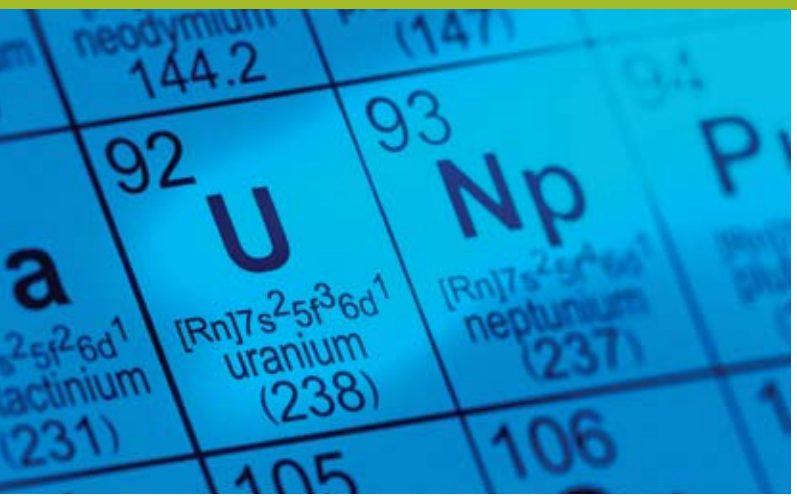

Australia's Energy Options: Policy choice not economic inevitability

November 2012

committee for economic development of australia

WITH SUPPORT FROM:

RioTinto

ElectraNet
electricity transmission

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About this publication
Australia's Energy Options: Policy choice not economic inevitability

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About CEDA
CEDA – the Committee for Economic Development of Australia – is a national, independent, member-based organisation providing thought leadership and policy perspectives on the economic and social issues affecting Australia.

We achieve this through a rigorous and evidence-based research agenda, and forums and events that deliver lively debate and critical perspectives.

CEDA's expanding membership includes more than 800 of Australia's leading businesses and organisations, and leaders from a wide cross-section of industries and academia. It allows us to reach major decision makers across the private and public sectors.

CEDA is an independent not-for-profit organisation, founded in 1960 by leading Australian economist Sir Douglas Copland. Our funding comes from membership fees, events, research grants and sponsorship.

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committee for economic development of australia

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Foreword

It is with pleasure that I present this fourth and final publication in CEDA's Australia's Energy Options series – *Policy choice not economic inevitability*.

As a major source of commodities, including significant known reserves of low carbon emission energy sources, Australia is well positioned to supply the world's future energy needs.

However, in order for that to occur, Australia needs to examine all its energy options, a point CEDA has made through this research series and thought leadership programs around Australia.

CEDA's Australia's Energy Options series commenced in late 2011. It has included three policy perspectives that have covered nuclear energy, renewables and efficiency, and unconventional energy options, and this final report.

This final report provides key recommendations drawn from each policy perspective but also looks at the Australian electricity market and opportunities to improve its efficiency and effectiveness.

New recommendations in this report include:

- That state governments divest their ownership of network service provision assets, or if this does not happen, at the very least, change regulatory oversight arrangements to take account of state-ownership;
- Steps be taken to speed up the roll-out of smart meters and also time-of-use pricing to allow better consumer control of electricity use;
- An education campaign be undertaken to better educate consumers about their energy use and the real cost of electricity, such as during peak demand periods; and
- Concession provisions be reviewed to ensure all households in hardship can be appropriately identified.

CEDA has undertaken this series over the past 12 months because the combination of these issues has the potential to not only set-up Australia with low-cost efficient energy supplies for all Australian consumers but also open up significant export opportunities potentially delivering substantial gains to our economy.

In addition, it is no coincidence that CEDA's work has also coincided with the Federal Government's work on its Energy White paper, because we saw this as the perfect time to provide policy-makers with evidence-based research.

Pleasingly there has been some good discussion and debate of the issues covered in this series in the lead-up to the Federal Government's Energy White Paper. However, the elephant in the room remains nuclear.

CEDA still maintains that governments must review their opposition to nuclear energy and ensure this option forms part of any strategy for Australia's future energy options.

This is important because nuclear could be a significant contributor to Australia's long term energy needs delivering low cost baseload power while also helping to mitigate the effects of climate change.

