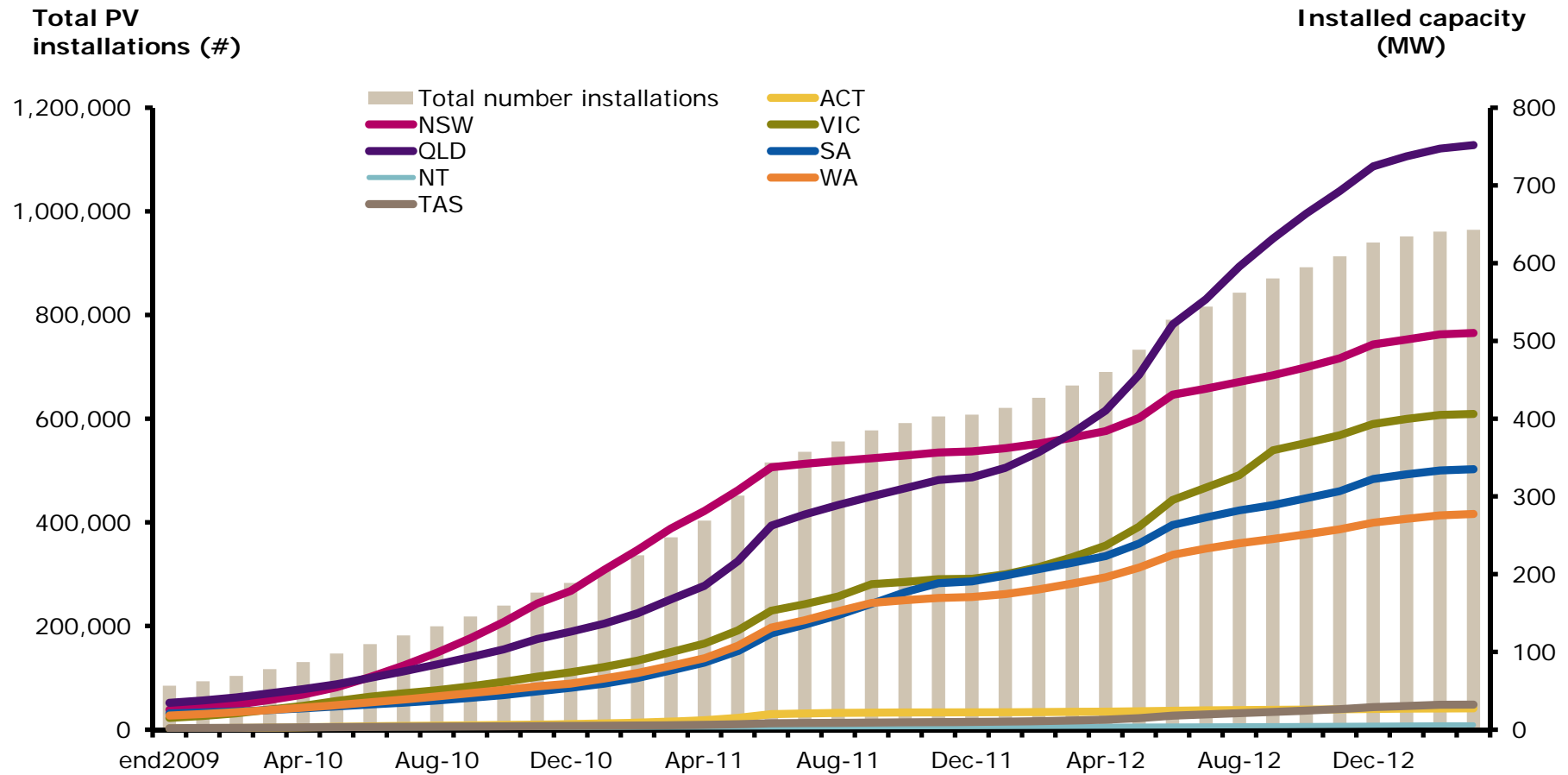




# Solar PV installations and installed capacity

Growth in Solar PV capacity continues.

Solar PV installations and installed capacity by state (MW)



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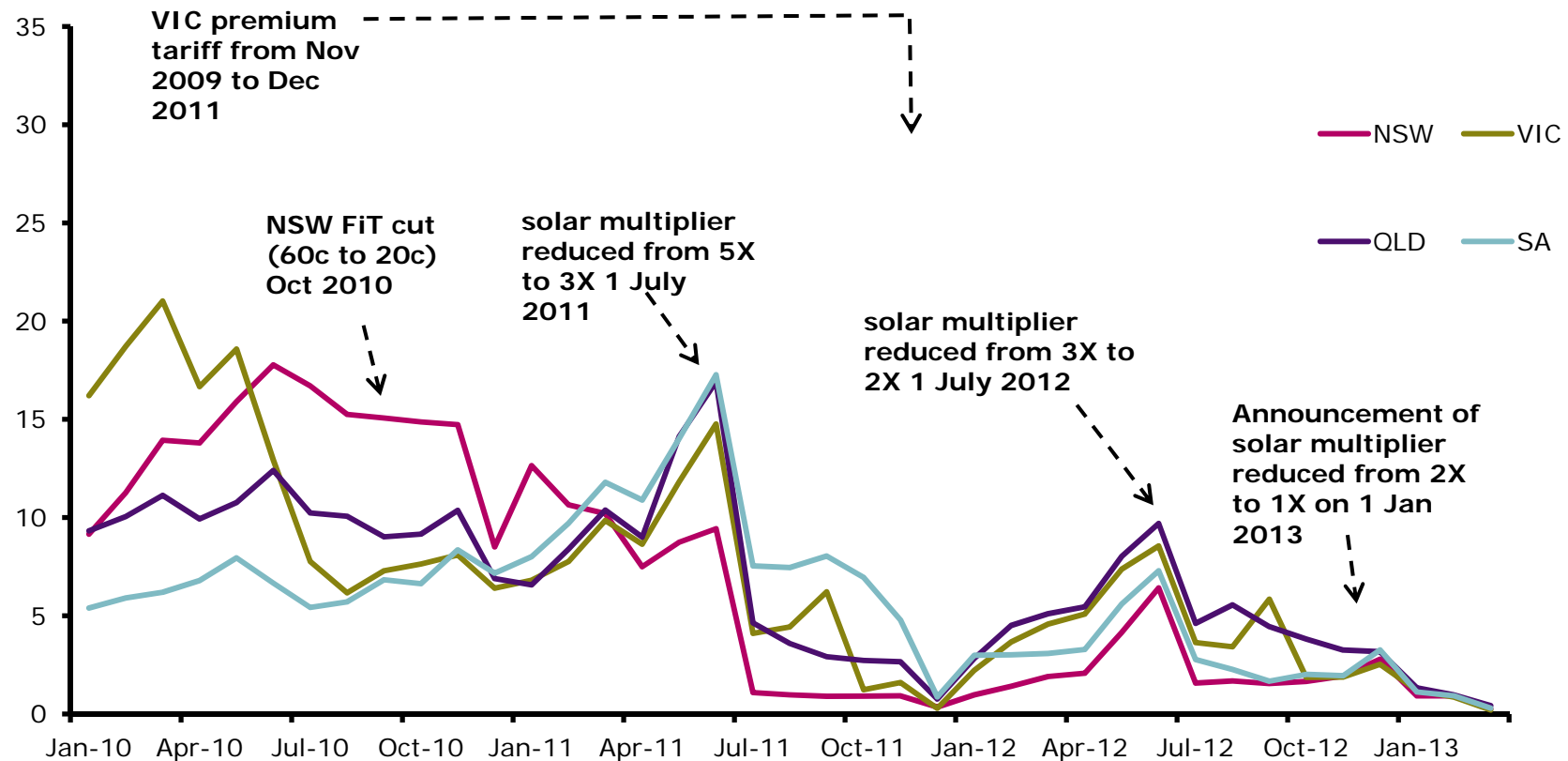
Source: CER REC registry database, AGL

# Solar PV installation growth rates

Households respond to solar PV incentives on offer.

## Solar PV installations (Month-on-Month growth)

Growth installations  
(MoM %)

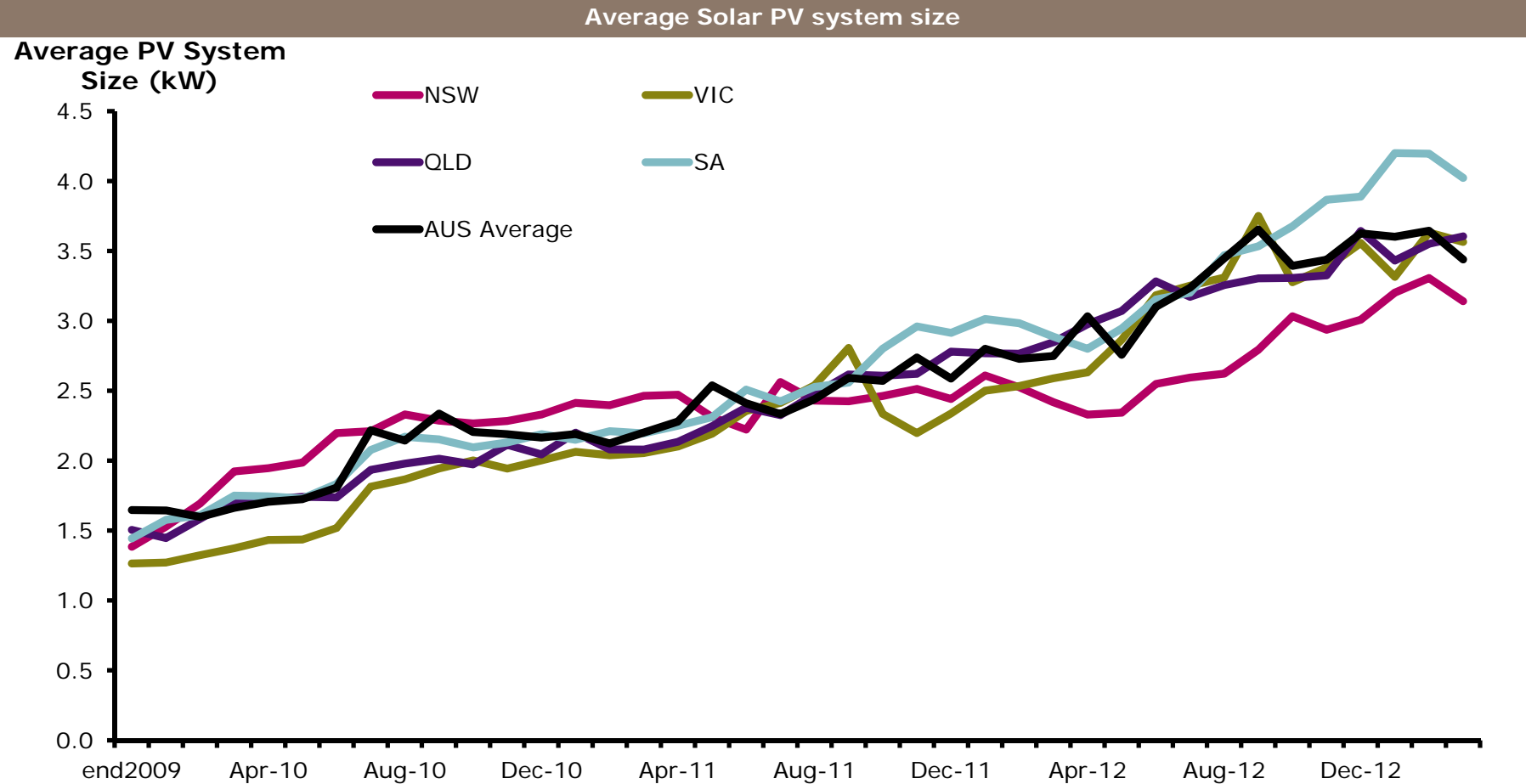


Source: CER REC registry, AGL

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# Solar PV system size

Installation rate has moderated but installation size is rising.



