

The Energy Market Death Spiral - Rethinking Customer Hardship

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Abstract

The Australian energy sector is in the middle of an investment megacycle and this is driving above-trend electricity tariff increases. In this article, we combine energy market and demographic data and find that dominant thought on the primacy of customer hardship, aged pensioners, pales into insignificance by comparison to those in the family formation cohort, and in particular, those known as Australia's 'working poor'. Consequent actions by government which serve to redistribute wealth via energy customers, as occurs in the UK, are regressive policy options and more likely to inflame customer hardship than help. Our modelling results are clear in their implications; hardship policy for energy customers requires reengineering. The structure of electricity tariffs also requires an overhaul - shifting away from flat prices and quarterly billing, to smart meters, time-of-use pricing and monthly billing to address both the investment megacycle and the incidence of hardship.

*Keywords: Electric Utilities, Energy Prices, Customer Hardship.
JEL Codes: D61, L94, L11 and Q40.*

1. Introduction

Over the past three years, one of the defining characteristics of the September quarter release of Australia's Consumer Price Index has been the marked contribution of electricity tariff movements to headline inflation rates. In September 2011, electricity tariffs were up 7.8%, following a 6.0% rise in September 2010 and an 11.4% rise in September 2009.¹ However, as a component cost of the average household wallet, energy bills have remained virtually constant for more than two decades at just 2.6%, as ABS data reveals. Other essential items such as housing (18%), food and beverages (16.5%) and transport (15.6%) take up a dramatically larger share of household income. In fact, Australian households consistently spend more on alcohol & tobacco (3.6%) than they do on energy. Given this, why residential electricity tariffs remain regulated and inflexible in most states remains one of the enduring policy mysteries of Australia's market economy.

What could explain the apparent disconnect between sharply rising electricity tariffs while energy costs remain a constant 2.6% of household expenditure? It should be obvious that when the annualised earnings of \$70,000 experiences persistent wage growth of 3.6% per annum (i.e. \$2520), the average Australian household is able to accommodate a 10% rise in a \$1500 pa (i.e. \$150) household electricity bill, with energy costs remaining constant in proportional terms as a result.

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¹ See ABS at

<http://www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/5475ABC397EA27DDCA257822001409A3?opendocument>

While prices have been increasing, annual household consumption is now showing signs of contracting for the first time since World War II. Indeed, energy consumption by NSW households has fallen by about 2.0% per annum over the past four years.² This contraction is the result of demand response to persistent tariff increases, more energy efficient appliances, housing insulation and the uptake of solar hot water and solar PV units. Additionally, household floor space, an important driver of spatial heating and cooling loads over the past two decades, has also finally reached a plateau – a result not surprising given Australia’s incremental housing stock is now the largest in the world at 245 square meters (James, 2009). Media coverage of electricity tariff increases may also have helped households to focus on energy consumption. As Simshauser and Laochumnvanit (2011) revealed, press articles on energy prices increased in NSW from about 600 articles per annum in 2007 to more than 4250 articles in 2011, a 6.7-fold increase. Household survey data also reflects the ‘net cost’ of electricity after customers have applied market discounts offered by competitive energy retailers, or have been afforded rebates by governments, whereas CPI data more likely uses published ‘safety-net tariffs’ or the regulated ‘price-to-beat’. In any event, the recent data from the ABS household expenditure survey clearly underscores the notion analysed in Simshauser, Nelson and Doan (2011a, p.88) - that *“for the majority of society, even a doubling of energy cost will be little more than a household budgeting inconvenience”*.

In contrast to the average household, the quickening of electricity tariffs for the small subset of customers defined as being ‘in hardship’ is considerably more serious than an episode of budgeting inconvenience. Simshauser, Nelson and Doan (2011a, 2011b) examined a scenario in which retail electricity tariffs would double between 2008 and 2015, and would in turn aggravate the incidence and severity of customer hardship. But, we now foresee a new problem that was not seen within the context of that research – continually rising peak demand with falling underlying energy growth rates. This has the potential to drive a particularly dangerous scenario.

Falling base or average energy demand naturally results in higher tariffs, because the industry’s heavy fixed costs will be spread across fewer units of output, holding all other variables constant. But ongoing rises in peak demand on very hot days necessitates a continual run-up in new power system equipment to ensure reliability since electricity cannot be stored. The resulting higher capital expenditure thus further intensifies the underlying tariff increases. In this instance, *bad plus bad equals worse* – falling throughput leads to tariff increases, and rising peak demand and the consequent new investments impounds additional tariff increases. It is not difficult to see how this could become a vicious cycle in the absence of careful intervention by policymakers, and in particular, the introduction of default time-of-use and critical peak pricing structures.

To be sure, the worst form of policy intervention would be the introduction of inclining block or Clow Differential tariffs, as was recently contemplated in Queensland. As Houthakker (1951) explained more than 60 years ago, when consumers face Clow Differential tariffs, they naturally economise at times least convenient to them. This is not during very hot critical peak weather events – the events that drive additional investment. On the contrary, inclining block tariffs will almost certainly inflame the situation by shrinking the non-critical event demand for energy.³

For households in hardship within the “Family Formation” cohort, characterised by the head of house being aged between 30-49, living in a large house, with a substantial mortgage or rental costs and two uncontrollable consumers (otherwise known as children) – such a scenario could become especially problematic and, increasingly, the emerging face of customer hardship in the National Electricity Market (NEM) as our quantitative analysis subsequently reveals.

² See <http://www.abc.net.au/news/2011-08-15/power-consumption-makes-historic-drop/2839394> for details.

³ AGL Energy Ltd has a seasonal inclining block tariff in the South Australian region of the NEM, although we note that the structure is quite mild between seasons (12% differential) and across consumption blocks. AGL is now planning to seek regulatory approval to abandon the structure from July 2013. The South Australian load factor has continued to decline year-on-year and has fallen from about 0.55 in the early 2000s to just 0.37 in 2011.

We have structured this article as follows; in Section 2, we outline the key pressures on electricity tariffs while in Section 3, we examine significant structural changes that have occurred in underlying energy demand as a result of global economic uncertainty. Section 4 then provides an overview of an energy market death spiral. Sections 5, 6 and 7 examine the concept of customer hardship in the energy sector and present detailed modelling of the incidence of hardship. Our policy recommendations and conclusions follow.

2. The momentum in the market for fuel and power system investments

What is the retail price of electricity and what are the component charges? In very general terms, for our purposes current tariffs for households are *about* \$260/MWh, with power generation (including carbon taxes) accounting for about 36% of the costs, high and low voltage network costs comprising about 46%, environmental schemes about 7% and retail supply costs about 11%.⁴

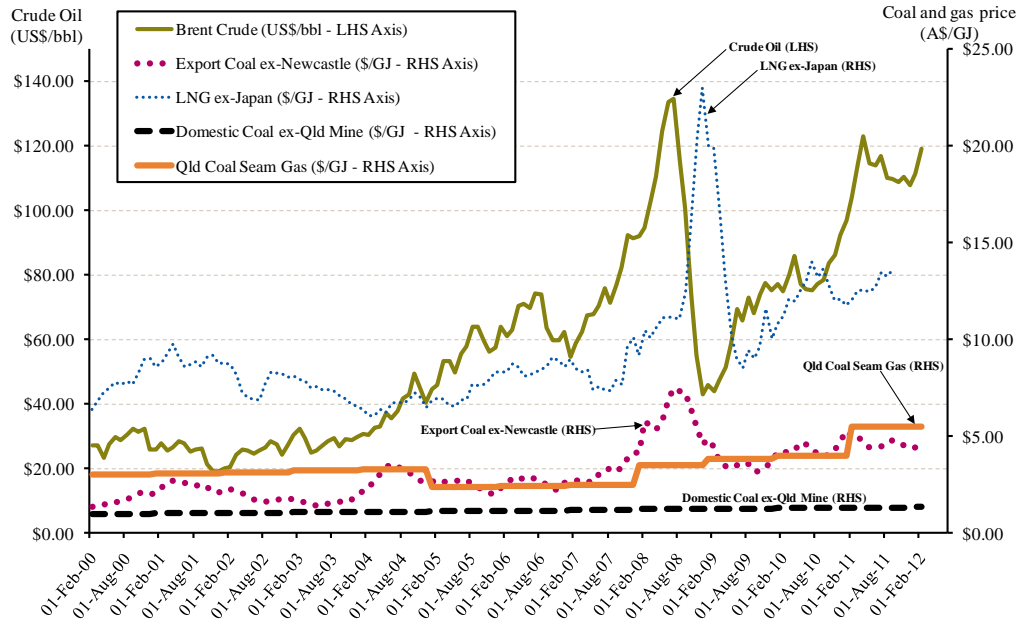
Historically, fuel used in power generation in Australia has been extremely low cost by global standards and amongst the lowest in the world. Available domestic supplies of thermal coal traditionally outstripped local demand, and as a result, Australia's thermal coal (i.e. coal used in power production) was supplied by way of very long-dated, fixed-price contracts to domestic power stations for less than \$1.30/GJ or about \$30/t in real terms. Transactions of this nature underpinned a rapid expansion of thermal power in Australia, in particular, throughout the late-1970s, 1980s and early-1990s. By the mid-2000s, natural gas was similarly in abundance relative to domestic demand and so long-dated, very low cost Gas Supply Agreements were common with pricing typically below \$3/GJ (for unity load factor) gas supplies.

The outlook for fuel costs in the 2010's is very different. Many domestic coal and gas producers are intensely focused on creating the link between export markets and their output. The reason for this is aptly illustrated in Figure 1, which plots monthly Brent Crude (LHS axis, US\$/bbl), along with the spot prices for export coal, export LNG, and long-dated (i.e. historic) domestic coal and domestic gas contracts (RHS axis, measured in \$A/GJ) from 2000 to 1Q2012.

Note in Figure 1 that existing long-dated contracts for Domestic Coal are priced at about \$1.30/GJ by the end of the time series. In contrast, Export Coal (ex-Newcastle) has a current value closer to \$4.50/GJ by the end of the series, despite starting at the same unit price in 2000. Similarly, historic long-dated gas contracts in Queensland struck at c.\$2.50/GJ as late as 2006 pale into insignificance by comparison to LNG ex-Japan, which is now trading at about \$15.00/GJ, which after netting-back to the local well-head, equates to about \$7.00/GJ using the parameters contained in Simshauser, Nelson and Doan (2011a). Domestic producers, to the extent that they reasonably can, will pursue export markets to maximise profits, and in turn, recoverable reserves. The implication for domestic users of coal and gas is that they will face cost pressures given export prices available to suppliers, at least where those suppliers have genuine access to seaborne markets.

⁴ These estimates and the components will vary considerably by region. Default tariffs in the NEM range from about \$230 - \$300/MWh. Competitive discounts are then applied to these rates. The allocation of costs are based on those in IPART (2012) for Sydney residents.

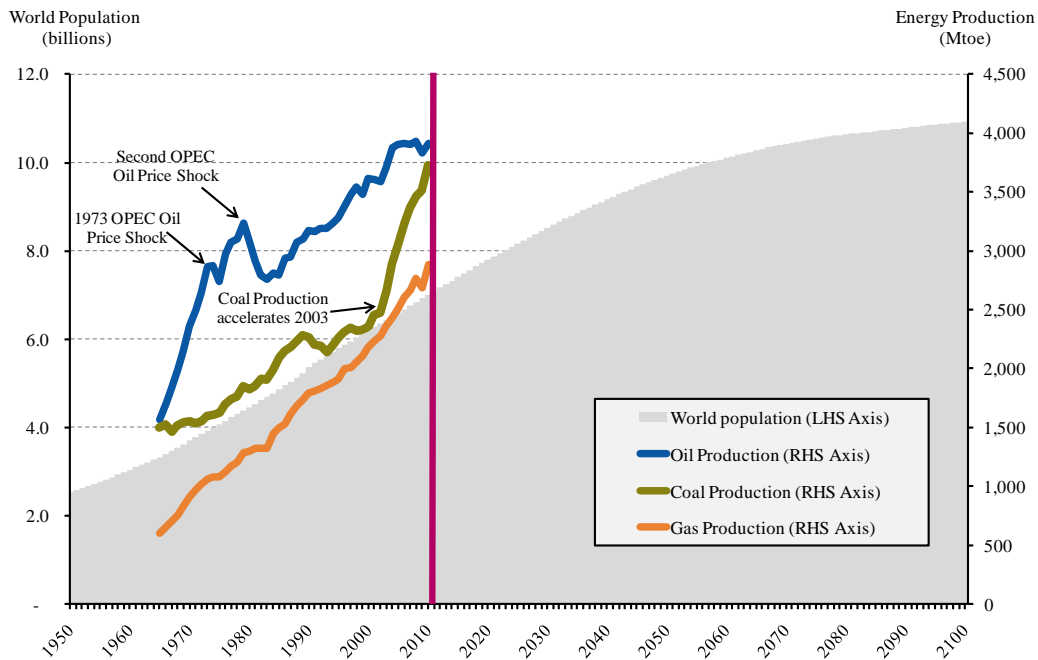
Figure 1: Prices for raw fuel from 2000-2012



Source: Bloomberg, AGL Energy Ltd.

In the case of coal, the existence of export markets has not been of any great significance historically. On the one hand, domestic power plants accept substantially lesser quality thermal coal than that which is typically exported, while on the other hand, the price differential between the domestic and seaborne markets was rarely as dramatic as now. The differential in local and seaborne coal prices can be traced back to 2004. We know of no other way to better capture momentum in global fuel markets than Figure 2, which combines demographic data on world population with annual oil, coal and gas production data. Note in particular the slowdown in oil production from 2004, and the consequent rapid rise in coal and gas production.

Figure 2: Global population and energy production



Sources: KPMG Demographics, BP Statistical Review (2011), UN (2011), AGL Energy Ltd.

Very long-range, trend-growth in raw energy production (i.e. over a 40 year window) has averaged 2.0% (year-on-year). The 10-year period that exhibited the highest growth was the window leading up to the second OPEC oil price shock in 1978, where growth in global energy production was 4.2% pa. Growth in oil production was a startling 6%+ leading up to the first OPEC oil shock in 1973. However, following the second oil price shock in 1978 growth in oil production moderated to 1.3% pa and over the last 10 years has fallen to just 0.8% pa. This observation is important. Population growth is running at pace, and growth in oil production is grinding to a halt. As a result, coal and gas are now high growth fuels.