As first steps towards enabling nuclear power deployment government should establish a national regulatory regime to oversee and monitor any potential deployment of nuclear power and also begin training nuclear engineers by establishing the equivalent of the previous School for Nuclear Engineering or the Australian School of Nuclear Technology.

Thank you to all the contributing authors during this series and also our sponsors, Rio Tinto and ElectraNet.

I hope this series has been informative and will continue to drive rigorous analysis and discussion on this important topic.

Professor the Hon. Stephen Martin
Chief Executive
CEDA

Foreword . . . cont

It is very important to arriving at credible and appropriate public policy, that institutions such as CEDA are encouraged and supported to independently undertake analysis and actively challenge the prevailing orthodoxy on matters of public policy.

Good policy only occurs because a broad review of all aspects of a question is put under the microscope. In its Energy Options series, CEDA has canvassed a great many of the existing paradigms and introduced a large number of thought leaders through the series.

ElectraNet has been proud, as an energy industry participant, to have supported CEDA's work to enable these questions to be debated. We may not always agree with the conclusions reached, but frankly that is not the point. Not all points of view receive equal weighting in resolving conundrums. However, processes that encourage all parties to share their points of view and perspectives make for a more pluralist and inclusive society.

Essentially, we are all working to achieve the same outcome which is soundly encapsulated in the first sentence of this report:

"A reliable and affordable supply of energy is a fundamental component to a vibrant economy."

If ElectraNet support has in any way helped to foster that better outcome, we are both proud and privileged to have been part of it.

Ian Stirling
Chief Executive Officer
ElectraNet

ElectraNet
electricity transmissior

Energy is the lifeblood of modern society. It literally powers our economy, providing the driving force for transport and heavy industry, giving life to the bits and bytes of information technology, and enabling the quality of life that we currently enjoy.

Reliable energy is something that we take for granted. Moreover, it is considered an essential service. In Australia and other developed countries we expect, almost without exception, to have sufficient electricity to meet all our requirements at every instant in time. And this expectation is almost always met. However, this is not the case in much of the world. Many in Australia would be surprised to learn that today over 1.3 billion people have no access to electricity.

We are fortunate in Australia to have abundant indigenous energy resources and a well-developed energy system. However, significant challenges have emerged. Electricity prices have risen very significantly over the past several years causing hardship for many households and businesses. Over a relatively short timeframe energy costs in Australia have stopped being a source of competitive advantage. Also a credible pathway to sustainably reducing greenhouse gas emissions is yet to emerge.

Finding solutions to these challenges will require a long term perspective, which is often incongruous with the reality of the day to day political contest faced by governments. It is in this context that rigorous and independent contributions to the public policy debate are so important. Rio Tinto is proud to support this series of reports facilitated by CEDA.

David Peever
Managing Director
Rio Tinto Australia

RioTinto

Executive summary

A reliable and affordable supply of energy is a fundamental component to a vibrant economy. As a major source of commodities, including significant known reserves of low carbon emission energy sources, Australia is well positioned to supply the world's future energy needs. In order for that to occur, Australia needs to examine all its energy options.

The Government released a Draft Energy White paper in November 2011. CEDA considers this an opportunity that the Government should not miss in ensuring that Australia not only develops its energy resources for national economic gain but also to guarantee access to reasonably priced energy for Australian consumers.

CEDA determined it would contribute to this significant debate by undertaking a year-long research project that examined Australia's future energy options.

As part of this research project CEDA published three policy perspectives that addressed Australia's nuclear, renewables and efficiency and unconventional energy options. Recommendations in each of these perspectives were made with the specific aim of providing policy-makers with evidence-based research on the various energy sources either currently available or being actively explored and researched, often funded through the public purse. Fundamental governance decisions underpinned by strong economic policy arguments were at the centre of these recommendations.

This final research report canvasses one of the more significant current debates associated with the availability of energy – the Australian electricity market. It puts forward a series of recommendations designed to enhance this element of the energy sector's efficiency, security and effectiveness by placing consumers at the centre of the energy market and a reform agenda is proposed.