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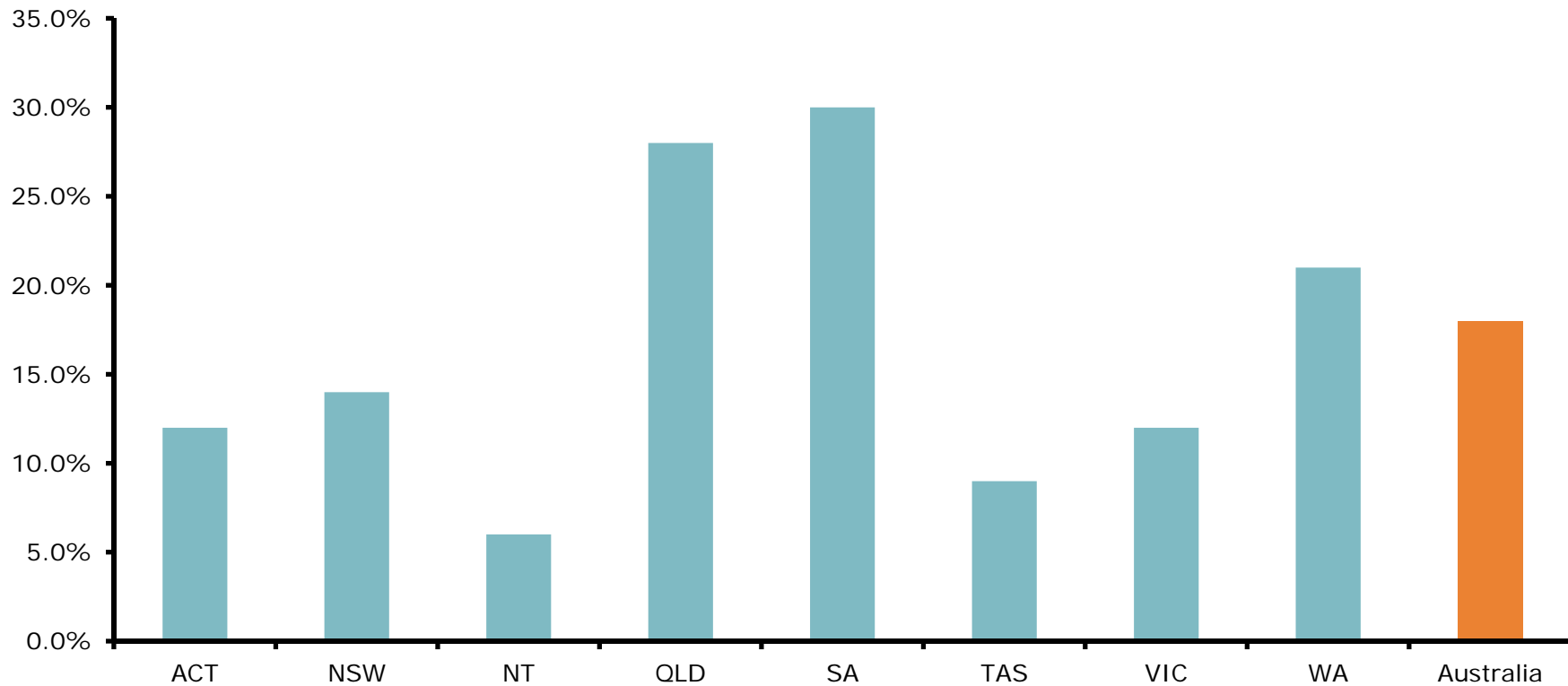
Source: CER REC registry, AGL

# Solar PV market saturation estimates

And aggregate installation remains well below market saturation.

Market share of Solar PV on suitable dwellings

Solar PV Est Share of  
Suitable Dwellings  
(%)



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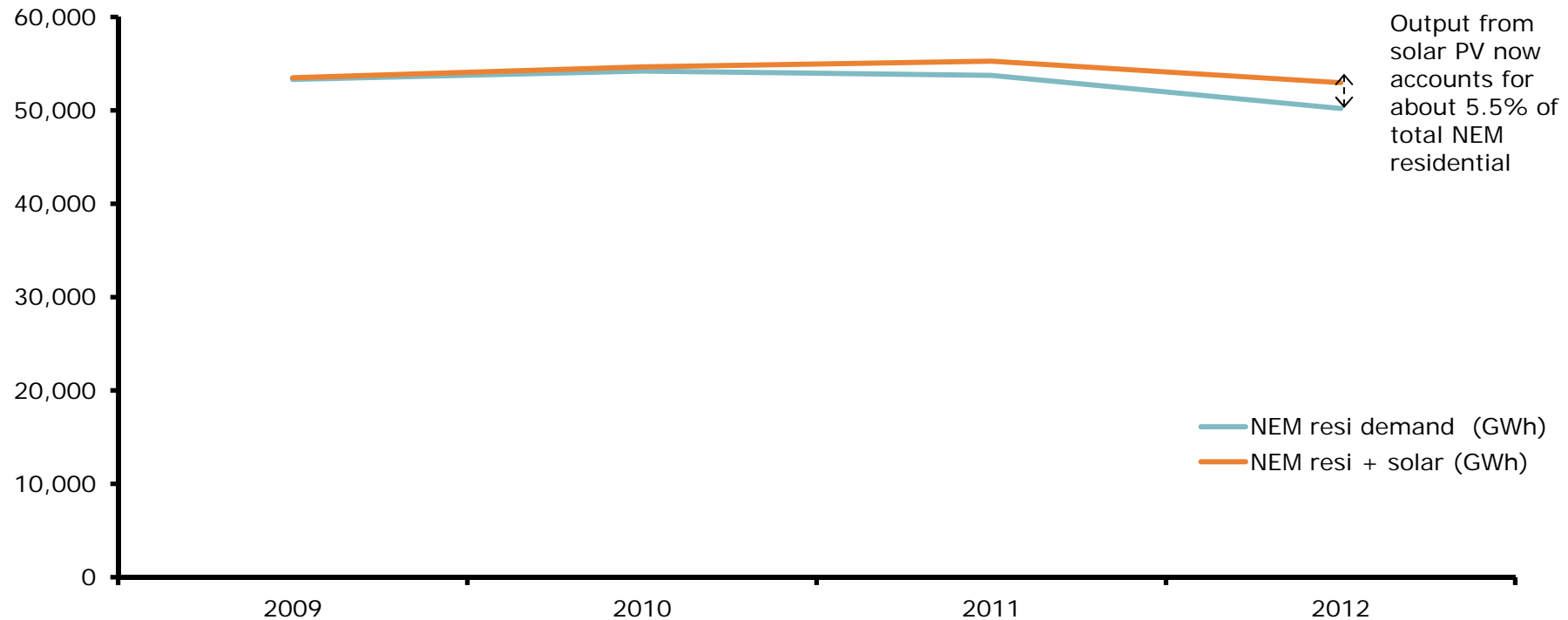
Source: Green Energy Trading

## Impact of solar PV on residential demand

Represents 1.9% of aggregate demand and ~5.5% of household demand.