Gas production has had a persistent long-range growth rate of 2.9% per annum, and recent non-conventional gas production levels (for example, shale gas in the US and coal seam gas in Australia) seem set to underscore this trend. But the most striking result in Figure 2 is the sharp run-up in coal production from 2004. Compound growth rates for coal output during the 2000s was 4.7%, more than double the long-range average (2.3%) and more than five times the growth in oil production.

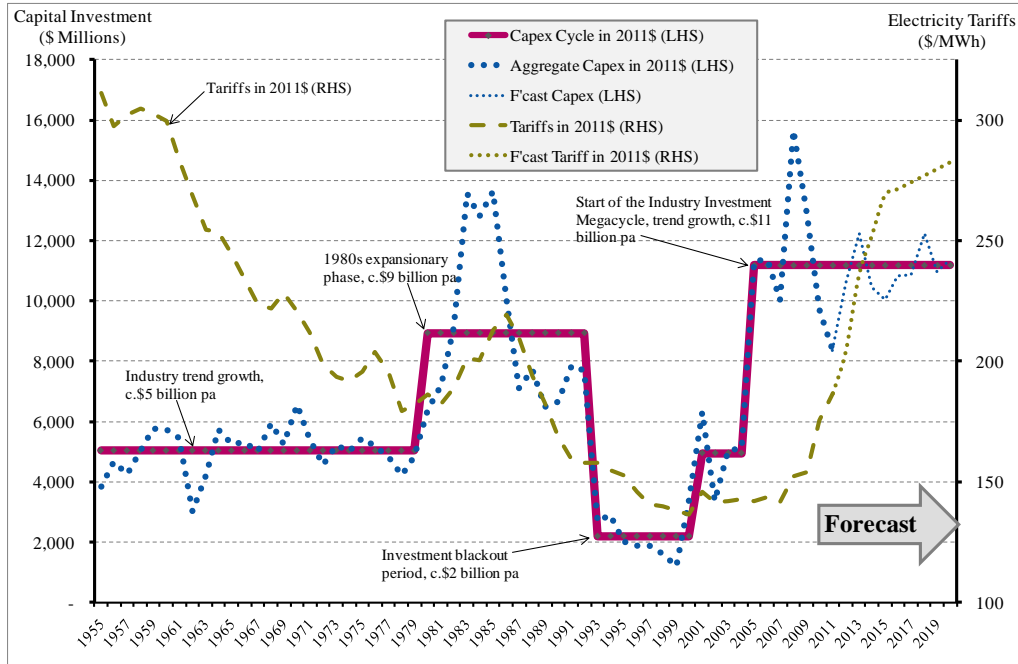
From 2000-2010, global population increased by 13.0% while production of raw energy increased by 29.3%. Since oil production has almost stalled, rising energy demand has been increasingly met by coal and gas (and indeed, renewables). In the 1980s, oil accounted for 49.8% of the world's fossil energy mix but fell to just 37.2% by 2010. Coal on the other hand has increased from 29.3% to 35.4%, and gas has increased from 16.4% in the mid-1960s to 27.4% by 2010.⁵

The drivers of growth in coal and gas are many, but one that stands out above all others has been the rapid urbanisation of the Chinese population (see Appendix I, which illustrates the change in population density in Shenzhen Province between 1982 and 2007). Over the past 30 years, the 'urban drift' in China has been estimated at 400 million people, which is unprecedented in history. There are now more than 170 cities in China with a population greater than one million, and to give this some context, there are only 35 such cities in all of Europe (CSIRO, 2010). Urbanisation also has a long way to run in China with a further 300-400 million people expected to drift from rural to urban centres over the next 20 years. These twin drivers of urbanisation and industrialisation shed some light on the rapid rise in demand for energy resources. And while such growth will inevitably experience cyclicity in quantities and price, the long run momentum seems clear enough.

The infrastructure requirements of China and other emerging economies are likely to place long-run pressure on key inputs to the power sector (i.e. metals, labour, capital and fuel). And in the case of fuel, over 90% of the NEM's power supply is currently derived from coal or gas. Historically, the unit cost of raw fuel has represented less than 10% of the average household electricity bill. The momentum currently gathering in fuel markets seems likely to change this with unit fuel costs quite capable of rising to more than 20% of the electricity bill in regions where fuel costs link to export markets. Introducing a price on carbon will also have an impact, although this is a second-order issue by comparison to the underlying rises in fuel costs, and as we subsequently reveal, the costs of new investment in poorly utilised plant and equipment. Indeed, rising fuel costs and the investment implications of environmental policies are not the only headwinds facing energy consumers in the NEM. As Simshauser and Catt (2012) recently noted, Australian investment in power generation, transmission and distribution networks is currently running at about \$11 billion pa, substantially above long-term trend-growth of \$5 billion pa. This is illustrated in Figure 3.

⁵ While not shown in Figure 2, more investment in electricity is now being directed into renewables than in coal and gas-fired generation.

Figure 3: Energy Utilities Investment Megacycle



Source: Simshauser & Catt (2012).

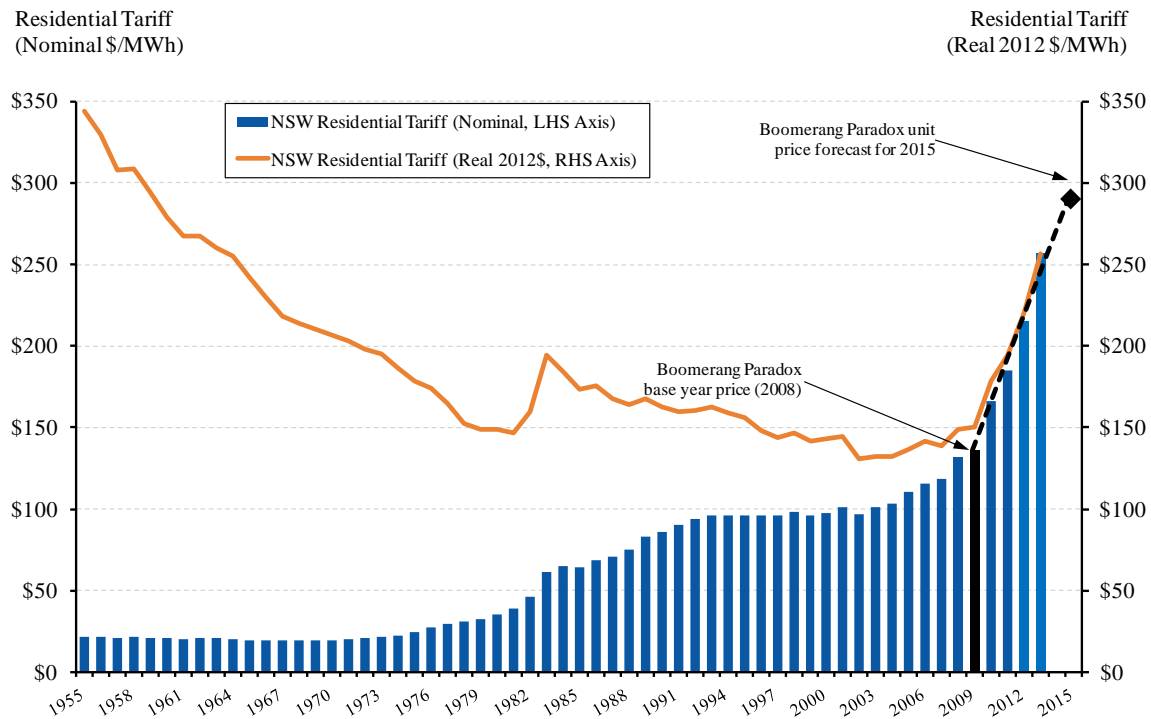
In Figure 3, aggregate annual investment in fixed assets is represented by the dotted line series, while a superimposed proximate ‘industry investment cycle’ - made possible by converting all capital expenditures into constant 2011 dollars - is given by the solid line. Electricity tariffs have been plotted as the dashed line series against the RHS Y-Axis.

Note that investment between 1955 and 1979 was about \$5 billion pa. This occurred while electricity load growth was running at 7.9% pa. A run-up in investment to \$9 billion pa occurred during the 1980s, and along with it, a commensurate electricity tariff increases. During this expansionary phase in the 1980s, load growth remained strong at 5.4% pa. However, this high growth rate was actually lower than forecasts at that time. A series of discrete industrial loads (i.e. primarily aluminium smelters) was expected and in turn, drove the expansionary phase. But in the end, less than 50% of these new industrial electricity loads materialised (Kellow, 1996). Unsurprisingly, the power system was chronically oversupplied by the mid-1980s, and unit electricity price increases were dramatically higher than the industry, government and policymakers had anticipated. Predictably, an “investment blackout” followed during the 1990s, in which aggregate industry investment fell to just \$2 billion pa. With continual growth in aggregate electricity demand, the oversupply eventually cleared and from 2000-2006 industry investment reverted to trend-growth of \$5 billion pa. The “investment megacycle” visibly commences from 2007 onwards.

There are broadly three drivers of the investment megacycle, two of which represent a broader global thematic. The first of these is asset replacement. Approximately one-third of the investment in network infrastructure in the NEM is currently being directed towards aged asset replacement. Like many advanced economies, Australia made substantial investments in electricity infrastructure in the 1970s and 1980s, and given the 30-50 year life of electricity equipment, portfolios require asset renewal. The second is the investment requirements associated with environmental policies such as renewable targets and greenhouse gas restrictions. Meeting Australia’s 20% Renewable Energy Target (by 2020) will require approximately \$20-30 billion worth of cumulative investments. Electricity price increases are also prominent in Europe, the UK and the USA and these two drivers, replacing aging assets and the investment implications of greenhouse gas and renewable energy targets, are again common features.

But Australia and the US have a third driver which seems to be less of a problem in Europe or the UK: the peak load problem. The issue for Australian energy consumers is that a non-trivial component of the investment megacycle, which notionally commenced in 2007, is being initiated to meet the worst kind of demand growth - growth in peak demand, not base energy demand. When an investment megacycle combines with durably higher fuel prices, it is not difficult to envisage substantial rises in electricity tariffs. In Simshauser, Nelson and Doan’s (2011a, 2011b) *Boomerang Paradox*, retail electricity tariffs were predicted to double in just seven years, between 2008 and 2015. To give this some historical context, it took 23 years, from 1985-2008, for electricity tariffs to double previously. Needless to say, given the extreme nature of the pricing scenario envisaged, the *Boomerang Paradox* article was released after considerable hesitation, and extensive testing and retesting of inputs, modelling and outputs. The primary results of the *Boomerang Paradox* analysis have been reproduced in Figure 4, along with the most recent changes in actual electricity tariffs in NSW. These forecasts were produced in 2009, released in 2010, and published in 2011. At the time of writing in 2012, there is nothing we have seen that would lead us to conclude that our original 2009 forecasts contained in the *Boomerang Paradox* research have somehow lost their relevance in terms of direction, or momentum.

Figure 4: NSW electricity tariffs from 1955-2015f



Source: Simshauser, Nelson and Doan (2011a, 2011b).

Large-scale investment in electricity equipment is not in and of itself a problem if it is intended to meet rising throughput. For example, while Kellow (1996) and Booth (2000) noted that the 1980s expansionary phase was excessive, growth in industrial energy demand and substantial household load growth via the arrival of cheap air conditioning units eventually utilised the productive capacity of the power system. As a result, electricity tariffs “troughed” by the mid-2000s. However, current trends in energy demand do not reflect those of the 1990s, and as Sections 3 and 4 subsequently reveal, the peak load problem is something that policymakers will need to turn their attention to despite the short term political economy of electricity prices.

3. Economic growth and the momentum of energy demand

Electricity demand forecasts are becoming more difficult to prepare due to the uncertain international economic environment and the changing expenditure patterns of households. As Figure 9 later highlights, macroeconomic conditions following the Global Financial Crisis produced Australia's first negative year of growth in power production since World War II.

At an aggregate level, the performance of the Australian economy has nonetheless been somewhat of an anomaly amongst OECD economies, with Gross Domestic Product (GDP) revealing 20 years of continuous economic growth. However, the 2011 GDP result of 2.3% remains sub-par by comparison to trend growth of 3.25% (although the March 2012 year-on-year GDP result of 4.3% seems to have caught economists by surprise). More important however is the notion of the 'two-speed economy' - a well understood concept in Australia, and with good reason. Australian GDP results have more recently been driven by the energy and resources sector (i.e. the 'fast lane' running at about 9% growth) while other sectors such as manufacturing, retail, tourism and non-engineering construction remain in the 'slow lane' at about 1% growth, and have been deteriorating for some time as Gibbs (2011) noted. Indeed, the South-eastern region of Australia, where there is comparatively little in the way of resource sector activity, posted zero or negative economic growth rates in the final quarter of 2011. And residential property prices across the country have experienced five successive quarters of negative growth before flattening in early 2012.⁶ The importance of this is that, as with the USA, a large proportion of Australian household wealth is associated with the family home. A subdued real property market and non-resources sector economic environment will weigh heavily on consumer confidence, and therefore the structural composition of consumer spending. Consumer spending is important – it has historically driven about 60% of Australia's economic growth and a dominant proportion of the growth in non-resource sectors.⁷ This includes domestic power demand.

The uncertain global economic conditions that exist at the time of writing are likely to persist for some time to come. Reinhart and Rogoff (2009), and the IMF (2009, p.112, 119), examined the short run output dynamics of 122 recessions over the last 50 years from 21 developed economies and noted that:

...recessions associated with financial crises have typically been severe and protracted, and recoveries have been slower, held back by weak private demand and credit. In addition, highly synchronized recession episodes [defined as recessions simultaneously impacting 10 of the 21 advanced economies] are longer and deeper than other recessions. Moreover, developments in the United States often play a pivotal role both in the severity and duration of highly synchronized recessions... Recessions that are associated with both financial crises and synchronized global downturns have been unusually severe and long lasting. Since 1960, there have only been 6 recessions out of 122 that fit this description...

The Global Financial Crisis of 2008-09, otherwise known as *The Great Recession* (Stiglitz, 2010), fits this definition as it was both precipitated by a financial crisis and was globally synchronised. Such conditions in less acute downturns typically lasted for seven quarters from peak to trough, in which GDP falls by 4.8%. The subsequent economic recovery runs at only half this rate, meaning that an economy hit by such downturns will virtually stand still for *at least* four years. While the energy and resources sectors of the Australian economy have clearly averted disaster, non-resource sectors have deteriorated, and face the real prospect of an equivalent episode of at least four years of stagnation. Much of this is driven by a combination of consumer

⁶ Source: RP Data.

⁷ Dent (2011) notes that in the US consumer spending typically drives 70% of economic growth.