Overall series recommendations

Australia's Nuclear Options

Recommendation 1

As a significant potential contributor to solving Australia's long-term energy needs, mitigating negative climate change effects, and ensuring the economic benefits associated with uranium mining and the potential to develop an international nuclear waste storage industry, Governments should review their opposition to nuclear energy and uranium mining and ensure this option forms part of any strategy for Australia's future energy options.

Recommendation 2

To enable nuclear power deployment:

- Establish a national regulatory regime to oversee and monitor any potential deployment of nuclear power; and
- Train nuclear engineers by establishing the equivalent of the previous School for Nuclear Engineering or the Australian School of Nuclear Technology.

Australia's Energy Options: Renewables and efficiency

Recommendation 1

In order to achieve long term socially sustainable renewables policy:

- Quantify the value of renewable energy sources for mitigating carbon emissions over the long term so that monies expended on them match their social value; and
- Replace ad hoc decision making with a rigorous methodology that accounts for the risks and quantifies the assumptions, influencing policy intervention.

Recommendation 2

To maximise the nation's social benefit from low carbon emissions technology development:

- Introduce a market that incentivises energy efficiency. This would potentially buy a considerable period of time without further energy generation capacity needing to be deployed, allowing more time for renewable technological innovation to occur prior to deployment.

Australia's Unconventional Energy Options

Recommendation 1

Government and industry undertake specific actions to ensure a social licence to operate underpins energy extraction activity. This should include:

- Establishing a framework for land access negotiations to facilitate collaboration between industry and other users of land. As unconventional gas reserves are located onshore, state governments are responsible for simplifying the process surrounding access arrangement negotiations. However, the Federal Government should ensure there are consistent requirements across the different jurisdictions;
- Establishing clear and well-resourced processes for community consultation based on OECD guidelines that include providing timely, reliable, easy to find and understandable information to the community. In addition, an independent and public process for evaluating the success or failure of community engagement programs should be implemented and shortfalls identified through this process addressed; and
- Adoption of better and best practice management by industry that includes careful monitoring of wellbores and their integrity, water, air quality and noise levels associated with mining activity.

Recommendation 2

To ensure that water policy successfully incorporates the full impact of unconventional energy extraction:

- Government must mandate through legislation that unconventional energy water use be integrated into regular water allocation frameworks;
- Industry be required by government to develop an integrated risk management framework that applies temporary precautionary measures that are progressively relaxed, if appropriate, as more information becomes available about potential impacts from unconventional energy activity; and

- A timeframe that is long enough to incorporate all the consequences of unconventional gas extraction be adopted for water policy management. This should be over the lifecycle of the mining activity, up to three or four decades, rather than the shorter timeframes traditionally employed in water management.

Reforming network service provision

Recommendation 1

State governments divest their ownership of network service provision assets.

If state governments do not privatise the provision of network services, then the following should be undertaken:

- The ownership structure of network service providers is considered when determining a suitable return on the regulated asset base;
- The timeframe over which regulatory price or revenue controls are imposed should be reassessed;
- The use of benchmarking for prices, expenditures, asset values, service outcomes and rates of return should be expanded to best domestic and comparable standards; and
- The regulatory oversight arrangements for jurisdictions where state governments maintain ownership should be examined.

Australian Electricity Market

Recommendation 1

- The regulatory framework for electricity metering should be amended to introduce competition for metering services. Such an outcome would promote faster adoption of new smart metering technology;
- Immediately deregulate electricity prices and allow for time-of-use pricing at both the network and retail level (this pricing already effectively exists at the wholesale level through the operation of the NEM); and
- Governments and industry should develop a comprehensive education campaign for electricity consumers aimed at providing information about why electricity prices are rising and why reducing peak demand is in every customer's interests.

Recommendation 2

- That a mechanism for consumers to effectively participate in electricity markets via negotiated settlements be explored.