NEM solar PV output as proportion of residential demand

**NEM Household Consumption (GWh per year)**



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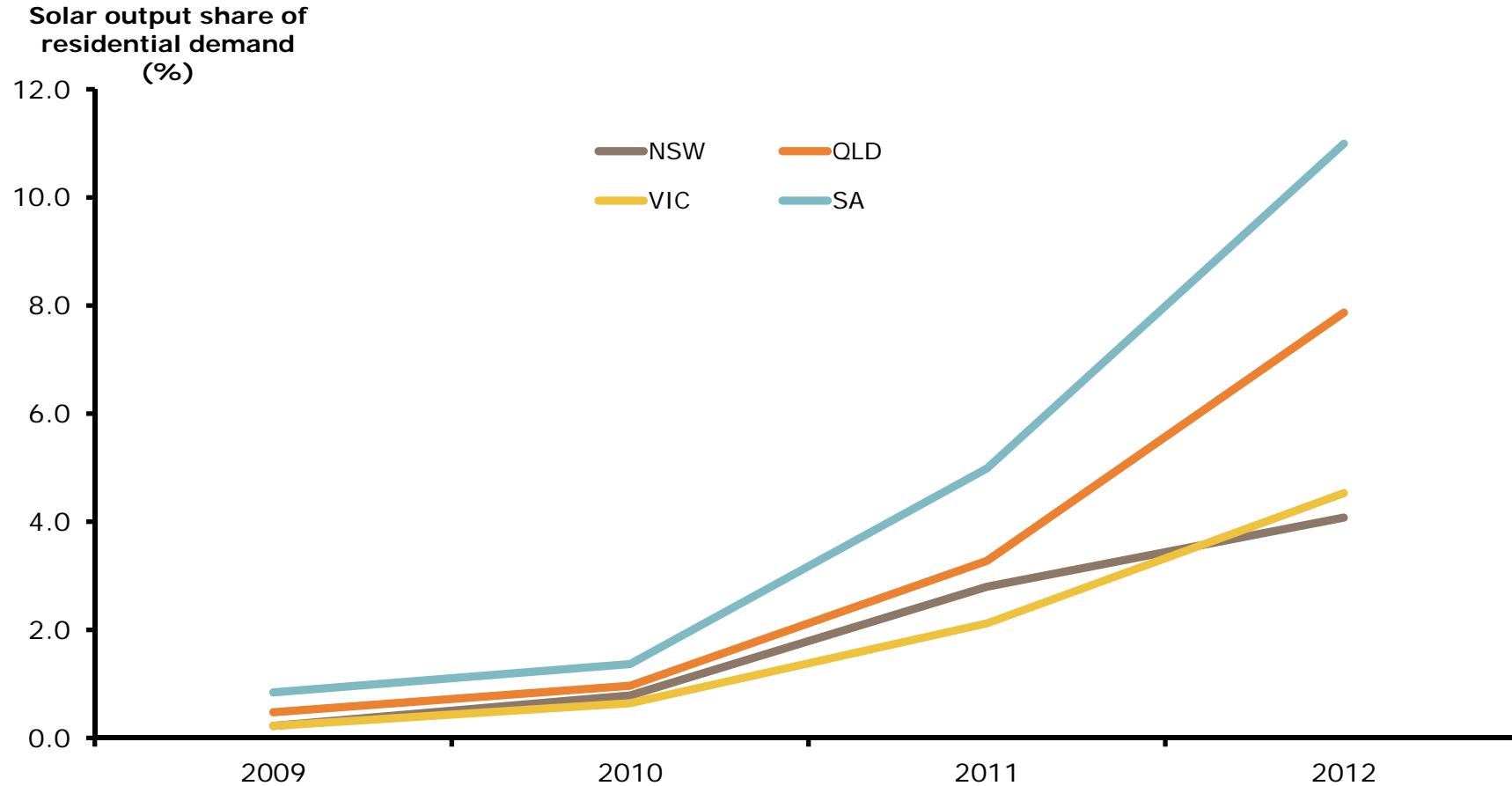
Source: AGL HANNA, esaa, CER database, AEMO



# Solar PV output as a share of NEM consumer demand

Solar PV output represents a rising share of NEM consumer demand.

NEM solar PV output as proportion of consumer market demand



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Source: AGL HANA, CER database, AEMO

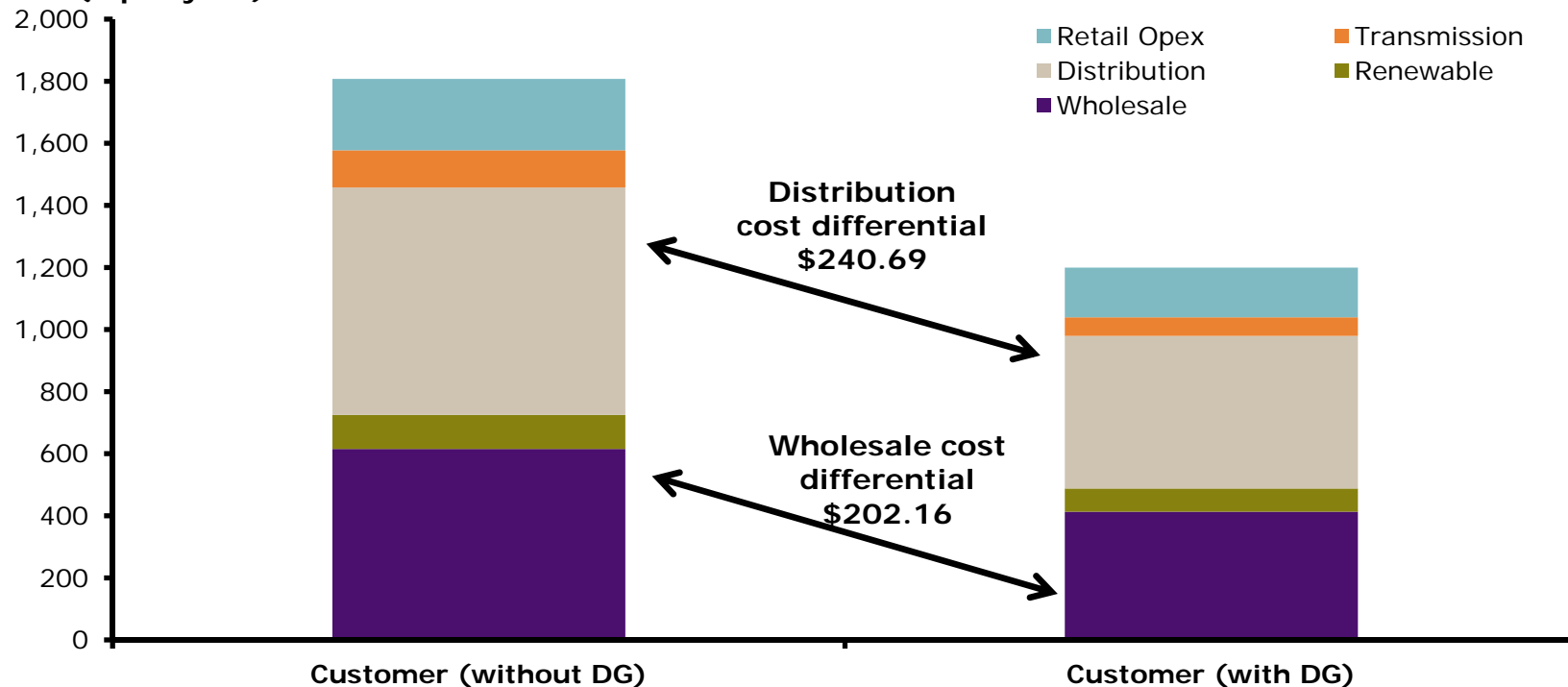
# Intermittent Distributed Generation

Intermittent DG policy settings are likely to come under scrutiny.

- › Policymakers will inevitably review network tariffs, net-metered FiT design, or both where a peak-load mismatch persists (vis-à-vis economic welfare, and investment above efficient levels)

DG and non-DG household electricity bill with Net FiT

Annual household Bill  
(\$ per year)



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Source: AEMC, ACIL Tasman, AGL

From a power production perspective, Solar PV is having a moderate effect by comparison to demand contraction and large-scale Renewable Energy production. This will have implications for mid-merit plant, i.e. the 'right half' of the aggregate supply function...

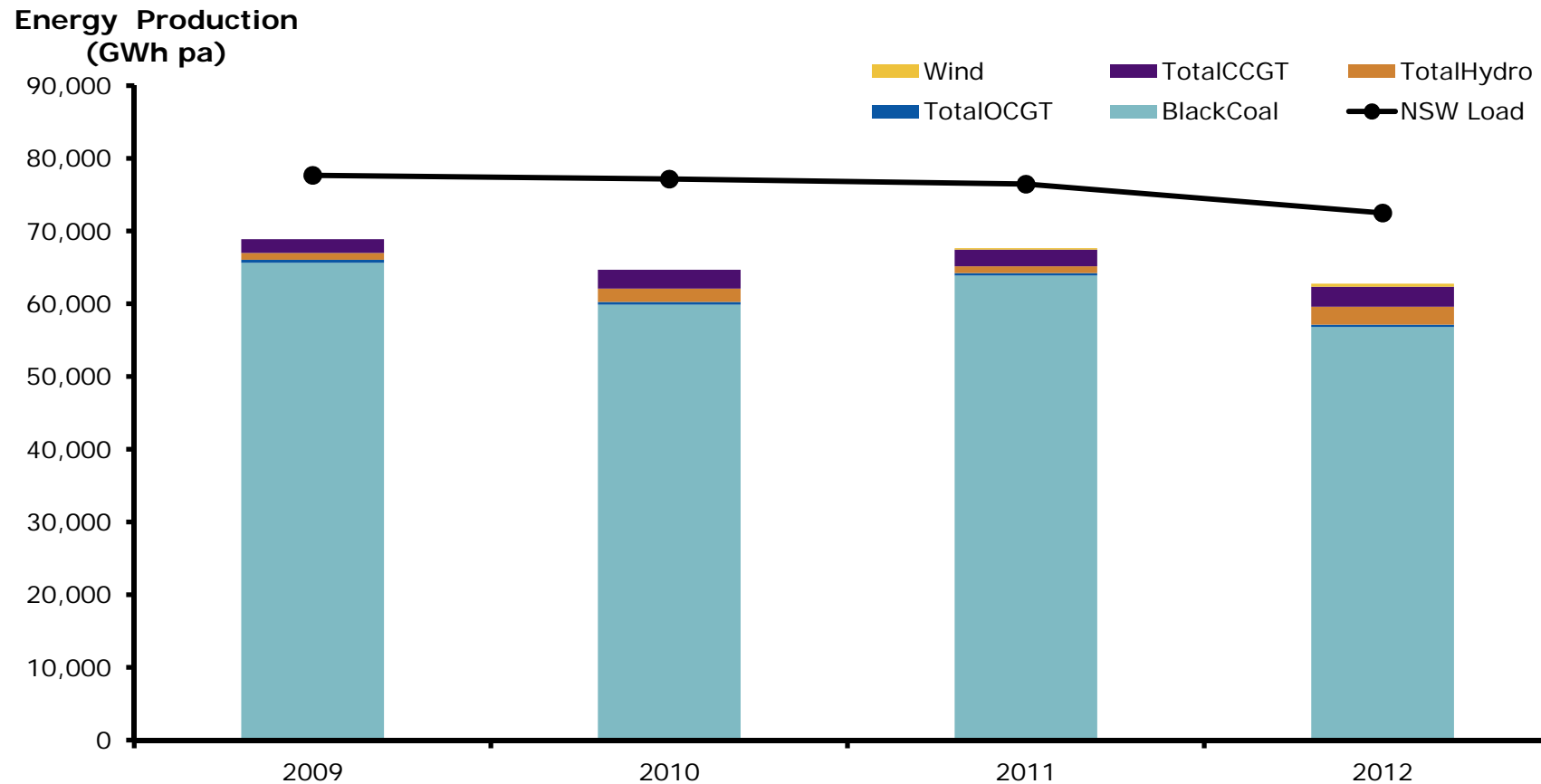




# NSW generation mix

Lower production by NSW black coal generators.