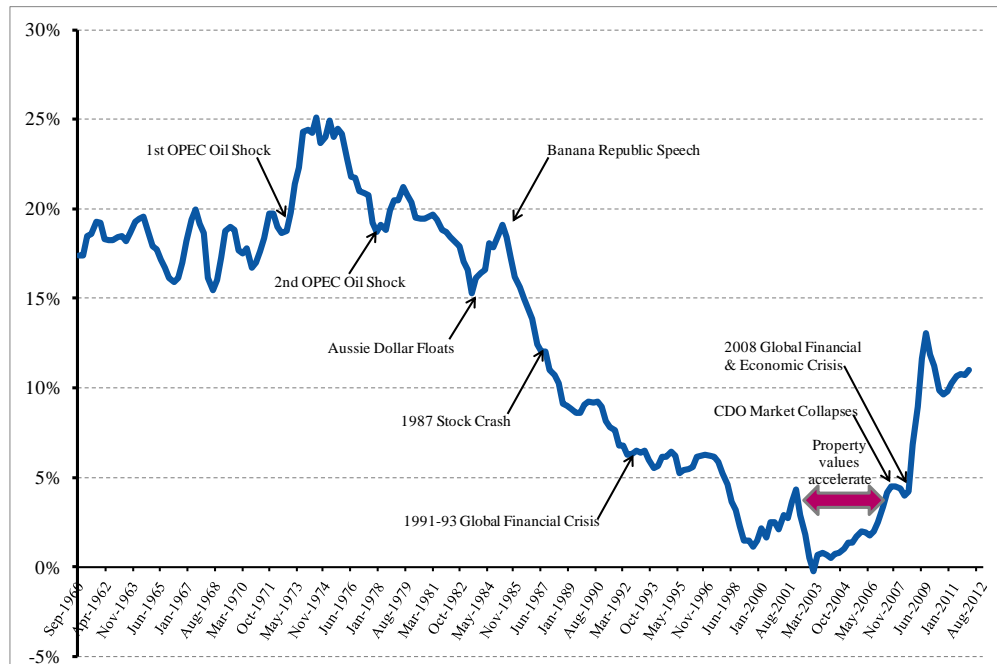
caution and reduced credit as households and firms deleverage their balance sheets. As the IMF (2009, pp 116-117) observed in relation to the international economy:

What do these observations tell us about the dynamics of recovery after a financial crisis? Households and firms either perceive a stronger need to restore their balance sheets after a period of over-leveraging, or are constrained to do so by sharp reductions in credit supply. Private consumption growth is likely to be weak until households are comfortable that they are more financially secure. It would be a mistake to think of recovery from such episodes as a process in which an economy simply reverts to its previous state.

In Australia, households are evidently restoring balance sheets as a result of perceptions of being over-leveraged just as the IMF predicted in 2009:

(a) Savings: As Figure 5 illustrates, the average savings rate of Australian households from 2000-2008 was just 1%. Rising real property values and innovations in banking allowed consumers to convert their previously illiquid housing stock into a virtual ATM machine, thus driving consumer spending to record levels (Reinhart and Rogoff, 2009). But since the collapse of Lehman Brothers in 2008, household savings rates in Australia have increased to about 11%, a level not seen in Australia since just prior to the stock crash of 1987. BCG (2011) noted in their international survey of consumer spending plans that Australians are amongst the most cautious, despite living in one of the best performing economies in the world. Surprisingly, BCG (2011) found that Australian consumer spending plans differed little from consumers in crisis-ridden Greece, and other economies under duress such Italy and the United Kingdom.

Figure 5: Australian household savings rates

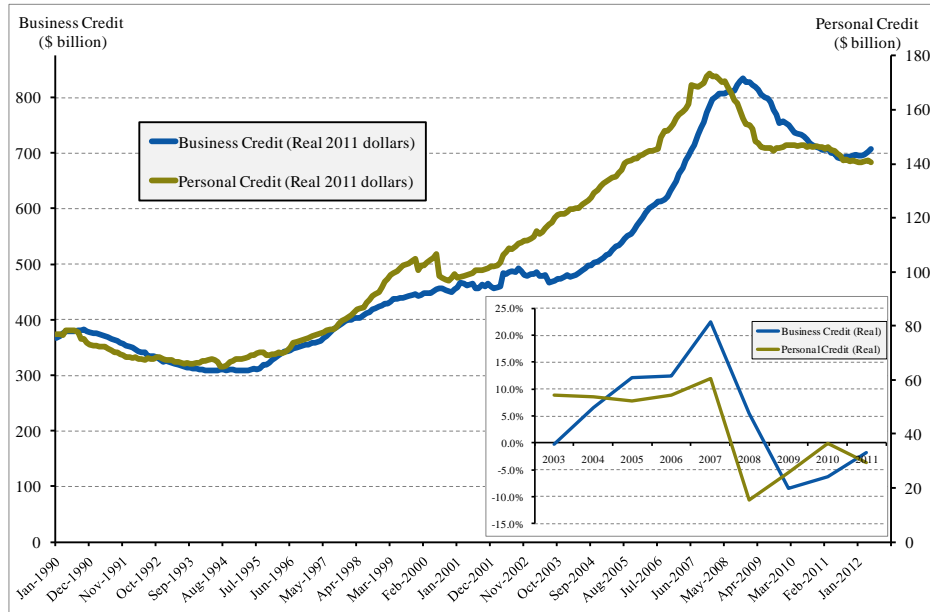


Source: RBA, AGL Energy Ltd.

(b) Credit: A large component of economic growth is driven by consumer spending, and a large component of growth in consumer spending is fuelled by the availability of bank credit. Credit is, therefore, an important growth catalyst and a lead indicator for non-mining sectors. But Australian credit markets reveal constrained credit trends, as Figure 6 highlights. Whereas the use of personal credit increased by 43% during the four years

leading up to the Great Recession, over the following four years it has contracted by 18.3%. Similarly, business credit expanded by 64.5% pa over the four years leading up to the Great Recession, but has since fallen by 12.5%. All things being equal, if credit is rationed in its supply or use in comparative terms, economic growth will be sub-par. Figure 6 illustrates aggregate business credit and personal credit expressed in 2011 dollars, with the ‘inset graph’ illustrating year-on-year growth rates for business and personal credit.

Figure 6: Growth in Australian Business and Personal Credit



Source: RBA, AGL Energy Ltd.

The changing patterns in household savings, credit markets and consumer spending (i.e. absolute level and identifiable changes in the composition of goods and services) will inevitably have an impact on energy demand. While the short run drivers of energy demand are anthropogenic patterns and weather conditions, at the household level, long run demand can be broken into three separate drivers:⁸

- **Structural effect:** this component of energy demand is driven by population growth and the number of new household (and business) connections. This has historically contributed about 1.8 percentage points to demand growth, but since the Great Recession has fallen to 1.2%. Population growth has slowed to 1.4% (down from 2.2% in 2008),⁹ while new housing approvals in 2011 had fallen by 12.1% compared to 2010, and remain 13% below the approval levels of 2007.¹⁰
- **Cyclical effect:** this component of demand is driven by the composition of households. Growth in average dwelling floor space has been material, increasing from 113 square metres in 1990 to about 150 square metres in 2011, with the incremental housing stock at 245 meters. Growth in the number of appliances within the household such as air-conditioning, clothes dryers, and the extent of discretionary goods such as computing equipment, flat screen televisions and set-top boxes has also been important, with the average household stock increasing from 46 appliances in 2000 to 67 appliances in 2010, with an average of 38 appliances plugged-in, and 25 appliances at anytime using standby

⁸ We should acknowledge the work of ABARE (2010) who first described three drivers of demand. Our concepts are similar, but not identical, to ABARE’s (2010) research.

⁹ See <http://www.abs.gov.au/ausstats/abs@.nsf/mf/3101.0> for details.

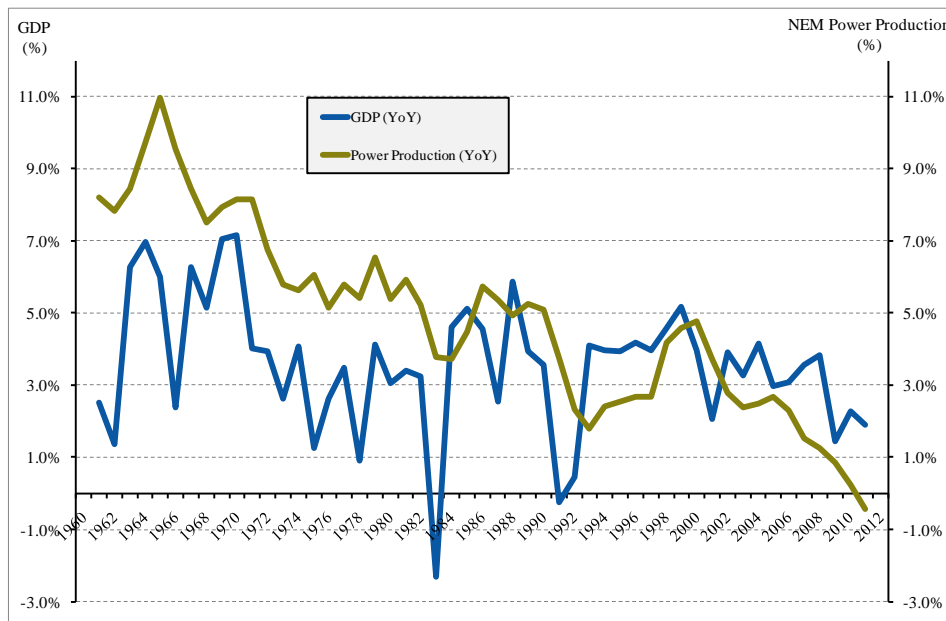
¹⁰ See <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/8731.0February%202012?OpenDocument> for details.

power (Phillips, 2012). Historically this has contributed about 1.2 percentage points to demand growth, but since the Great Recession appears to have stalled.

- Productivity effect: this component of demand contributes to negative growth via improvements in the energy efficiency of appliances, and the quality of materials used in the housing stock and on average, is thought to be -0.9% per year.

Of course, household energy consumption comprises only one third of total power system demand (albeit noting that households comprise about 60% of the peak load in metro areas and 80% of the assets deployed¹¹), and so in aggregate the long run driver of energy is nation-wide economic growth. Figure 7 presents Australian annual economic growth rates and NEM power production growth rates (using a 3 year moving average) over the 51 year period from 1960 to 2011.

Figure 7: GDP growth rate vs. NEM power production growth rate – 1960-2011



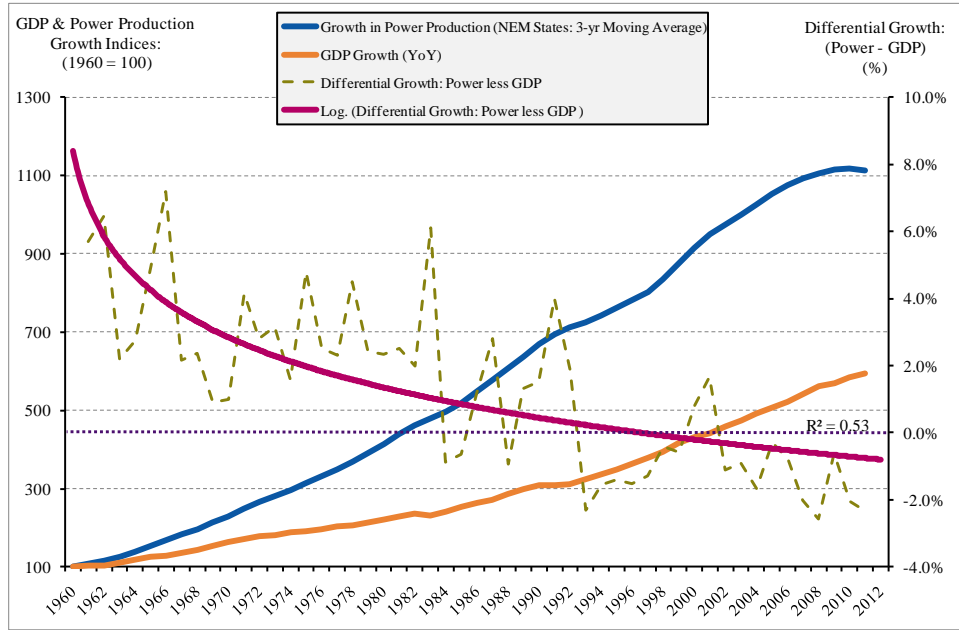
Source: RBA, esaa, AGL Energy Ltd.

Economic growth for Australia has averaged 3.6%, with power production averaging 4.9% - some 1.3 percentage points higher than GDP. Of course, these are extremely long run averages. When analysed over the past 10 years, economic growth has averaged about 3.25% whereas power production has fallen below GDP, to just 1.6% or half that of trend GDP. Often it is the case that as an economy matures, a point occurs in which energy production decelerates below trend economic growth. In the case of Australia, this can be traced back to the mid-1990s, which as an aside, coincides with the energy sector reforms and the unravelling of sectoral cross subsidies.

Figure 8 presents cumulative Australian economic growth and power production from 1960 on the LHS y-axis expressed as an index, the differential rate of growth of power production (i.e. power production *less* economic growth) and an associated trend-line as measured by the RHS y-axis. The growth differential trend-line captures the essence of the issue. Notice that from the mid-1990s, the trend line drops below 0% on the RHS y-axis, meaning that from the mid-1990s, power production growth rates fell below Australia’s GDP growth rates – the growth disconnect had essentially been confirmed.

¹¹ For details of the asset allocation, see Energex (2012).