Recommendation 3

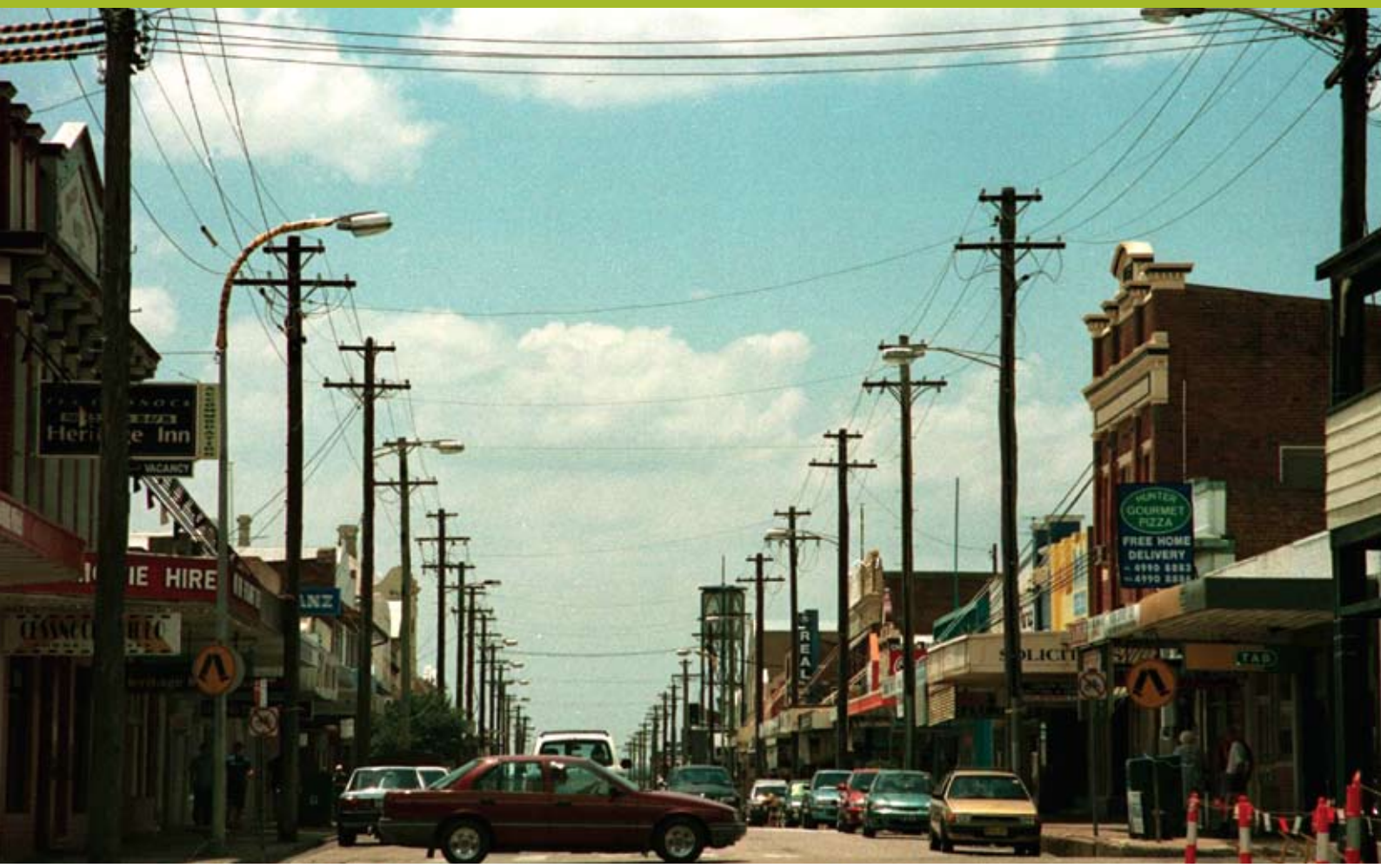
- The enabling regulatory and technological changes to facilitate an energy services model should be examined.

Recommendation 4

- There needs to be a comprehensive national review of concessions frameworks with a view to better aligning concessions and transfer payments with customers in need (for example payments based on household income and consumption rather than one or the other).

Recommendation 5

- That any new additional support for low carbon technologies should be based on the value of the call option they represent for Australia. Essentially, this represents a shift in new policies from encouraging deployment to encouraging the potential for deployment.



Australian electricity market: Policy choice not economic inevitability

Paul Simshauser, Tim Nelson and Nathan Taylor

This chapter examines issues associated with the Australian electricity market and provides recommendations to enhance the sector's efficiency, security and effectiveness.