NSW power generation mix 2009-2012



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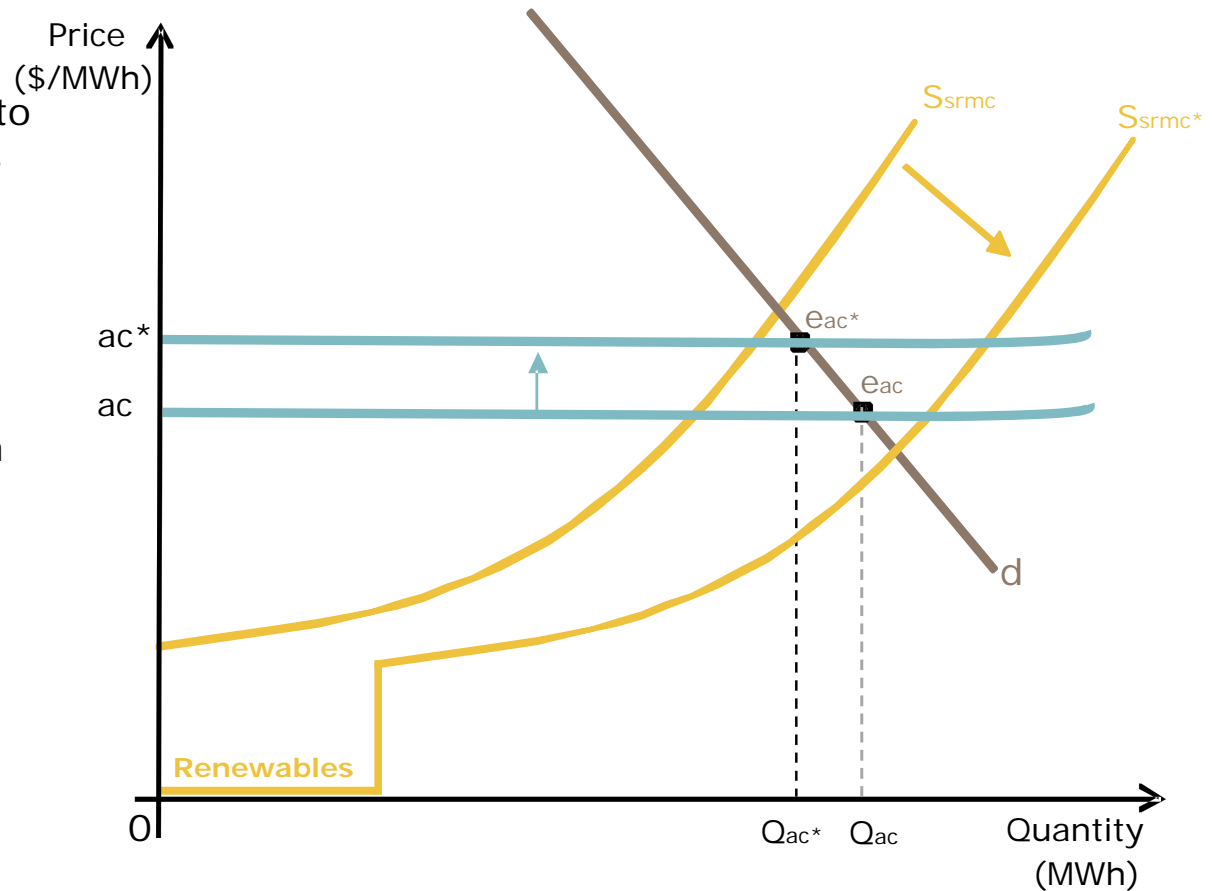
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Source: AEMO, NEMInsight

# Impact of Renewables

Adding renewables changes the short run dynamics.

- > When renewables are added to a power system, the average annual cost of supply (ac) shifts upwards (to  $ac^*$ ) through non-NEM mechanisms such as Renewable Energy Certificates and FiT's
- > Renewable technologies generally have low or zero marginal running costs, which shifts the aggregate real-time aggregate supply function to the right (to  $S_{srmc}^*$ )
- > For conventional plant on the 'right half' of the aggregate supply function, this means reduced hours of operation, and higher O&M costs due to the demands of greater operating flexibility
- > New conventional plant tends to occupy the 'right half' of the supply curve



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Source: Nelson, Simshauser & Nelson

## Wholesale Markets



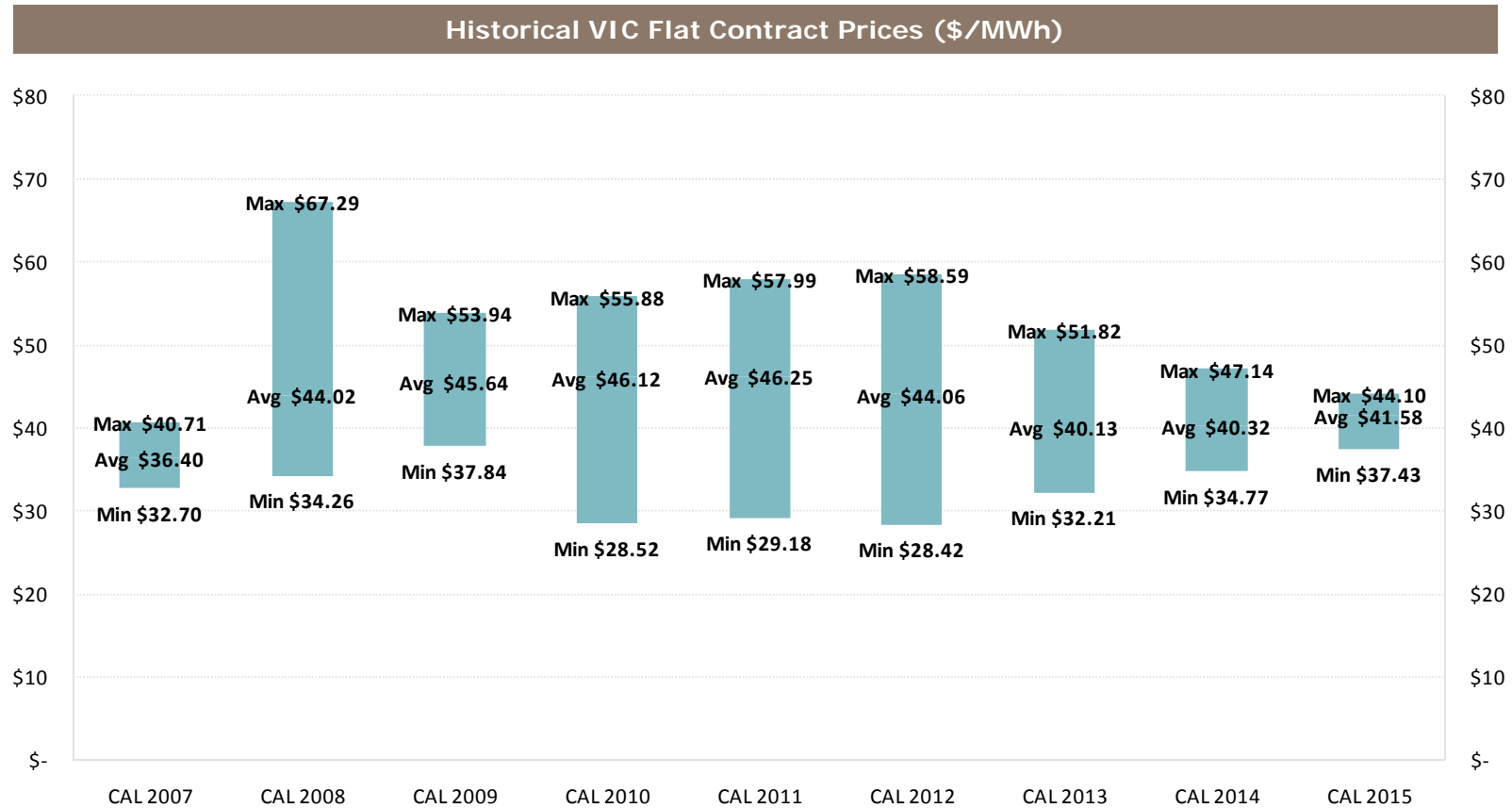
## Electricity markets

East coast energy markets are experiencing significant uncertainty.  
Key factors:

- › Future demand growth
- › Stagnant electricity forward curve
- › Uncertain carbon and renewable energy policy settings
- › Increased renewable generation
- › Future gas prices

# Electricity markets

Stagnant Forward Curve reflects low demand and excess supply.



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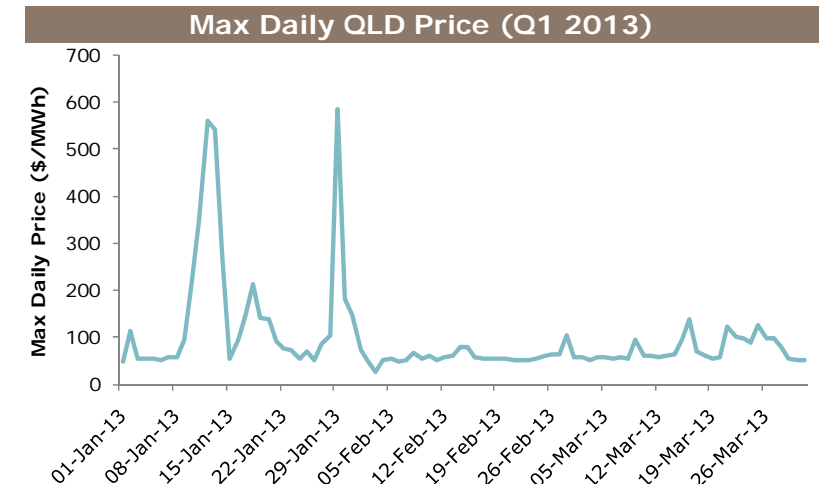
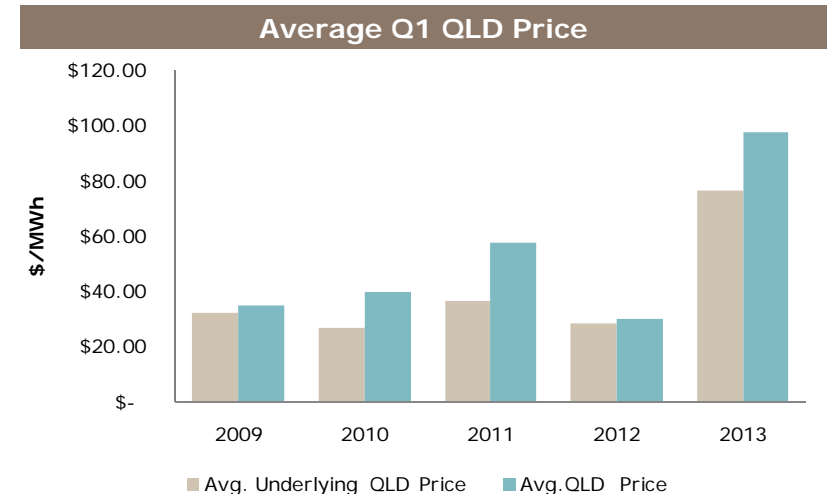
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Note. Data is nominal, carbon inclusive, calendar year contract.