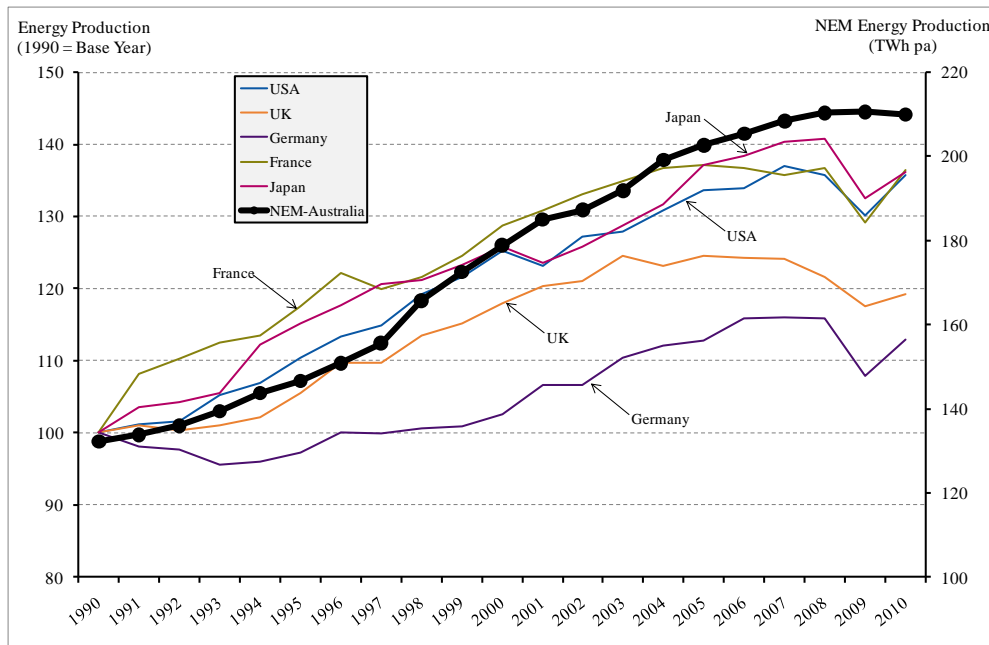
Figure 8: Cumulative GDP growth vs. NEM energy production growth – 1960-2011



Source: RBA, esaa, AGL Energy Ltd.

Yet, power production is not just decelerating below trend economic growth - production levels are currently contracting. However, we caution any extrapolation of such results. While this is indeed most unusual by Australian standards, it is in no way atypical after severe economic shocks. Figure 9 plots annual power production in Terrawatt Hours (TWh) for the NEM (RHS y-axis) and contrasts this with a power production index series for the USA, UK, France, Japan and Germany from 1990-2010 (LHS y-axis). Notice that power production experienced a sharp slump during the Great Recession in all economies. The British pool reduced by almost 8%, from 349TWh in 2005 to just 322TWh in 2009. For its part, the NEM registered its first year of negative growth since WWII in 2010.

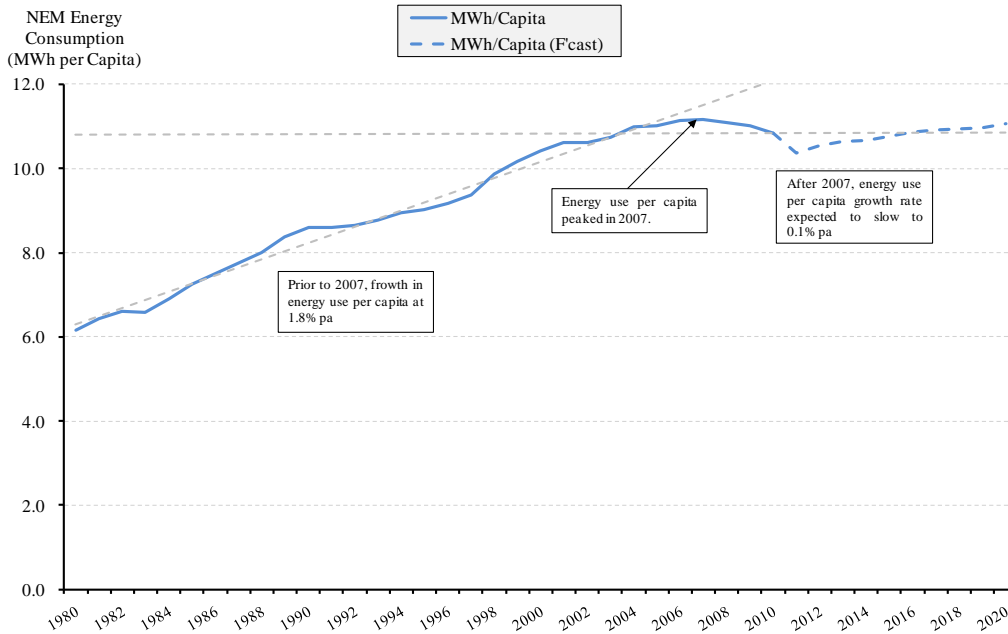
Figure 9: Stalling power production: 1990-2010



Source: AGL Energy, ESAA, BP Statistical Review.

Energy demand forecasts are now being revised downwards by central forecasting agencies, albeit noting that peak demand forecasts continue to rise. Figure 10 puts these energy forecasts into context by combining historic and forecast electricity load data and Australian population data. Note that prior to 2007, the point at which energy use per capita peaked in Australia, consumption growth was running at approximately 1.8% pa, but since the onset of the Great Recession, and combined with sustained increases in the unit price of electricity, energy use per capita is now expected to slow to about 0.1% per annum. A progressive hollowing-out of manufacturing loads has no doubt contributed to the declines since 2007, and the subdued forecasts to 2020.

Figure 10: **Electricity use per Capita (1980-2020f)**



Sources: ABS, ESAA, AGL Energy Ltd.

Slowing energy demand will create challenges for an industry that has become accustomed to volumetric growth rates of 2.5-2.8% year-on-year. Regardless, the troubling aspect for policymakers and for consumers in the intermediate term is that since 2005, peak demand growth has been running at twice the growth rate of underlying or energy demand (AEMC, 2011). So while growth in annual energy demand has experienced modest declines, growth in peak demand on a weather adjusted basis continues largely at trend. And increases in peak demand manifest themselves in higher capital expenditure by networks and generation plant to maintain security of supply given the inability to store electricity. It is this characteristic, when combined with asset replacement and environmentally-driven investments that has the potential to drive an energy market death spiral scenario in the absence of well-structured policy intervention.

4. Energy market death spiral

Peak demand is responsible for a large proportion of the investment megacycle highlighted in Figure 3, but unlike the 1980s, underlying energy demand is not expected to quicken at anything like the rate of additional investment, and so tariffs must rise to compensate network infrastructure owners given existing regulatory arrangements. From a policy and energy utilities perspective, the most troubling aspect of such momentum is that an *energy market death spiral* could manifest. The concept of a death spiral was defined by Severance (2011, p13):

The unspoken fear of all utility managers is the “Death Spiral Scenario”. In this nightmare, a utility commits to build new equipment. However, when electric rates are raised to pay for the new plant, the rate shock moves customers to cut their kWh use. The utility then raises its rates even higher – causing a further spiral as customers cut their use even more... In the final stages of that death spiral, the more affluent customers drastically cut purchases by implementing efficiency and on-site [solar PV] power, but the poorest customers have been unable to finance such measures...

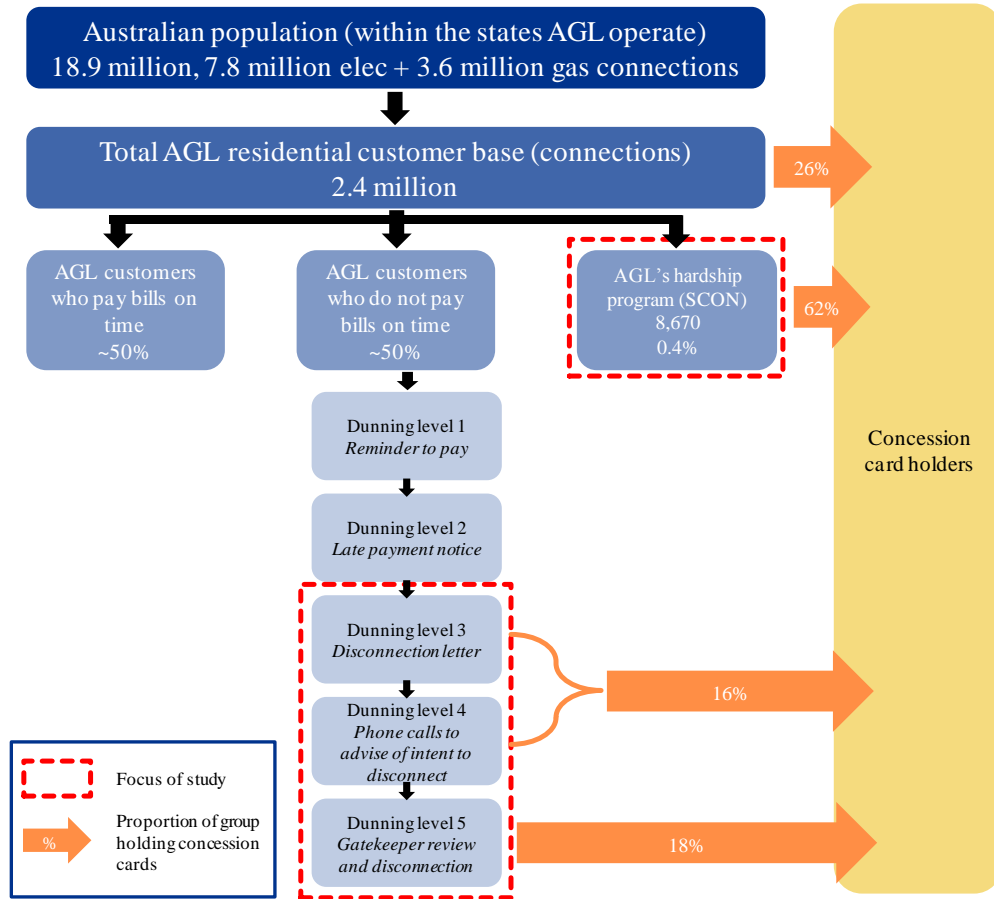
The implications of this are obvious enough. Network assets in the NEM, which currently account for 46% of the customer bill, are regulated by way of ‘revenue equivalence’. That is, if energy demand (i.e. kWh throughput) decreases by say 10%, holding all else constant network prices are raised by 10% or ‘rebalanced’ the following year to ensure future annual revenues are maintained against their substantial asset base. And by implication, even if energy demand remains constant but investment in the network is non-negative, network tariffs must increase to deliver the maintenance of benchmark asset returns.

In this instance, as we noted earlier, the two variables are compounding. If underlying energy demand decreases, and investment increases to meet rising peak demand, tariffs must rise above traditional run-rates to firstly offset volumetric losses, and secondly, rise again to compensate for the new investment. A *death spiral* is clearly more than a theoretical possibility. During 2010 in NSW for example, the annual energy consumption of households fell by 3.7% while simultaneously, network companies invested \$3 billion into the grid to cope with rising peak demand (esaa 2010; Simshauser, Nelson and Doan, 2011a). This trend seems set to continue. The NEM market operator revised its FY12 energy consumption forecast to a 5% reduction on FY11 after previously forecasting modest growth, while in the current five year window, more than \$40 billion will be invested in new and replacement poles and wires across eastern Australia.

5. Customers in hardship

Simshauser, Nelson and Doan (2011a, 2011b) noted that for the majority of households electricity tariff increases will be more of a household budgeting inconvenience than anything else. The most recent ABS Household Survey revealed that energy bills are no more significant now than in 2003/04 at the time of the last survey because household incomes have also been rising rapidly and individual household use has stagnated. That energy bills have remained at 2.6% of the average household budget underscores the notion that customer hardship is not a substantive problem per se. This is of course of little consolation to the subset of households in hardship. To put this issue into context, Figure 11 maps out the NEM population, the number of residential electricity and gas connections, and from AGL’s databases, the credit characteristics of our 2.4 million households (representing 3.4 million electricity and gas accounts). AGL data represents about ¼ of all households, which we assume to be adequately representative of the NEM.

Figure 11: AGL Customer base, credit behaviour and “Staying Connected”



Source: KPMG Demographic, AGL Energy Ltd.

Note from Figure 11 that approximately only 50% of customers pay on time, and thus half of the customer base utilise their energy retailer as a source of almost costless short term credit. The subset of customers who are on AGL’s hardship program (i.e. “Staying Connected”) represents only 0.4% of the customer base. Figure 11 also highlights that 26% of AGL connected households have a concession card.

6. Disconnection of households

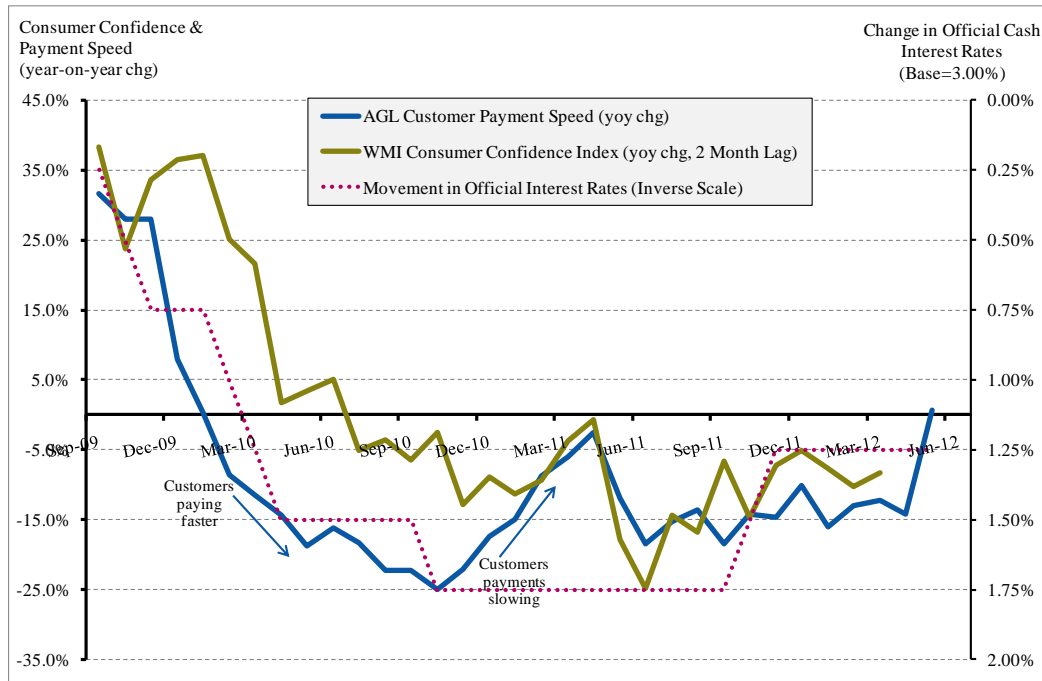
When a customer has difficulty paying their energy bill, are they disconnected? The short answer is no – so long as they remain engaged with their energy retailer. Energy Retailers do not purposefully disconnect a residential customer just because they cannot afford to pay their electricity or gas bill, given the essential service nature of these commodities. The distinguishing feature here is the underlying credit behaviour of the customer. Where customers have the willingness, but not the ability to pay, and in the event remain engaged with the firm then the customer is placed into a hardship program (such as the AGL Staying Connected program). The customer is then provided with access to a combination of in-home energy audits by AGL technicians, bill smoothing and bill payment re-scheduling, access to financial counselling and an analysis of potential assistance sources typically available to the customer in hardship from government and non-government sources.