Paul Simshauser joined AGL in 2008 as Chief Economist and Group Head of Corporate Affairs. He has overall responsibility for regulated pricing, economic policy and sustainability, energy regulation, government affairs, media and corporate communications, and emerging technology.

Paul has over 20 years experience in the energy industry having started his career with the Queensland Electricity Commission. He previously held senior executive positions at Stanwell, NewGen Power and Babcock & Brown. He holds Bachelor Degrees in Economics and in Commerce, a Masters Degree in Accounting and Finance, and a PhD in Economics from the University of Queensland. He is an FCPA, an AFMA Accredited Dealer and a Fellow of the Australian Institute of Company Directors.

Paul is Professor of Economics at Griffith University's Business School, and is widely published on energy economics in academic journals. Paul is also a member of the Australian Bureau of Resource and Energy Economics Advisory Board and a member of CEDA's Council on Economic Policy.

Tim Nelson is the Head of Economics, Policy and Sustainability at AGL Energy. In this role, Tim is responsible for: AGL's sustainability strategy; greenhouse accounting and reporting; AGL's energy and greenhouse research; AGL's corporate citizenship program, Energy for Life; and energy and greenhouse policy.

Tim is also an Adjunct Research Fellow at the University of New England and has had several papers published in Australian and international peer-reviewed journals. He has presented at conferences in Australia and throughout Asia and Europe.

Nathan Taylor is the Chief Economist at CEDA and a behavioural economist. He is responsible for the CEDA Research and Policy agenda which is undertaking an extensive series of reports into water, energy and population issues in 2012. He has been responsible for the projects *Crisis and Opportunity: Lessons from Australian Water Reform* and *A Greater Australia: Population, policies and governance*. He has also edited *Australia's Nuclear Options, Renewables and efficiency* and *Australia's Unconventional Energy Options*. He has authored the paper *Water Security: Water for the farm and the city*. Nathan has held policy roles at the Reserve Bank of Australia, the Chamber of Commerce and Industry WA, WALGA and others. He is the author of a book on corporate governance and cultural change and the blog *The Writings of a Naked Ape*.

Introduction

A reliable and affordable supply of energy is a fundamental component to a vibrant economy. As a major source of commodities, including significant known reserves of low carbon emission energy sources, Australia is well positioned to supply the world's future energy needs. In order for that to occur, Australia needs to examine all its energy options.

CEDA was founded to encourage good policy and influence public and private opinion by providing a platform for worthy ideas to be shared and heard. For this reason, CEDA commissioned 15 contributions from leading individuals and organisations with expertise in energy matters and exposed their thoughts to a broad audience of business and government decision makers via three policy perspectives.

The three policy perspectives discussed a broad suite of policy and energy options available to Australia to ensure future energy security and reliability in a carbon-constrained environment. Issues examined included the potential opportunities and challenges associated with nuclear power (*Australia's Nuclear Options*, November 2011), renewable energy and efficiency (*Australia's Energy Options: Renewables and efficiency*, May 2012) and unconventional energy such as coal seam gas (*Australia's Unconventional Energy Options*, September 2012).

A brief overview of these perspectives is contained in Appendix 2.