# Electricity markets

## Queensland Q1 2013 spot outcomes.

- > The transmission network connecting southern and northern Queensland is congested
  - » Network constraint with significant pool price impact resulted
- > Queensland state-owned generators bid their plant strategically to increase pool volatility by forcing the constraint to bind
- > Gas and electricity contract positions of some market participants was also a factor
- > A network augmentation, expected to be complete mid-2013, should remove this congestion from the network



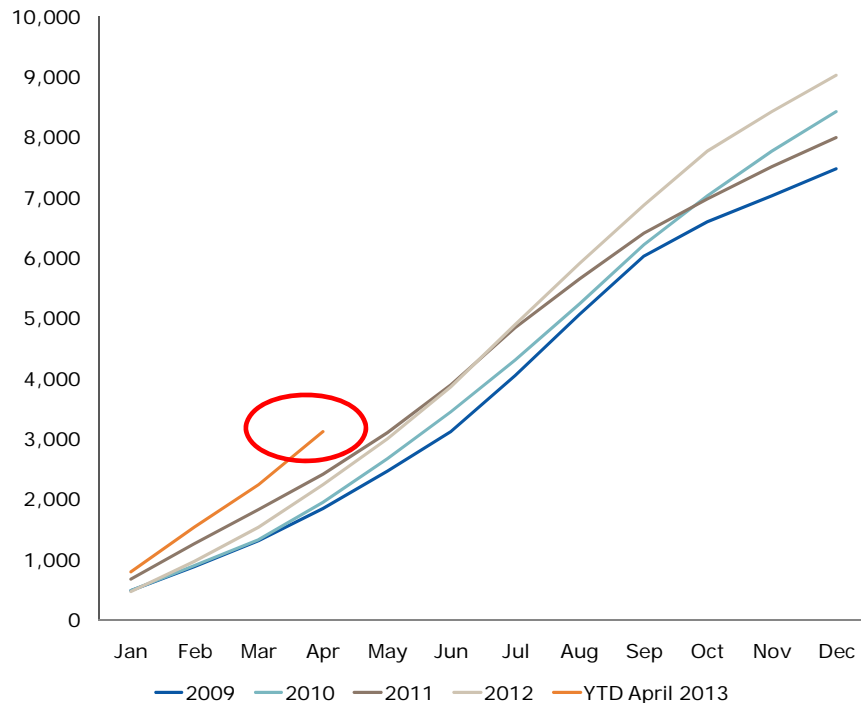
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# Carbon policy

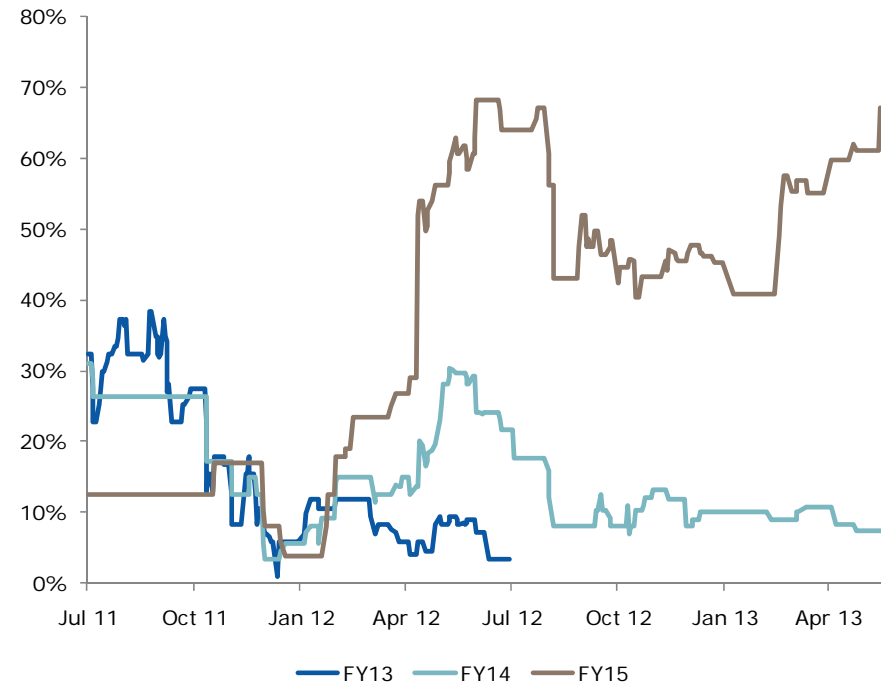
Policy uncertainty is adversely affecting the electricity market.

- › Decreased liquidity in the forward market
- › Altering expectations around plant closure and increased hydro generation

Historical Tasmania Hydro Cumulative Generation (GWh)



NSW market implied probability of carbon repeal



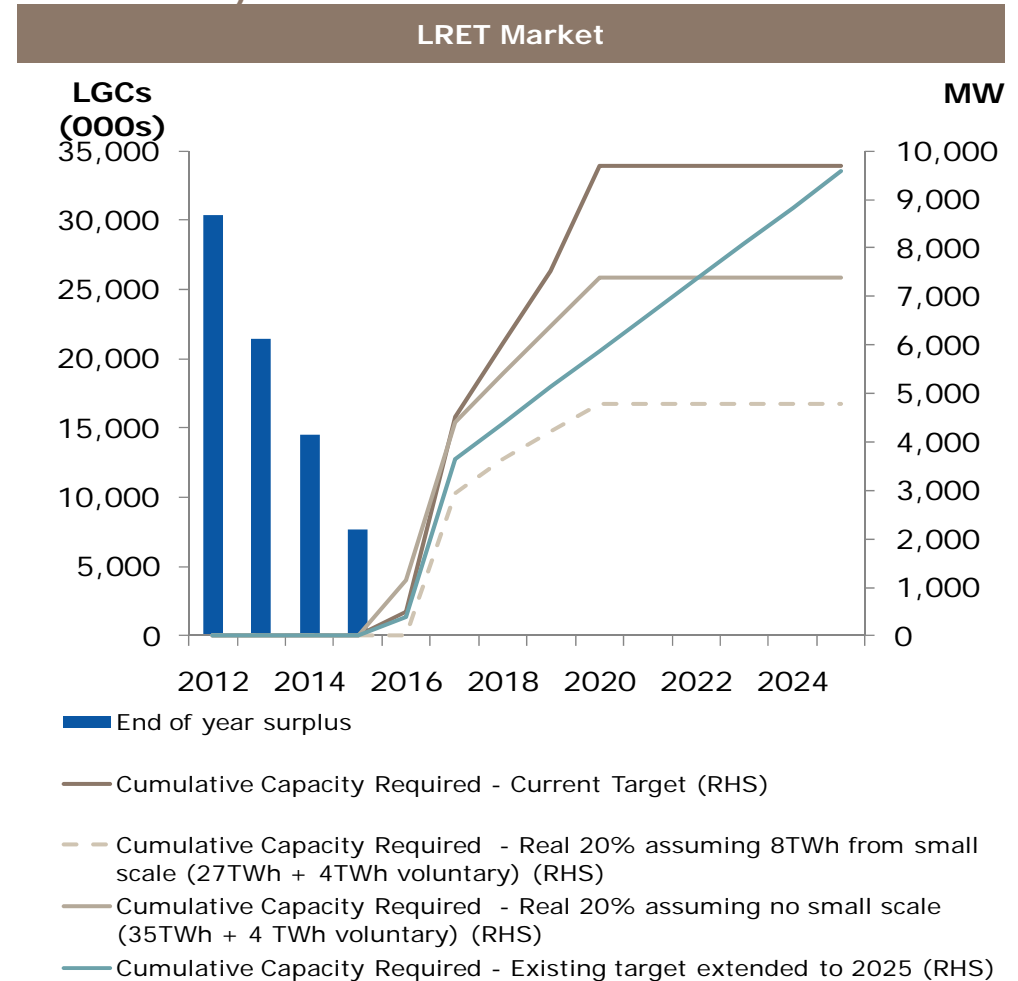
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Source: AGL, d-cypha, AFMA

# Renewable Energy policy

## AGL generation positioned for MRET uncertainty.

- › The LREC market continues to carry a bank until 2015/2016, due to the rapid uptake of small scale solar that occurred in 2009 & 2010 (which is now excluded from the scheme)
- › AGL has sufficient LRECS to meet its consumer market and existing contracts for business customers for ~5 years under the existing MRET target
- › Increasing level of political uncertainty regarding MRET target
  - » Any potential changes to MRET target still likely to require significant further renewable development
- › A reduced MRET target would result in decrease LRECS/increased "black" Electricity Prices



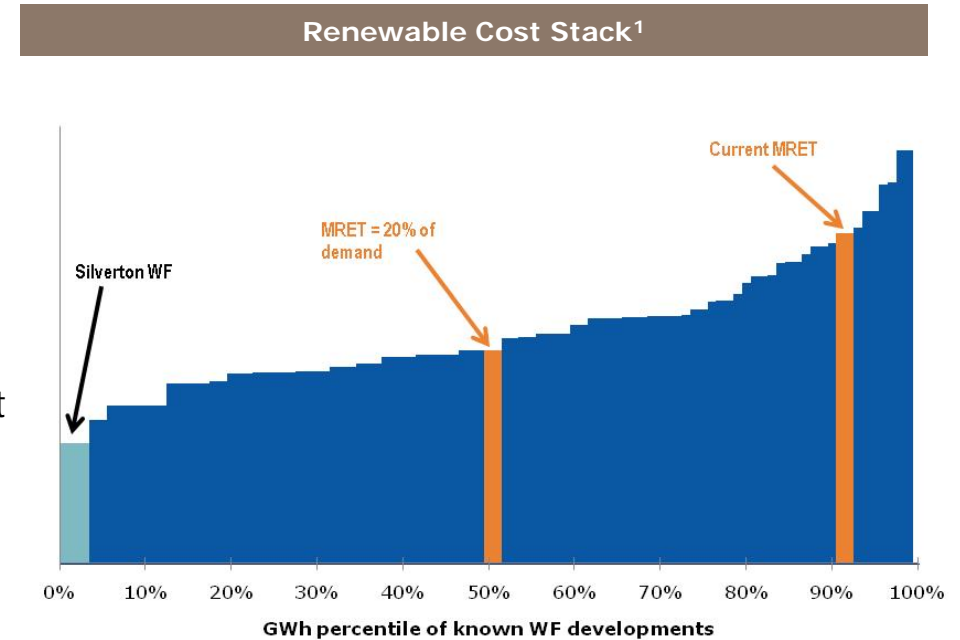
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# Renewable Energy policy

Leading renewable development options.