Figure 11 also sets out the high-level process followed once a customer account falls into arrears. Initially, an SMS reminder is sent followed by direct phone call (known as Dunning Level 1), then a written late notice (Dunning Level 2) which is followed by a written notice of intent to disconnect (Dunning Level 3), followed by a further phone call confirming the intent to

disconnect (Dunning Level 4). At this point, an internal ‘gatekeeper review’ is undertaken to confirm all efforts to engage with the customer have been exhausted (Dunning Level 5). Disconnection therefore only occurs when a customer has “disengaged” with their Energy Retailer.

Customer credit behaviour is currently polarised. Recent experience with AGL’s 2.4 million household customers and the 3.4 million energy accounts (i.e. some households purchase both electricity and gas) indicates that those customers who are paying on time are paying faster than ever before, reflecting the strong desire of households to restore their balance sheets, and to bring their finances under control. This ‘payment fear’ is illustrated in Figure 12. Our Payment Speed Index (year-on-year change) is based on an underlying analysis of ‘sales days outstanding’ which removes the impact of unit price variations that plagues an analysis of accounts receivable data. An accelerating Payment Speed is represented by a falling line in Figure 12. Notice that the Payment Speed Index appears to be leading one of the Australian economy’s principle leading indicators, the WMI Consumer Confidence Index – which is also included in Figure 12 but lagged by two months. We have also layered in the change in official interest rates (RHS axis, reverse scale) relative to the cyclical low of 3.00%.

Figure 12: Payment Speed vs. Consumer Confidence (yoy change, Sept-08 to May-12)

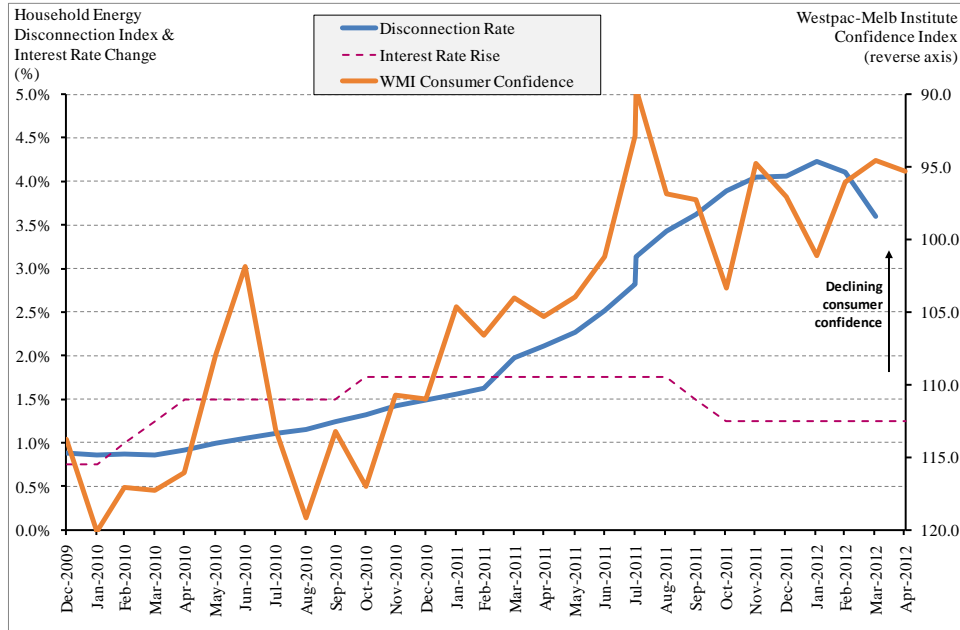


Source: RBA, AGL Energy.

As one might expect, with consumer confidence generally on the decline, the polarisation of household credit behaviour means that while some are increasing their Payment Speed, at the other end, disconnection rates are rising, which underscores the notion that the historical tactical responses by jurisdictional governments is not dealing to the core of the issue. This is as much a macroeconomic issue as it is an energy sector issue. Figure 13 illustrates customer disconnection rates on the LHS y-axis and movements in official cash rates relative to the cyclical low of 3%¹² also on the LHS y-axis. On the RHS y-axis, we have once again incorporated the WMI Consumer Confidence Index, although on this occasion with a reverse scale (i.e. as the line series rises, consumer confidence is falling). The rise in interest rates was evidently met with declining consumer confidence, and rising gas and electricity disconnection rates.

¹² The 3% official cash rate was first set by the RBA in April 2009.

Figure 13: Household disconnection rates, consumer confidence and interest rate movements



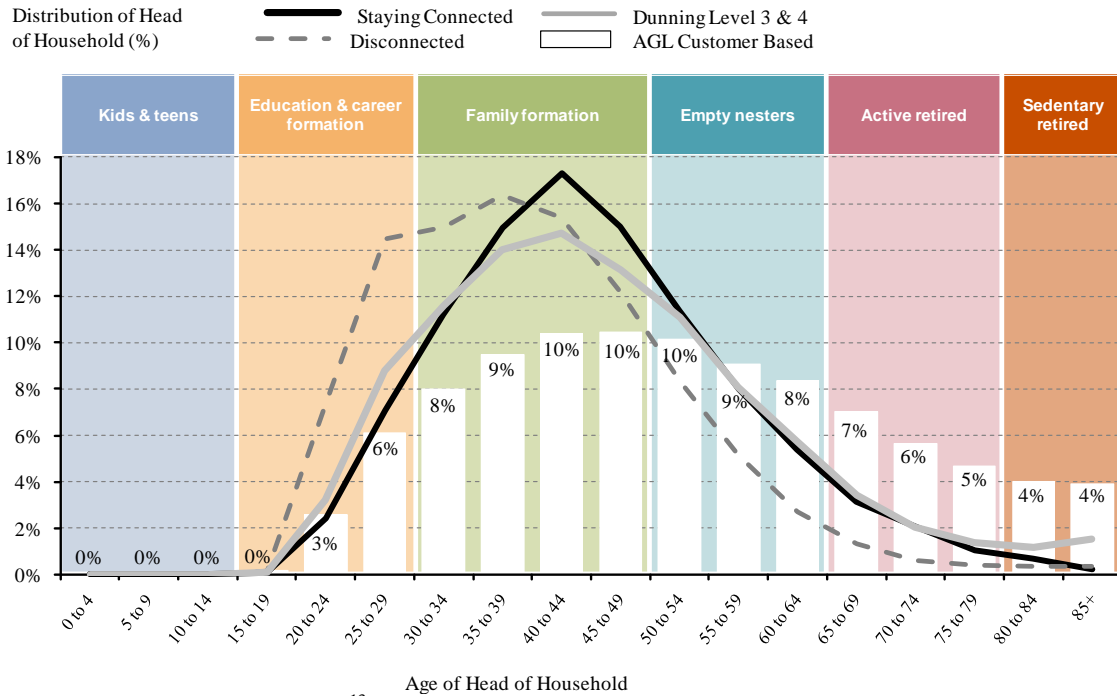
Source: RBA, AGL Energy.

Our concern here is twofold. The number of customers on AGL’s Staying Connected program is actually declining. Yet, Payment Speed is increasing at one end and disconnection rates are rising at the other, while the WMI Consumer Confidence Index is falling (with a correlation in excess of 0.80). While there may be short-term structural components to disconnection rates, the macroeconomic conditions associated with the two-speed economy are more likely the dominant driver of favourable Payment Speeds and unfavourable Disconnection Rate movements.

7. The incidence of hardship in the NEM

The primacy of hardship in relation to energy supply tends to be thought of as an issue affecting pensioners, the medically ill, and the unemployed. These groups are unambiguously in need of government policy assistance. We commissioned Bernard Salt, KPMG’s renowned demographer, to undertake a demographic study on hardship which helped us combine AGL’s 2.4 million household accounts data with ABS census data. Through the ensuing analysis we concluded that the primacy of hardship is in fact a subset of the Family Formation cohort. This is illustrated in Figures 14-17. The results are representative of a data set comprising more than 13 million energy accounts and reveals enormously important information for policy makers. Accordingly, we will devote considerable space to interpreting the results.

Figure 14: Age distribution of AGL’s 2.4 million customers and the incidence of hardship



Source: KPMG Demographics¹³, AGL Energy Ltd.

To begin with, in Figure 14 the horizontal x-axis measures the Age (in years) of the Head of each Household – that is, the person responsible for paying the household electricity or gas bill. While Age is grouped into 5-year time-buckets, they are further aggregated into six life-stages, or cohorts. The first cohort is ‘Kids and Teens’ which spans from age 0 to 15. This is followed by the second cohort, ‘Education & Career Formation’ which spans from 16 to 29 years, then ‘Family Formation’ from age 30 to 49 and so on. So for example, if an electricity account holder is 54 years of age, they are allocated to the 50-54 year time-bucket and form part of the ‘Empty Nester’ cohort. The y-axis then measures the distribution of the Head of Households.

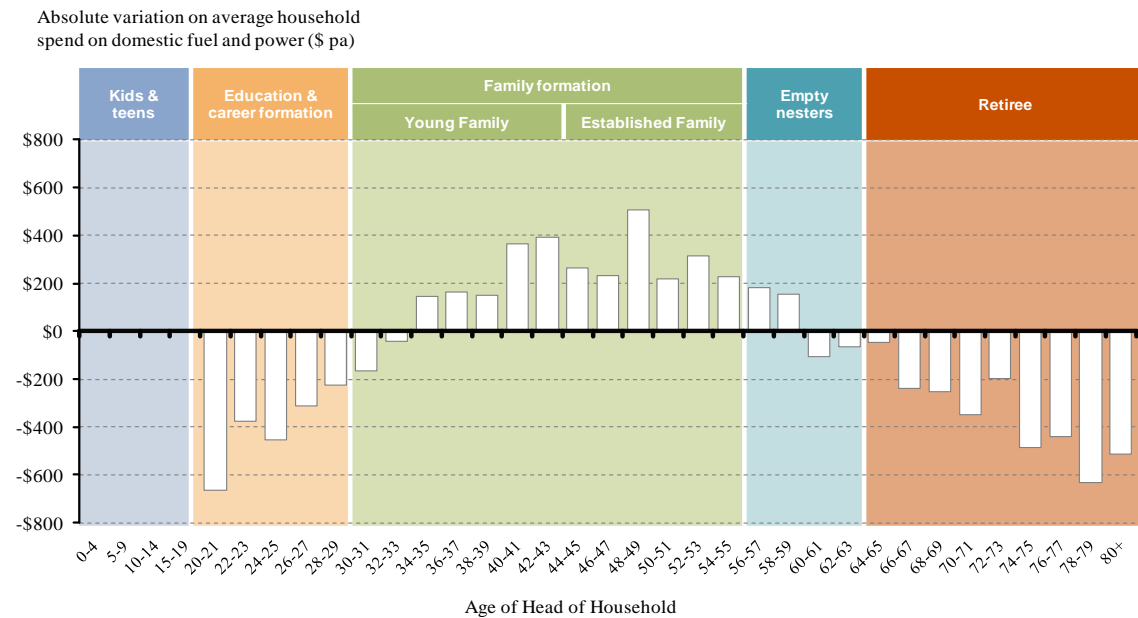
1. The distribution of AGL’s 2.4 million household customers is represented by the white bar graph series. Energy account holders are dominated by people aged between 30-64, and for obvious reasons, there are no account holders below the age of 15 and only a very small number aged 15-19. The average age of AGL energy customers is 52 years of age.
2. The distribution of AGL’s c.8,000 hardship customers, who are registered with our ‘Staying Connected’ program, are represented by the ‘solid black’ line series and visibly peak in the Family Formation cohort. The distribution is pronounced in the 40-44 year time-bucket, although the average age of Hardship Customers is 45 years of age.
3. The distribution of AGL’s c.380,000 Dunning Level 3 & 4 customers (who failed to make contact despite being issued with a late notice) are represented by the ‘solid grey’ line series. They largely follow the distribution of the Staying Connected group, and the average age is also 45 years of age; and finally

¹³ The authors would like to acknowledge the exceptional work undertaken by Bernard Salt and Sally Mikkelsen (KPMG) in producing Figure 14.

- The distribution of the c.20,000 Disengaged/Disconnected Customers is represented by the ‘dashed grey’ line series. This group, which has opted not to communicate and has subsequently been disconnected, has an average age of 40 years. The dominant time-bucket is 35-39 years of age, although there is a noticeable pronouncement in the highly mobile “Education and Career Formation” cohort.

In total, about 16% of AGL Customers display varying signs of hardship. However, this result rises to 1 in 4 households when examining the Family Formation cohort. But while Figure 14 demonstrates that hardship is dominant amongst the Family Formation cohort, it provides little information as to why this is the case. Figures 15-17 provide the requisite insight. In Figure 15, we present the absolute variation in household energy costs by age bucket compared to average, that is, the Australian energy consumption benchmark. Notice that the Family Formation cohort spends considerably more than benchmark, as do the early phase Empty Nesters. All other age groups and cohorts spend less than benchmark. There is also considerable variability of spending on energy amongst the Family Formation cohort. But on average, those in the Family Formation stage have a consumption pattern that is 13% in excess of benchmark, and this excess rises to almost 30% in the 41-48 year age bracket, the mid-point of which, perhaps unsurprisingly, is the average age of hardship customers identified in Figure 14.