- › AGL's next renewable project is Solar Flagships:
  - › 50 MW at Broken Hill and 100 MW at Nyngan
  - › Final investment decision expected in June
- › Currently reviewing EPC tender responses for Silverton Wind Farm:
  - › Up to 250 MW with 80 – 85 turbines
  - › Silverton at bottom of cost stack of East Coast and mainland projects
  - › Regulatory/political stability of RET will be a key consideration in any investment



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Source: AGL, AEMO, Department of Planning and Community Development, Bureau of Resources and Energy Economics, company websites.

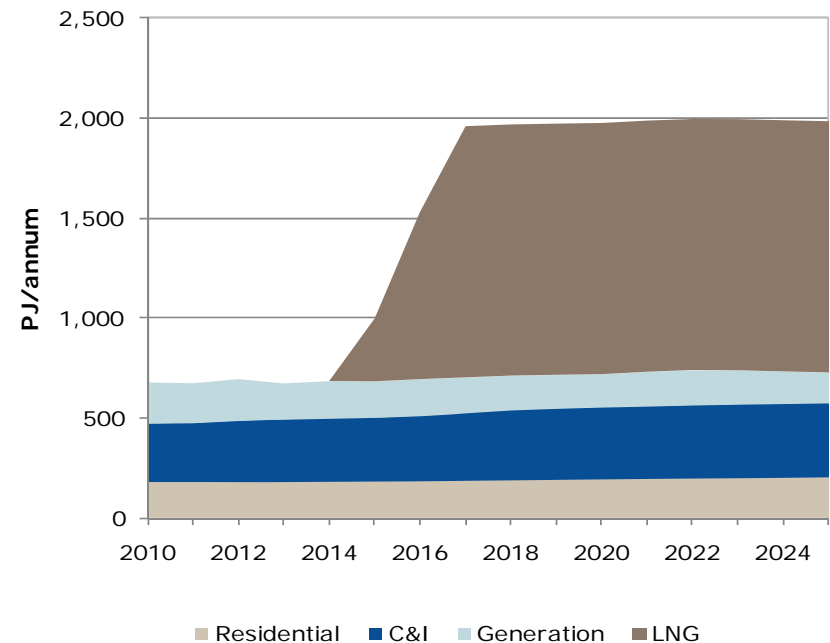
1. Renewable cost stack does not include Tasmanian and Western Australian sites.

## Domestic Gas market

### Increase in future value of gas.

- › The domestic gas market is going from a long market with declining production capacity to a short ('LNG pull') market with a significant price uplift expected
- › Expected that gas prices will be highest in Northern states and gradually start to impact Victoria and South Australia
- › Potential for prices in New South Wales to exceed Queensland if there is a supply shortage
- › LNG contracts often linked to oil price and \$US which will expose domestic gas prices to new external influences
  - » AGL has developed capability and experience in hedging oil and foreign exchange linked exposure
- › Higher gas price likely to reduce competitiveness of gas fired generation and contribute to other demand reduction

Annual demand projections (including LNG export)

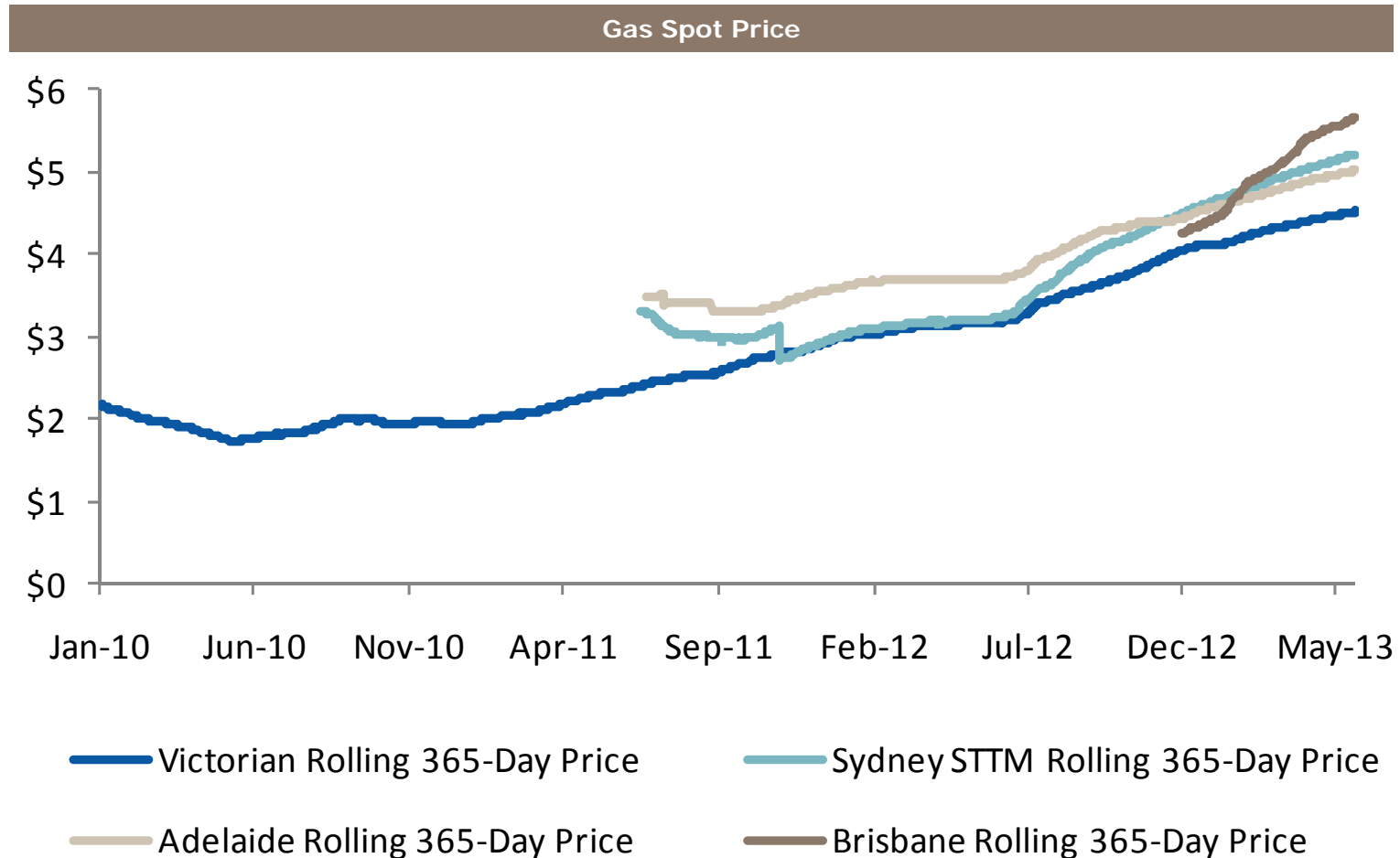


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Source: AEMO 'Gas Statement Of Opportunities 2011'.  
Energy Quest Quarterly November 2011 and AGL Analysis.

# Domestic Gas market

Tightening supply is resulting in rising gas prices.



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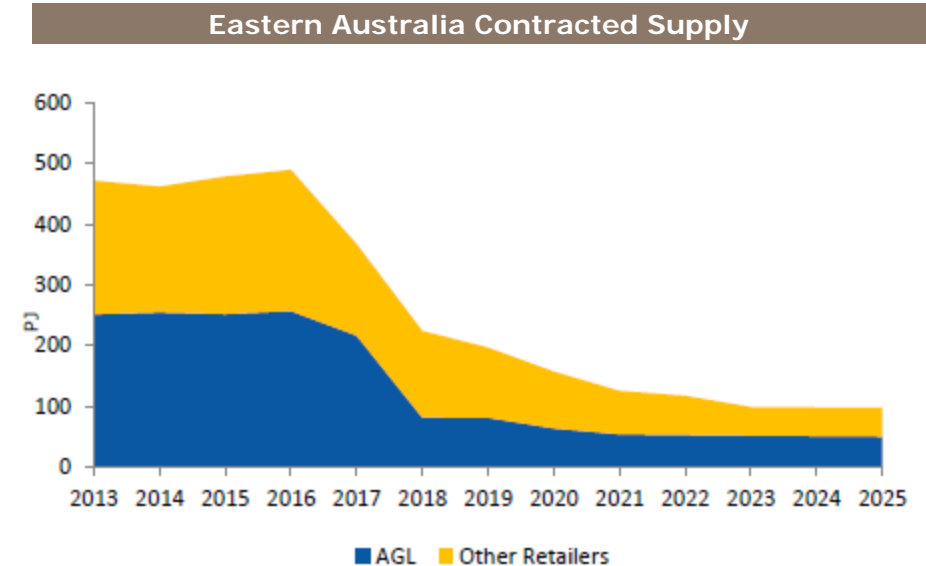
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# Domestic Gas market