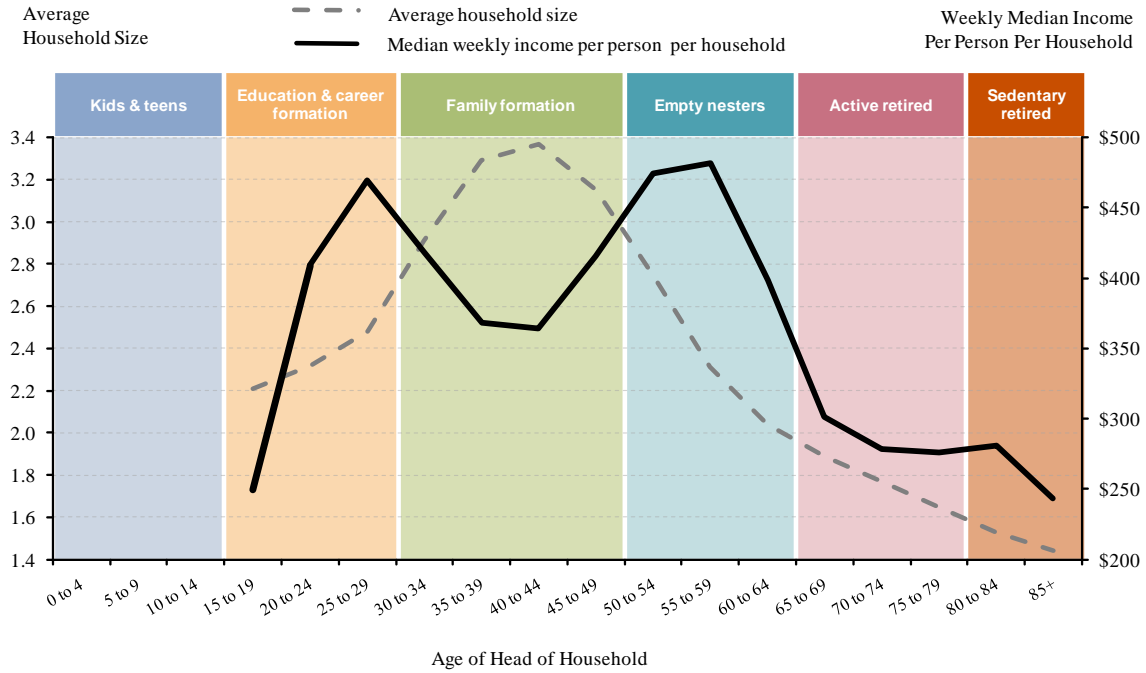
Figure 15: **Absolute variation in household energy costs**



Source: ABS, KPMG Demographics.

In Figure 16, we introduce the average size of Households and a somewhat unusual measure of household income, the ‘average per person income, per household’. So in other words, if a family comprising two adults and two children had a combined annual income of \$100,000, our measure would amount to \$25,000 per person, per household. Note in Figure 16 that household size (and by deduction, income) peaks in the Family Formation stage, and that income per person per household displays a distinct trough at the same time. While Family Formation income remains elevated by comparison other cohorts, households in that stage have more members, and are consequently more likely to face higher fixed housing costs.

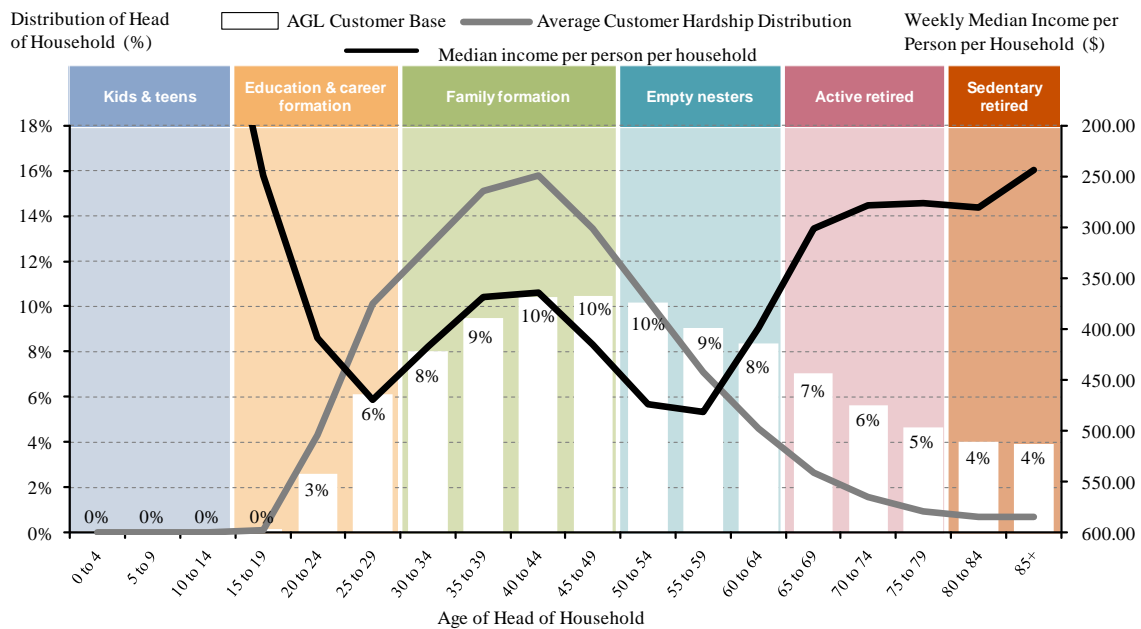
Figure 16: Average household size and average household income per person



Source: ABS, KPMG Demographics, AGL Energy Ltd.

In Figure 17, we combine Figures 14 and 16, and the reason as to why hardship is congested amongst the Family Formation cohort becomes clearer. Note that our measure of per person income per household has a reverse scale (RHS y-axis), meaning that a rising line equates to falling per person income per household – and in the event, within the Family Formation cohort seems to run almost parallel with the hardship distribution line.

Figure 17: The incidence of household hardship and income per person



Source: ABS, KPMG Demographics, AGL Energy Ltd.

Weekly per person income per household in the “Family Formation” cohort falls to just \$392 during a phase in life in which few, if any, escape the cost of rent or a mortgage capable of

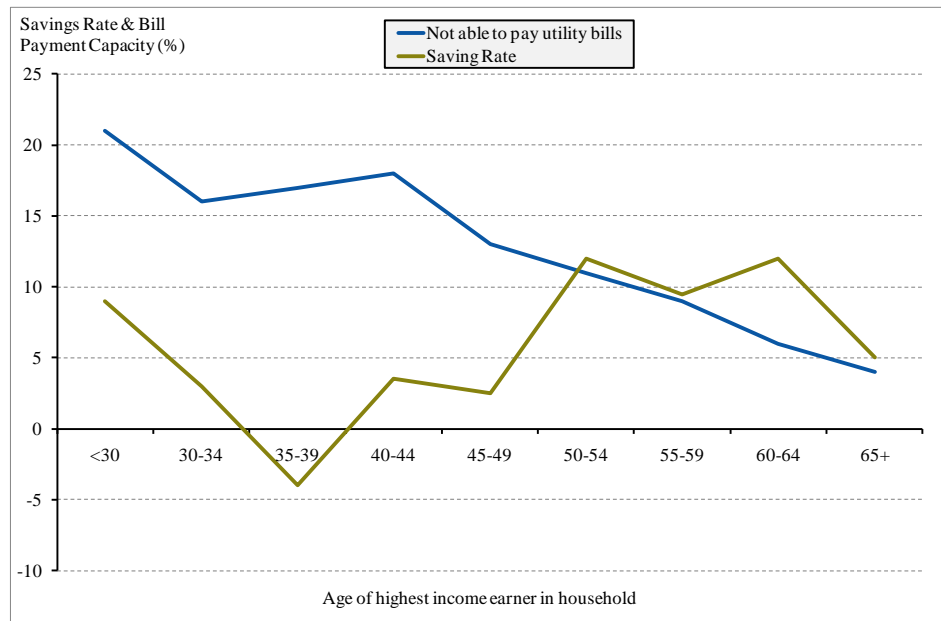
housing the average 3.2 person household. As authors, we found the results of this quantitative analysis, and the implications for hardship policy, to be startling. The Family Formation cohort are evidently the most proportionately impacted by hardship and the implications are material given that government assistance and concessions in relation to energy supply are not, as far as we are aware, aimed at this group. Our own data on the incidence of hardship and on disconnections clearly provides the appropriate evidence, with about 1 in 4 households in this cohort showing signs of energy account default. This cohort has a number of characteristics that make it unique from others:

1. When households in the Family Formation cohort are experiencing hardship, more Australians are being impacted proportionately. That is, Family Formation households in duress implies that 3.2 people are, on average, in hardship whereas a Sedentary Retired household involves only 1.9 persons, on average.
2. Children are staying at home longer and households with children means bigger and more active houses. As EMCa (2009) observed in their quantitative assessment of energy consumption in Western Sydney, households with 4 bedrooms consumed an average of 8.6MWh per annum, 2.6MWh (43.3%) more than a 3 bedroom house and 5.2MWh (152.9%) more than a 2 bedroom house.
3. The average energy account holders in the Family Formation cohort has two or more uncontrollable consumers (i.e. children) who are blissfully unaware and unmoved by the financial impact of their uncoordinated, and in many cases, simultaneous energy consumption decisions arising from the use of computers, game controls, plasma televisions, heating and cooling devices in their household. We know from pilot tariff programs that the number of residents per household is an important indicator of consumption levels.
4. The primary account holder will also hold a sizeable monthly mortgage or incur rental costs commensurate with the requirements of housing adults and children, which distinguishes them from Empty Nesters and Active Retired, for example.

The Family Formation cohort comprise 27% of the customer base and are therefore the dominant market segment. We noted above that the Family Formation cohort also dominate hardship statistics, with about 1 in 4 households showing signs of energy account default. Notice that while the Active Retired cohort has lower per person incomes per household, they are substantially under-represented in Staying Connected, early hardship, and disconnection events. Unlike their Family Formation counterparts, Active Retired are typically able to manage their own energy use down more effectively (i.e. they have no dependent children) although this cohort are also known to be more inclined to simply '*go without*' – the incidence and consequences of which we are simply unable to capture or measure. After discussing this limitation with some of our peers at NSW regulatory authority IPART, we consider this to be a significant limitation of our research.

Yet with respect to our underlying thematic, similar findings are being made by researchers examining other areas of social and economic policy. Bradbury (2012) recently noted an inverse correlation in relation to the age of highest income earner in a household and an inability to pay utility bills – we have reproduced his findings in Figure 18.

Figure 18: Correlation between ability to pay bills and savings rates by age group



Source: Bradbury (2012)

8. Policy Implications

Policymakers are acutely aware that Australian electricity prices have been rising rapidly. But as we noted at the outset, electricity tariff increases form part of the Consumer Price Index, and household incomes are, on average, rising faster than CPI and the basket of household goods that it represents. Consequently, economists and policymakers generally acknowledge that this poses no visible problem to the overwhelming majority of consumers beyond household budgeting adjustments and inconvenience. For households already in hardship, the issue is considerably more vexed than a budgeting adjustment. It could be argued that the public policy response to date has been limited in scope, and in foresight. To be sure, however, such criticism would be unfair – as energy economists, our results certainly took us by surprise.

Households in general are nonetheless reacting despite their rising incomes, and the media is focusing on energy price increases and consequently, the political economy of energy pricing in Australia has never been so controversial. This situation is being aggravated at the time of writing by the introduction of the politically divisive price on carbon. In some ways the introduction of a carbon price is indicative of the quality of the public debate on energy pricing: media stories on the carbon price are numerous yet the concept of an energy market death spiral, a much bigger problem, has not been reported. This lack of focus on the most prominent energy market issues was best summarised by Orchison (2012, p.1) when he noted that society “*doesn't have the depth of knowledge to even frame the right questions, let alone fully dissect the information that is coming into the public arena*”. It is little wonder that the public policy response to customer hardship has been limited.

While significant resources have been set aside to compensate households for increases in the cost of living associated with the introduction of a carbon price from in 2012, there has been no comprehensive national or sub-national response to the issue of customer hardship in relation to energy supply. Victoria is widely acknowledged by consumer groups and industry participants as having done the best job in dealing with hardship thus far. We believe that a number of existing policies require re-evaluation regarding their effectiveness in alleviating customer hardship, given the evidence presented in this article. These include (1) the approach to electricity tariffs, metering and billing, (2) concession policies where rebates are provided on household bills; and (3) the funding of hardship policy and the design of energy efficiency policies.

8.1 The approach to electricity tariffs, metering and billing

While it is important to deal with the symptoms of rising electricity tariffs (i.e. customer hardship), it is more important to deal with the cause of those increases. We have argued that an energy market death spiral is possible due to rising fuel costs, the investment megacycle, and rapidly rising peak demand. Fuel prices are set in global markets, and little can be done from a policy perspective to moderate their effects. But the investment megacycle is in large part a response to the peak load problem. Simshauser and Downer (2012) demonstrated that a shift away from flat tariffs to time-of-use tariffs with critical peak price structures, which requires interval meters, represents policy optimality in relation to moderating peak load growth, and in turn, non-trivial components of the investment megacycle.

We noted earlier that inclining block tariffs, which can be implemented with existing mechanical or ‘dumb’ meters, are more likely to aggravate an energy market death spiral. Rising energy throughput poses no problem per se, but the congested time-of-use consumption does. Inclining block tariffs are effective conservation-driven pricing structures, but they represent an especially blunt instrument if its intended target is critical event peak loads. More likely is that they will do virtually nothing to remedy the peak load problem as Houthakker (1951, p.5) discovered more than 60 years ago in the case of Britain:

...as demand approaches its maximum only within short periods of the day, these are precisely the periods when the relatively inelastic lighting component is important. Space heating, which has a special responsibility for the present peaks on cold mornings, is probably more sensitive to price changes than lighting but the elasticity varies with the time of day, and may be small on such mornings. Consumers will naturally economise at the times least convenient to them, and these are likely to be off-peak periods when no reduction of demand is required...

While Houthakker (1951) was analysing the electricity demand of a cold climate power system in a 1950s British household, his observations are equally applicable to hot climate systems and air conditioning loads, which have a special responsibility for the present peaks on hot days. Reductions in energy demand, but not peak demand, arising from inclining block tariffs (or inaccurately focused efficiency schemes) will hence result in further network tariff *rebalancing* to offset volumetric losses. This is not to say that tariff reforms and energy efficiency schemes should not be pursued – there are indeed sound public policy reasons for doing so. However, energy efficiency schemes, in the absence of the introduction of some form of time-based differentiated pricing, is likely to have an impressing effect on an energy market death spiral.

Most households in hardship experience financial difficulty when forced to digest unpredictable and high-cost invoice events such as a summer electricity bill. More regular invoicing would make household budgeting adjustment processes substantially easier. This is of course another benefit of introducing smart meters. Apart from facilitating critical peak pricing, smart meters enable electricity billing to be re-set to a monthly cycle, as is the case with telecommunications. Currently, energy invoices to customers are issued on a quarterly basis to match the frequency of physically reading dumb meters. Bill shock could be reduced very substantially and household budgeting adjustments made dramatically easier by shifting to monthly invoices. If smart meter rollouts are likely to be protracted, we believe that some form of seasonal bill smoothing and monthly accrual invoicing with quarterly final settlement may represent a sensible interim solution for households. While smoothing may well mute existing pricing signals, those that currently exist through flat tariffs and mechanical metering processes are entirely inadequate vis-a-vis critical peak demand in any event. Any reduction in bad debts arising from such an approach will also contribute to more efficient energy prices, since the cost of such debts is currently impounded and socialised in retailer operating costs.