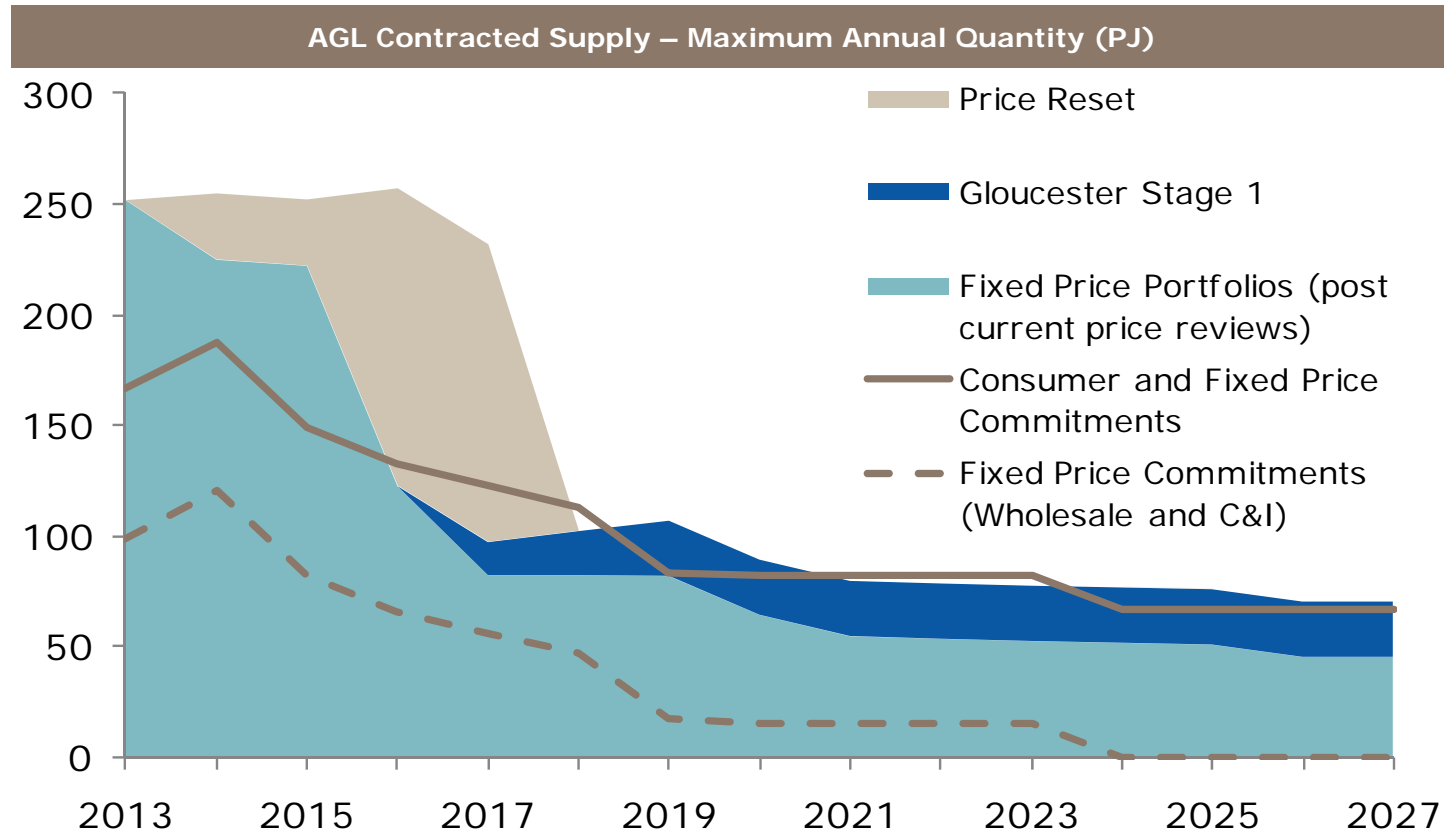
Supply contracts decline sharply post-2017.

- > Domestic gas contracts decline rapidly from 2017
- > NSW's CSG policy reversal puts stress on Commercial and Industrial users
- > Cooper Basin gas expected to largely flow to Queensland from 2015
  - > Expected to exacerbate NSW's short gas position and add to price pressure
- > However AGL portfolio is well positioned:
  - » Post current price reviews over 80% of gas portfolio will have fixed real prices
  - » Optionality to sell into high value markets



# Domestic Gas market

AGL well-positioned to benefit from emerging trends.



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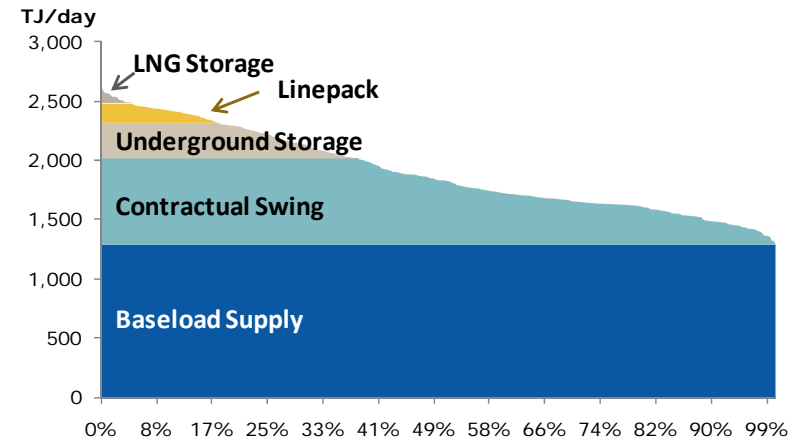
Note: Does not include AGL generation at TIPS and Somerton which will vary in accordance with the Wholesale Gas and electricity price.

# Domestic Gas market

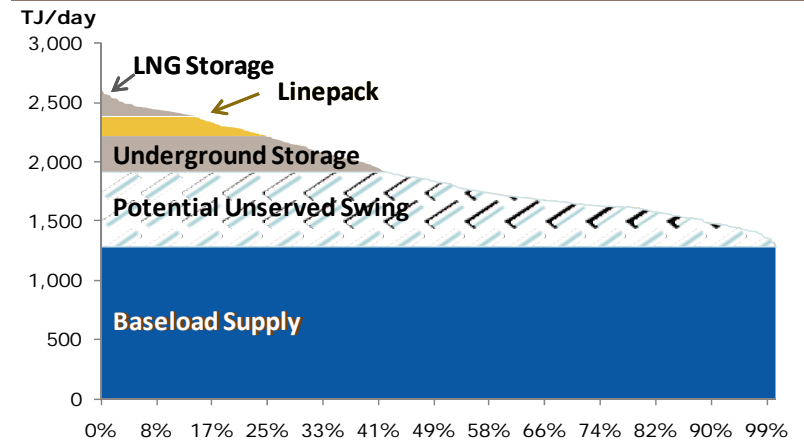
## Supply tightness reducing domestic swing.

- > Currently existing production provides a significant proportion of the gas market swing required to meet demand on peak days
  - > LNG demand contributing to supply tightness, provide opportunities for producers to increase plant utilisation rates
    - » Likely to reduce the amount of "swing" available to the domestic market
- > Opportunities to replace lost "swing" include:
  - » New storage facilities
  - » LNG producers providing swing gas
- > AGL developing its own storage capability at:
  - » Silver Springs – Depleted reservoir
  - » Newcastle – LNG storage
  - » Torrens Island – LNG storage (concept approved)

2012 East Coast Australia Supply & Demand



2020 East Coast Australia Supply & Demand



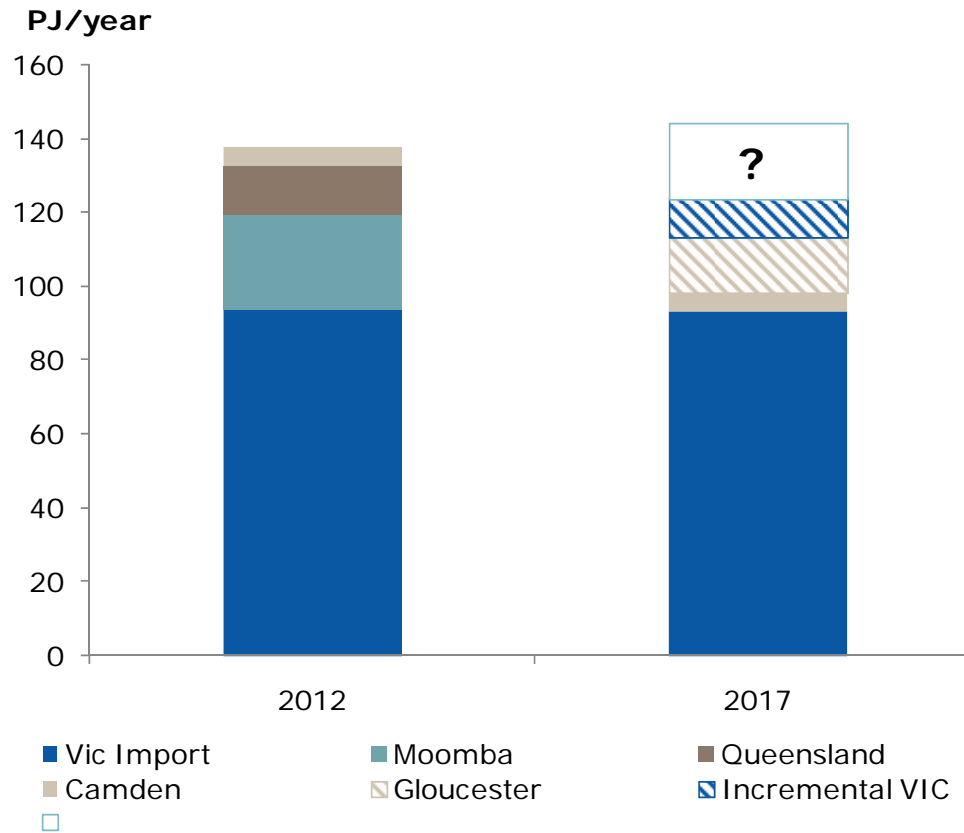
Source: AEMO and AGL

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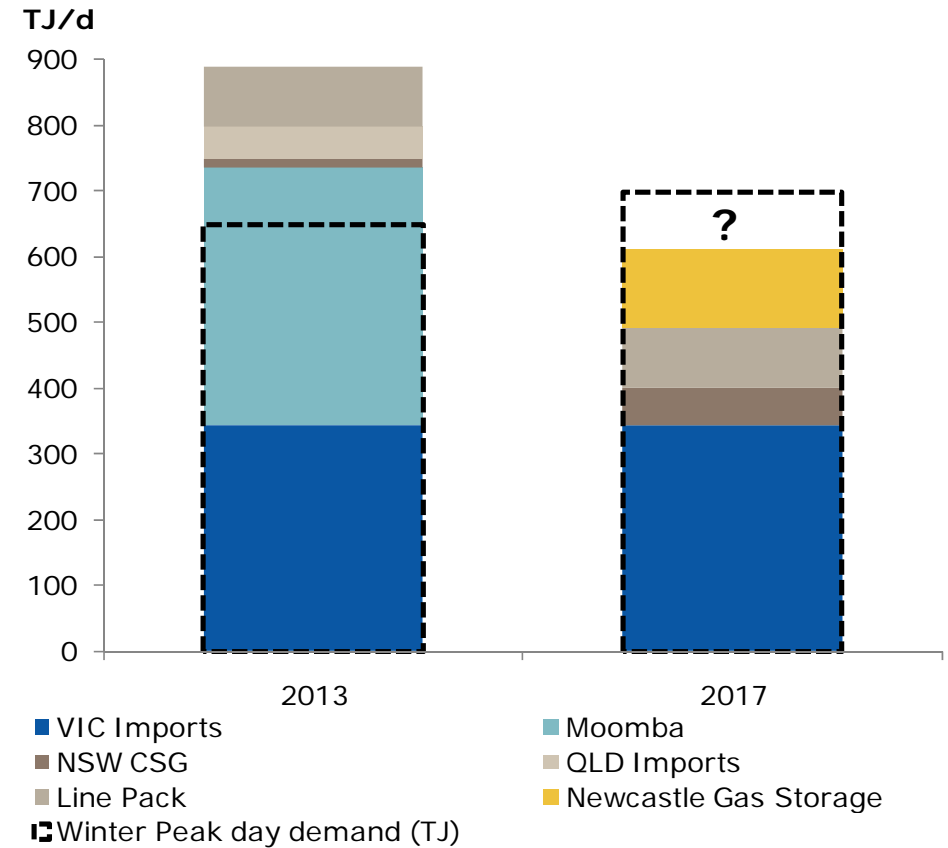
# Domestic Gas market

LNG reducing domestic swing.