8.2 Concession policies

In relation to dealing with the symptoms of rising energy prices, concessions frameworks have been in place since the deregulation of energy markets in the 1990s. Generally, they are funded by the Commonwealth or State Governments and implemented through a rebate paid on an electricity or gas bill. Other forms of important and necessary concessions exist which tend to be emergency in nature, such as the NSW Government's Energy Accounts Payment Assistance concession (administered by community groups) to customers facing disconnection, or very specific to particular groups such as medical or life support rebates. Table 1 provides a summary of the main concessions payable to eligible consumers.

Table 1: **State based energy (electricity and gas) concessions**

State	Summary of Standard Energy Concessions (2011)
Victoria	Annual Electricity Concession: 17.5% off consumption and service charges Winter Energy Concession: 17.5% off consumption and service charge Off Peak Concession: 13% off the off-peak usage
New South Wales	Low Income Household Rebate: \$200 annual rebate
Queensland	Electricity Rebate: \$0.5740 per day (\$209.51) Reticulated Natural Gas Rebate: \$0.1579 per day (\$57.63)
South Australia	SA Energy Rebate: \$158 annual rebate

Source: State Governments

In all states except Victoria, concessions are paid as a lump sum irrespective of consumption. This is somewhat problematic given consumption patterns of the Family Formation cohort – they are after all the largest users of energy. This is not controversial given the need for space heating and cooling with young children and the proliferation of energy-zapping appliances and information technology generally. Table 2 provides the quantitative evidence by breaking down consumption by the age of the person most responsible for paying the energy bill within a home.

Table 2: **Energy consumption by person most responsible for energy bill (%)**

Age	< 4 MWh	4-6 MWh	6-8 MWh	8-12 MWh	> 12 MWh
18-34 years	3	9	12	13	3
35-55 years	23	27	32	33	49
55-64 years	23	21	20	24	31
> 65 years	51	43	35	29	17

Source: IPART (2010).

The analysis in Table 2 has been adapted from a household energy and water survey completed by NSW regulator IPART relating to residents in Sydney and the Blue Mountains. Most striking is the extent to which high consuming households are mostly comprised of residents between 35 and 55 years of age, and so the use of non-consumption based concessions is likely to result in payments being disproportionately skewed towards non-Family Formation segments in relative terms. Since the number of persons in Family Formation households is by definition materially larger than other cohorts, payments are also being skewed away from a greater number of recipients. Based upon the evidence presented in relation to the incidence of customer hardship and consumption patterns in Table 2, it would appear prudent for policy makers in other states to

consider adopting a variant of the Victorian consumption-based framework, perhaps even linking fixed payments to the number of persons per household.¹⁴

Another key issue in relation to the provision of energy concessions relates to eligibility criteria, which as Table 1 notes varies by jurisdiction. In most states, eligibility is defined as being in possession of a Centrelink Healthcare card, a Centrelink pensioner card or a Department of Veteran Affairs (pensioner or war widow) card. These cards are not specific to any particular age group, but are reflective of providing assistance to particular groups in the community who are presumably in hardship or vulnerable in broader terms. Even more problematic is that some existing concessions are provided irrespective of whether hardship is likely to be an issue. For example, in Queensland, rebates are provided to all holders of Queensland Government Seniors Cards.

Existing eligibility criteria may well have been effective in preventing customer hardship in other cohorts, and may explain the counter-intuitive results arising from our analysis. However, there is no eligibility criteria designed to identify hardship within the Family Formation cohort. We consider this to be a ‘yawning gap’ in energy policy hardship frameworks. Appendix II provides geographical maps of the four main capital cities within the NEM, and identifies hardship ‘hotspots’ from an energy account perspective. While we would not purport that these maps are definitive, they provide a useful starting point for policy makers to consider – at least based on AGL’s experience in serving about a quarter of the energy customers on Australia’s eastern seaboard.

We believe that there is scope for a complete redesign of the State-based and national concessions framework to achieve a greater focus on customers in genuine hardship. A ‘trigger’ that seems to the authors as worthy of further analysis is those who qualify for Family Tax Benefit - Part A, the definition of which seems to fit low-income families, most likely within the Family Formation cohort.

8.3 The funding of hardship policy and energy efficiency schemes

Another area requiring the attention of policymakers relates to the source of funding, and specifically, the use of levies that use customer energy consumption as the collection device. Nelson, Simshauser and Kelley (2011) and Nelson, Simshauser and Nelson (2012) demonstrated the regressive nature of government policy measures funded through levies on all customer electricity bills. These articles examined the impacts of “Premium” Feed-in Tariffs – with a focus on how these premiums were being funded. The key finding was that *“the effective taxation rate for low income households is three times higher than that paid by the wealthiest households”* (Nelson et al, 2011, p. 113). While these articles examined the adverse effects of Premium Feed-in Tariffs, the results are directly applicable to any levy or indirect tax applied to energy customers, using household consumption levels as the revenue raising device.

Findings from such research provide valuable insights for policymakers in relation to other areas of energy policy. For example, energy efficiency schemes in Victoria, NSW and South Australia are aimed at reducing energy consumption through a mandated obligation on energy retailers (i.e. by procuring specified energy savings). The upfront costs of these scheme obligations are ultimately passed through to all end-consumers in the form of higher energy prices. South Australian policymakers have tried to balance these effects by placing specific obligations on energy retailers to provide energy audits for low-income consumers – a policy adjustment we believe to be entirely sensible, if not desirable.

¹⁴ We are reluctant to suggest a pure consumption-based framework – enough distortions already exist vis-a-vis residential tariffs. A consumption-based approach may also provide an unhealthy incentive for households to over-consume, and for State Governments to further suppress cost-reflective tariffs movements through strategic use of retail price regulation in an attempt to minimise hardship funding costs.

Energy efficiency schemes are an especially vexed area of policy because they also need to ensure that the correct demand segment is being targeted. Reducing peak demand will benefit all consumers because it will have the effect of reducing future resource requirements throughout the supply chain. Reducing energy consumption without reducing peak demand will not – reducing average energy demand merely adds to the prospects of an energy market death spiral occurring (although it may reduce negative production externalities – greenhouse gas emissions). The power system is now very poorly utilised due to rising peak demand, and thus reducing ‘non-critical event’ demand will simply lead to a further deterioration in utilisation rates, thus increasing costs, not decreasing them. As such, a misguided energy efficiency scheme can be particularly detrimental to all consumers, including business and industrial consumers.

Regardless, policymakers must turn their attention to the regressive nature, and the incidence of the cost burden for hardship policies, particularly where funding is raised through levies on energy consumers – after all, doing so is nothing more than a form of outsourced taxation. Such concepts are not contentious, nor difficult to demonstrate. In Tables 3 and 4, we analyse NSW and Queensland household survey data and apply a ‘tax’ or levy on all households based on their level of electricity consumption. The results of this analysis demonstrate that when taxes are added to electricity bills based on consumption levels, whether designed to alleviate hardship, enhance energy efficiency or fund premium Feed-in Tariffs, their impact is fundamentally regressive and therefore counter-productive. Notice from Table 4 that the effective tax rate for households earning less than \$31,000 per annum, given their consumption levels, is 0.20%. This is more than three times higher than those on incomes greater than \$151,000 per annum who, despite consuming more energy, face an effective tax rate of just 0.06% given the combination of consumption and income levels.

Table 3: **NSW consumption survey data by income and implied tax rate**

Income	< 4 MWh	4-6 MWh	6-8 MWh	8-12 MWh	> 12 MWh	Mean	Tax Rate
< \$34k	109	87	63	48	10	6.03	0.18
\$34k-\$62k	57	47	51	66	20	7.14	0.15
\$62k-\$130k	21	31	43	57	54	8.53	0.09
>\$130k	7	24	16	33	40	8.92	0.07
Not disclosed	23	20	15	35	21	7.89	N/A

Source: IPART, AGL Energy Ltd.

Table 4: **QLD consumption survey data by income and implied tax rate**

Income	< 4 MWh	4-6 MWh	6-8 MWh	8-12 MWh	> 12 MWh	Mean	Tax Rate
< \$31k	50	55	47	28	9	6.31	0.20
\$31k to \$71k	59	90	103	87	23	7.05	0.14
\$71k to \$151k	42	68	93	106	44	7.78	0.07
>\$151k	4	4	11	13	18	9.18	0.06
Not disclosed	24	34	33	42	11	7.28	N/A

Source: Energex Ltd, AGL Energy Ltd.

Accordingly, measures designed to reduce customer hardship should not be funded through levies on consumer bills. Australian policymakers should observe the evidence, and the mistakes, made in other jurisdictions. In the British energy market for example, stakeholders are now urging policymakers to reconsider the current “fuel poverty” policy settings because of their regressive nature. There, a substantial proportion of hardship funding is sourced from levies on all consumer bills. The Community Energy Savings Program (CESP) requires electricity generators and retailers to contribute funds to alleviate fuel poverty – one British energy retailer alone levied a whopping £500 million on their customer base in a single year to meet the requirements of the government’s CESP. This policy is aggravating the incidence of hardship because, as the CESP

is levied on electricity users, it pushes a fresh bracket of households into hardship as the levy rises, which may not have occurred in the absence of the scheme.

Economists have been increasingly turning their attention to the regressive nature of such policies (see for example Stockton and Campbell, 2011; Hotten, 2008). In addition to criticisms in relation to funding sources, Stockton and Campbell (2011, p.4) found that some measures are poorly designed to the point that *“the innate injustice of a regressive funding mechanism is compounded by lack of equal access to the potential benefits.”*

If policy initiatives are to be funded across the customer base, then the targeted beneficiaries of such policies should prioritise those likely to be in hardship. This has been a key thematic in the policy advocacy of welfare group The Brotherhood of St Lawrence in relation to energy efficiency schemes, the logic of which is hard to fault.¹⁵

9. Concluding Remarks

Australia’s NEM seems to us to be at a crossroads. Significant cost pressures exist across all components of the electricity supply chain. The two-speed economic environment and a rapid run-up in electricity prices, driven by higher fuel prices and an investment megacycle, has resulted in stagnating domestic energy demand for the first time since World War II. Yet these factors have had no impact on the unrelenting growth in peak demand. The persistent use of ‘flat’ or average tariffs, as distinct from time-of-use plus critical peak prices, appears to be stoking the potential for an energy market death spiral, whereby peak demand growth continues unabated while higher prices lead to reductions in underlying energy demand at times least inconvenient to consumers when the grid is underutilised in any event. A progressively worsening capital utilisation rate is capable of setting-off a whole new cycle of price increases, yet again. To be sure, such an outcome can be avoided. The introduction of smart metering technologies and peak, off-peak and critical peak pricing structures would almost certainly avert the onset of an energy market death spiral. In contrast, we believe inclining block tariffs will merely enhance the prospects of a death spiral. Such outcomes have been observed in practice at least as far back as the late-1940s.

Unfortunately, virtually no appetite for reform is being shown by Australian policymakers in relation to electricity pricing. As we noted that the outset, that electricity prices remain regulated and inflexible in most states remains one of the enduring mysteries of Australia’s market economy. Ironically, the consequences of inaction on the community are obvious – rapid tariff rises and greater numbers of consumers approaching hardship.

This article has demonstrated that hardship policy is not necessarily reaching the demographic where energy consumption-related hardship is most prevalent. ‘Family Formation’ households are disproportionately represented in our hardship statistics relative to other cohorts. These households are characterised by higher numbers of people within the household, non-income earning dependants and less discretionary energy use. While other demographic groupings may be experiencing other types of hardship (e.g. under-consumption of energy), households in the Family Formation cohort are most at risk of experiencing energy related financial hardship. Our results are consistent with other research related to identification of the demographic incidence of hardship. Winestock (2012) summarised this thematic of Family Formation being at greater risk when he noted that *“pensioner’s costs are rising at the slowest rate on record”*.

¹⁵ There is, however, an important contrast to be made here between policies which provide benefits to the entire customer base and policies which are intended to improve the outcomes for customers in hardship. Policies which provide benefits for the entire customer base, such as Renewable Energy Target and broad energy efficiency policies designed astutely to overcome the problems associated with the energy market death spiral, are not as regressive in nature as benefits accrue to all consumers, including customers in hardship.

RBA Board member Dr John Edwards recently noted that in a mature debate, not all calls for economic reform need to threaten imminent disaster if the reform is not speedily adopted. Our suggested policy initiatives fit into this category. Speed of policy reform is far less important than identifying the correct policy options and implementing them carefully. Indeed, slowly adopting default time-of-use pricing will produce dramatically better outcomes than hastily adopting inclining block tariffs, for example. So a review of tariff structures, billing cycles and a review of concessions policy more generally seems to us to be important, in addition to ensuring that funding of improvements are derived from progressive sources such as government balance sheets, not regressive sources such as household electricity bills.

It is important to avoid the policy failings of other international jurisdictions whereby obligations placed on energy customers (via the quarterly bill) to reduce energy-related financial hardship merely pushes a fresh bracket of households into hardship. Neither can Australian society afford to let the issue of customer hardship turn into an emotive and combative issue as has occurred in Britain. Hardship policy in Britain has become so divisive that the CEO of an energy company recently stated "*Is it not an issue where the state should find mechanisms and systems to address it? Where do you stop? Milk? Bread? Petrol?*".¹⁶ Action by policymakers represents the best opportunity to ensure such circumstances do not take hold in Australia.

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¹⁶ Reported in *The Telegraph*, UK. See Hotten (2008).