Meeting NSW AQ Demand



Meeting NSW MDO



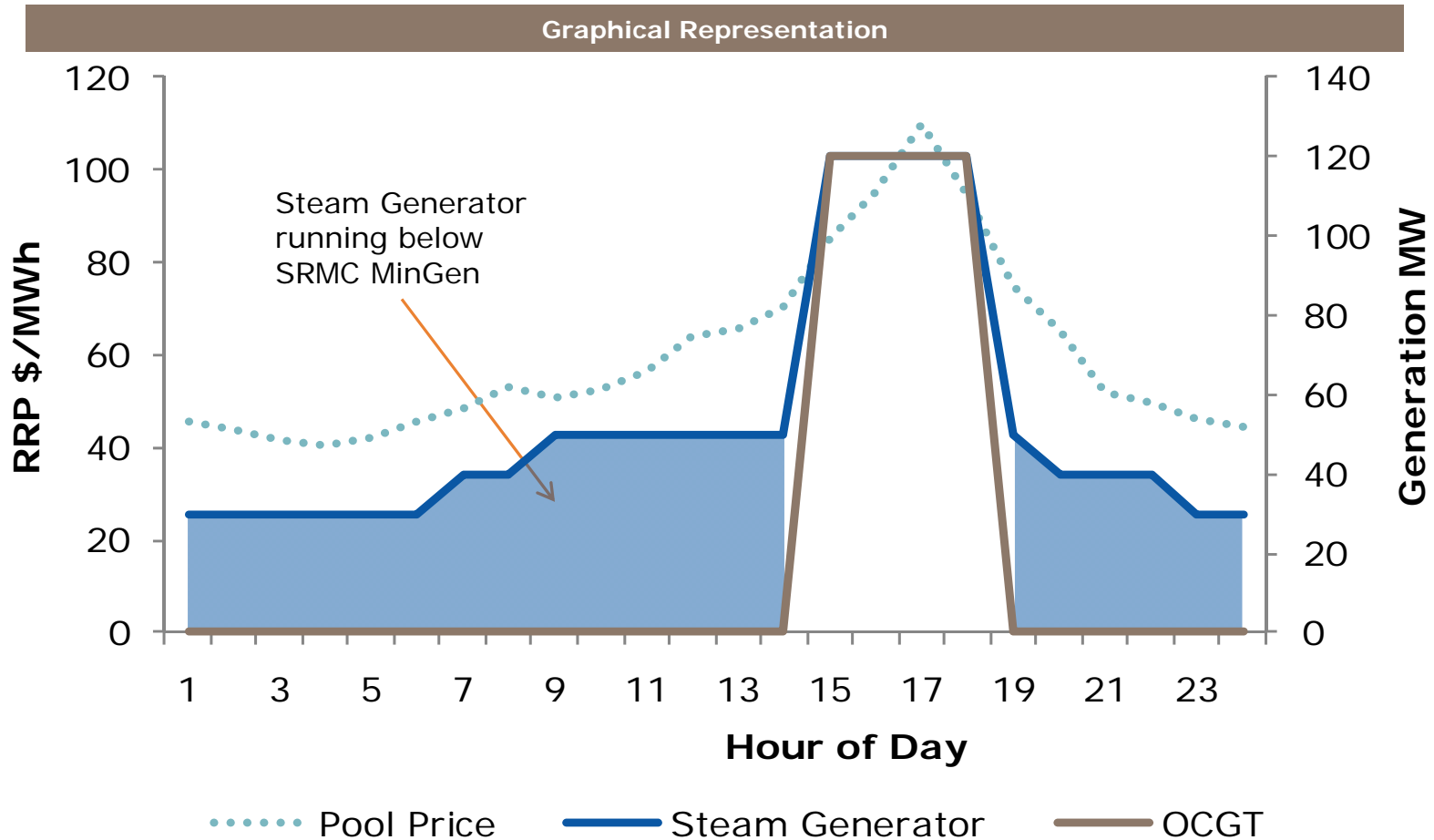
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# Gas-fired generation

High gas prices to impact gas generation.



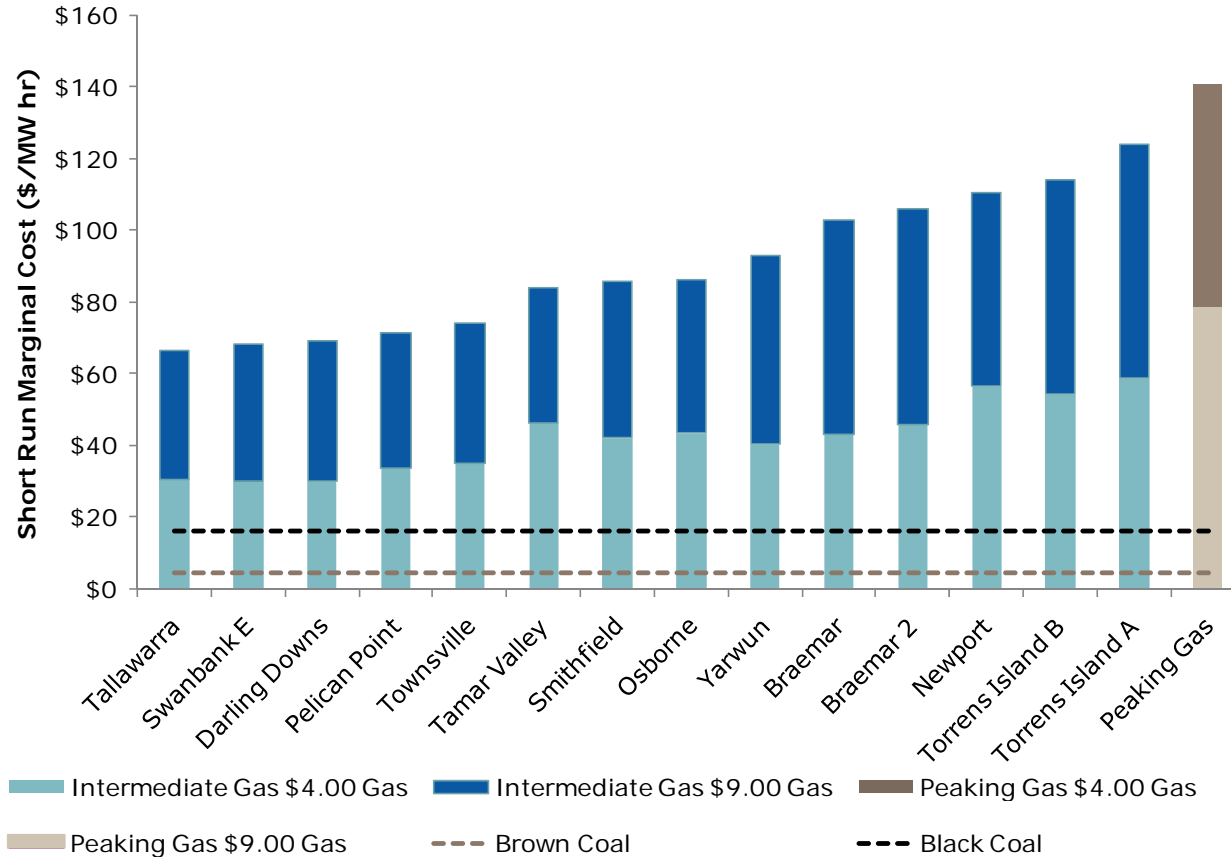
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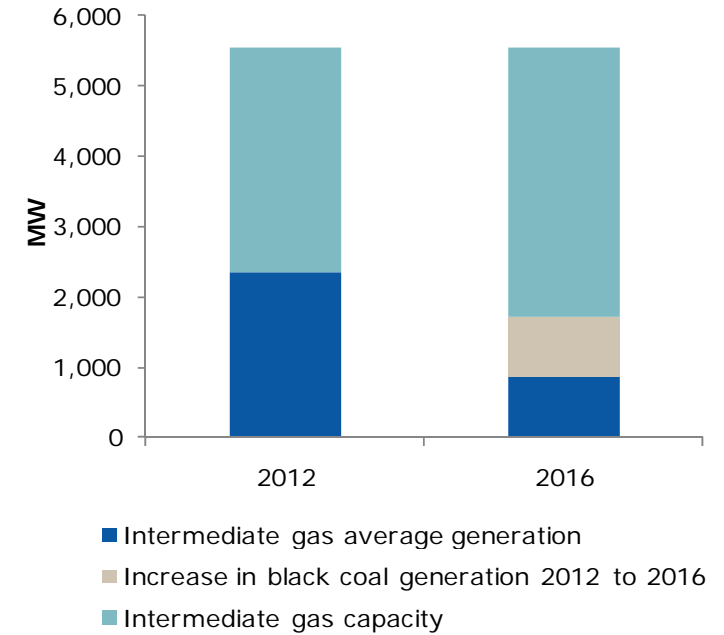
# Gas-fired generation

High gas prices result in >\$35/MWh increase in SMRC cost of gas generation.

NEM Intermediate gas SRMC - No Carbon



Intermediate gas capacity and utilisation



Note: Black coal, brown coal and peaking gas SRMCs are averages weighted by capacity.

Source: AGL, AEMO

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Questions