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Appendix 1: Growth in China (Shenzhen 1982 vs. 2007)¹⁷

Shenzhen 1982



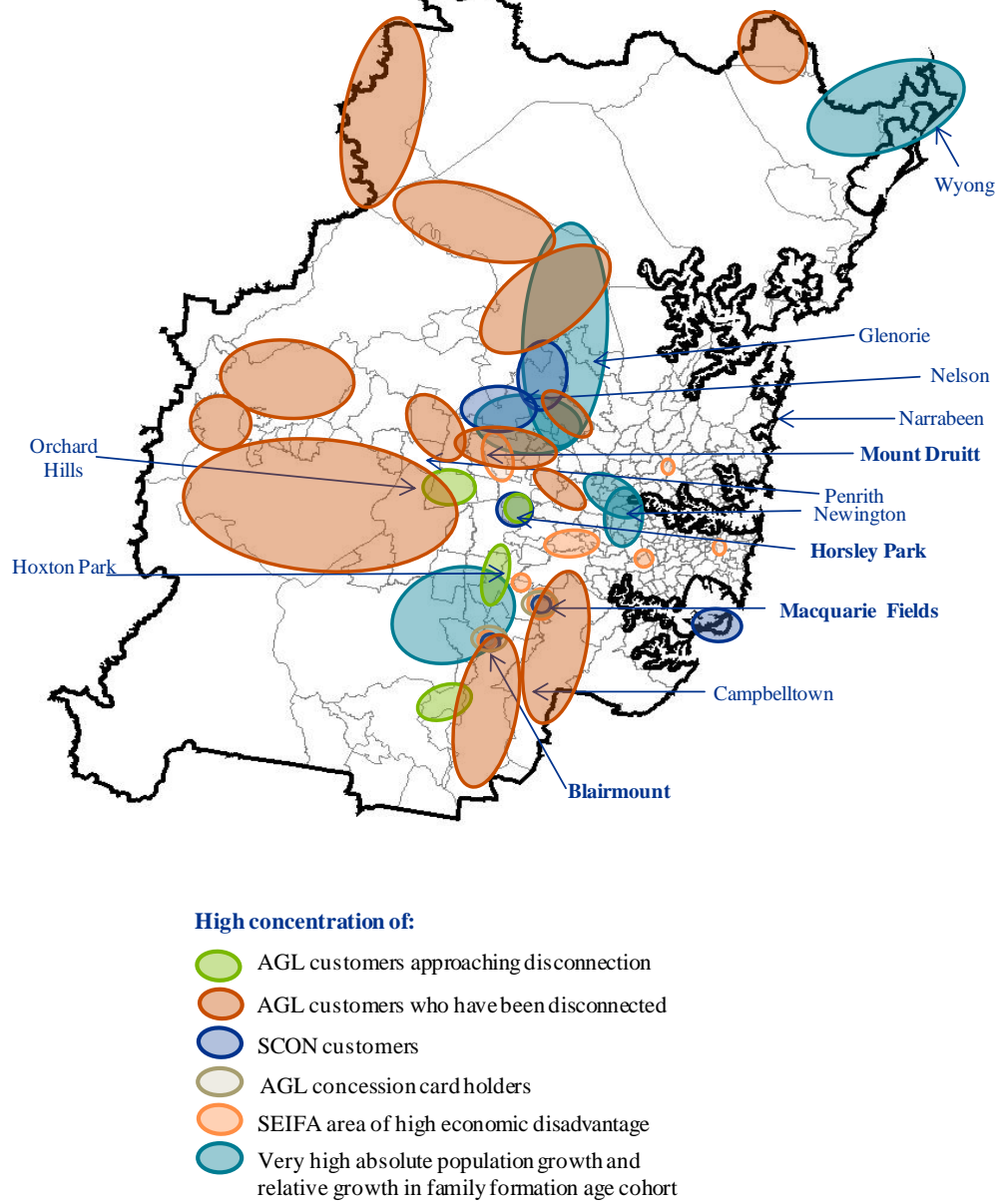
Shenzhen 2007



Source: The Chinese UPLA urban planning network, <http://www.upla.cn>

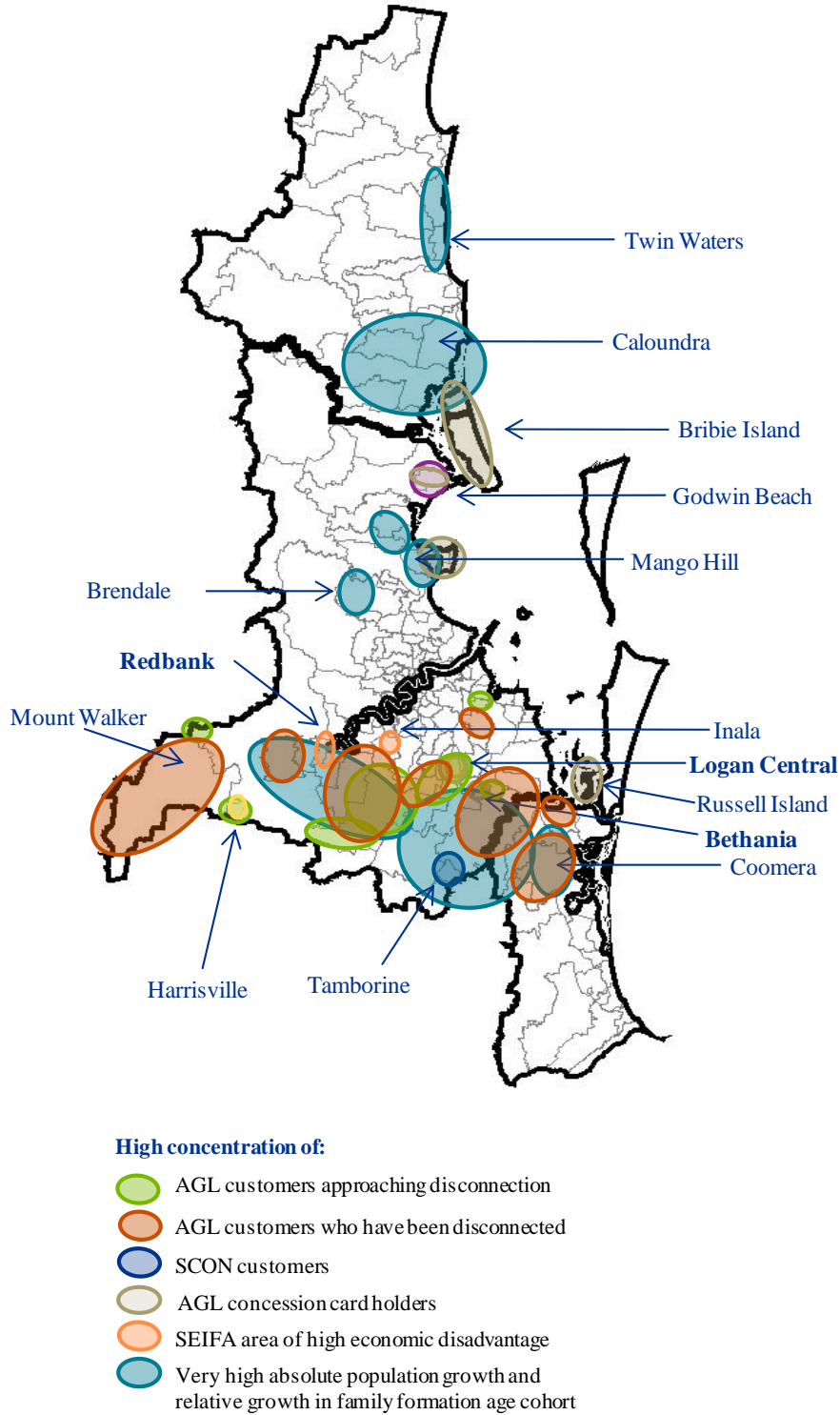
¹⁷ Our thanks to Dr James Moody and CSIRO.

Appendix 2a – Geographical Map of Potential Hardship: Sydney



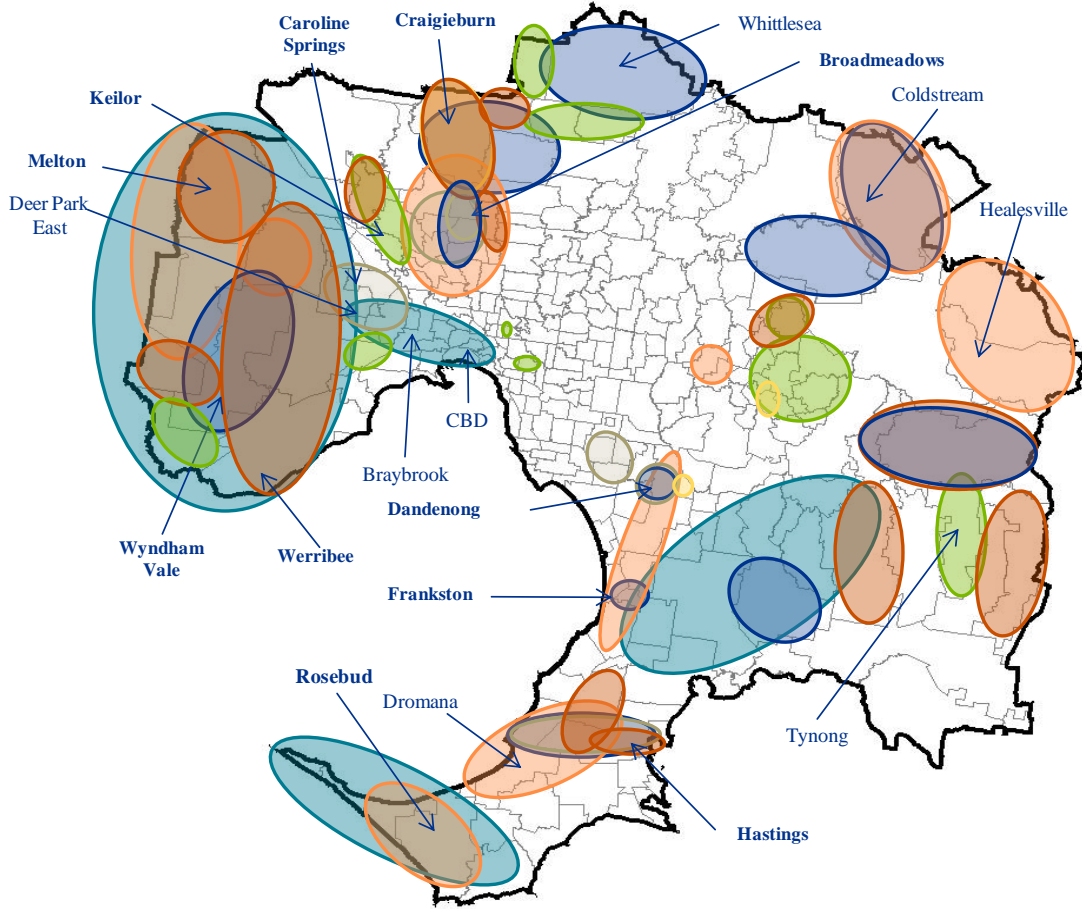
Source: KPMG Demographics, AGL Energy Ltd, based on data from the ABS, customised projections prepared for the Department of Health and Ageing by the ABS

Appendix 2b – Geographical Map of Potential Hardship: Southeast Queensland



Source: KPMG Demographics, AGL Energy Ltd, based on data from the ABS, customised projections prepared for the Department of Health and Ageing by the ABS

Appendix 2c – Geographical Map of Potential Hardship: Melbourne

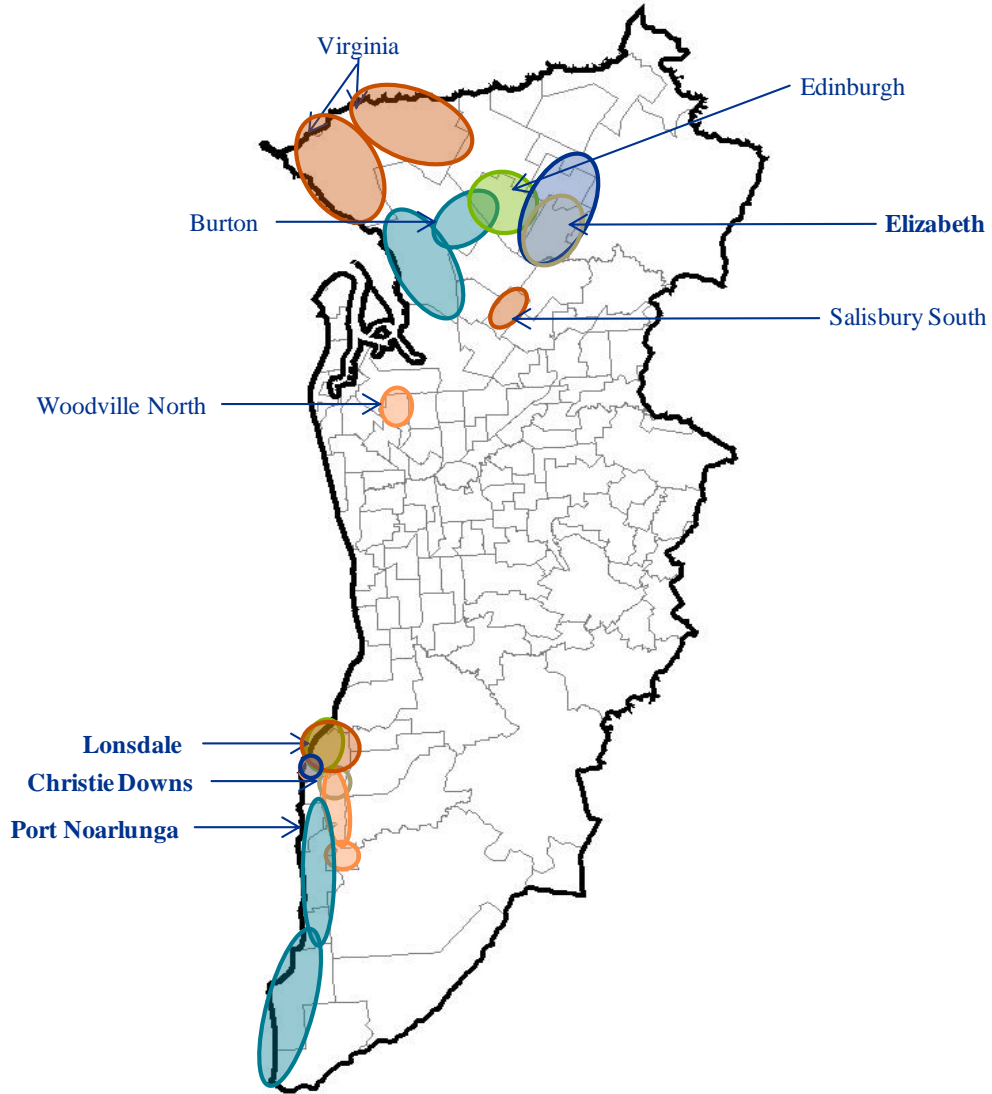


High concentration of:

- AGL customers approaching disconnection
- AGL customers who have been disconnected
- SCON customers
- AGL concession card holders
- SEIFA area of high economic disadvantage
- Very high absolute population growth and relative growth in family formation age cohort

Source: KPMG Demographics, AGL Energy Ltd, based on data from the ABS, customised projections prepared for the Department of Health and Ageing by the ABS

Appendix 2d – Geographical Map of Potential Hardship: Adelaide



High concentration of:

- AGL customers approaching disconnection
- AGL customers who have been disconnected
- SCON customers
- AGL concession card holders
- SEIFA area of high economic disadvantage
- Very high absolute population growth and relative growth in family formation age cohort

Source: KPMG Demographics, AGL Energy Ltd, based on data from the ABS, customised projections prepared for the Department of Health and Ageing by the ABS