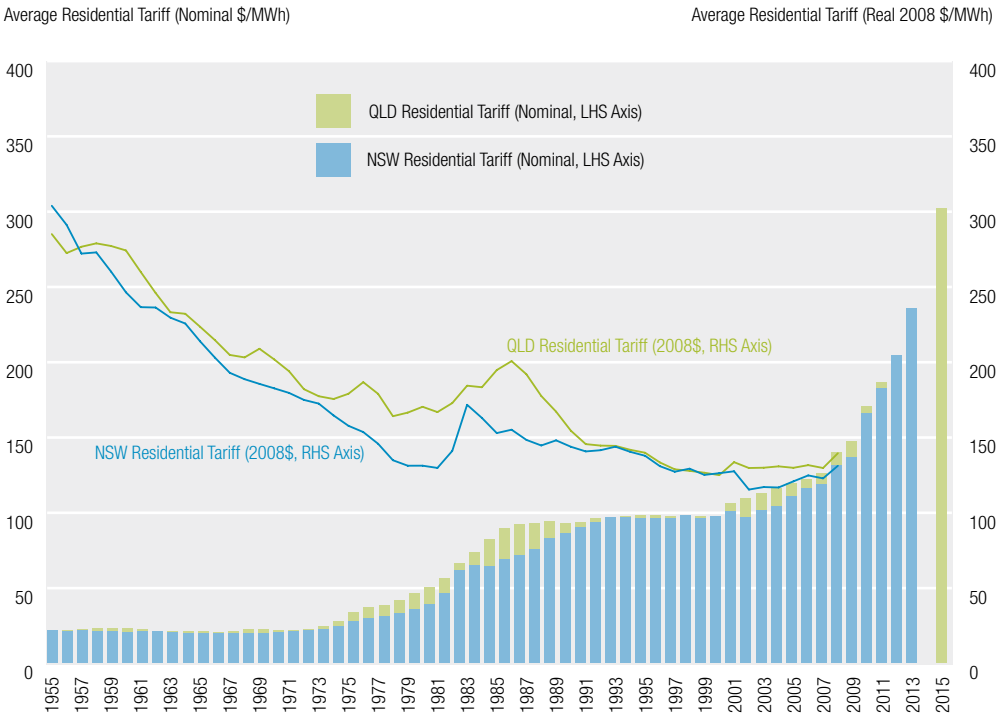
This final research report is a consequence of the publication of these, together with consideration of views expressed at CEDA thought leadership forums on the importance of good policy to guide government decision-making with respect to Australia's energy options.

In addition to drawing together the recommendations from the previous three reports, it also examines the issues associated with the Australian electricity market. It puts forward a series of recommendations designed to enhance this element of the energy sector's efficiency, security and effectiveness by placing consumers at the centre of the energy market and proposes a reform agenda.

Energy prices: Inevitability or policy choice?

In the 1990s, Australia embarked upon a journey of significant microeconomic reform. The wholesale electricity market was created through the establishment of the National Electricity Market (NEM) and significant gains, measured as a reduction in electricity prices, were achieved. In 2002, the Council of Australian Governments Energy Market Review estimated that over five years, reforms would increase Gross Domestic Product (GDP) by approximately $7 billion.[1]

FIGURE 1
REAL AND NOMINAL ENERGY PRICES



Source: Dynamic Pricing and the Peak Electricity Load Problem, Paul Simshauser and David Downer, The Australian Economic Review, Vol 45, No 3, pp 1–20

While the reform agenda that created the NEM produced stable energy prices for over a decade, since 2007 electricity prices began to escalate.

To usher in a new phase of stable, or even declining energy prices, will require a reform agenda focused on the critical challenges of the energy sector. This includes:

- Effectively addressing peak demand growth;
- Targeting hardship payments for consumers;
- Engaging and empowering consumers; and
- Establishing robust policy in a greenhouse gas constrained environment.

The reform agenda outlined in this report places the consumer front and centre in the energy market. It is telling that the current annual Statement of Opportunity released by the Australian Energy Market Operator (AEMO), which is meant to cover all energy issues for the sector, stops at the meter box of the consumer. This is a powerful example for how some parts of the sector views consumers and it is important to ensure they can be brought into the decision making process.

Addressing the peak

As electricity cannot be economically stored there is no inventory from which to draw upon during peak periods. Consequently, network infrastructure and electricity generation capacity must expand to meet projected instantaneous peak demand (plus a margin for forecast errors and plant outages). The capital cost of doing so is significant given the high fixed cost nature of electricity generation and network infrastructure. In fact, more than $900 million of capital has been invested in the distribution network in south-east Queensland and is used for just 3.5 days per annum, albeit not continuous days (Smart State Council 2010). To put this into context, the total capital stock of the south-east Queensland grid is $8 billion and therefore 12.5 per cent of the network is provided for use on 3.5 days per annum.

To calculate how underutilised the capital stock is likely to be, it is necessary to consider the "load factor". When aggregate electricity demand is measured as a continuous half-hourly "load" throughout the year, the load factor can be determined as the ratio between maximum and average demand. A virtually flat consumption curve, such as that typically associated with an aluminium smelter, has a load factor close to unity (100 per cent capital utilisation). Conversely, highly "peaky" household loads typically have a load factor of 0.30–0.40 in aggregate (30-40 per cent capital utilisation). Higher load factors result in greater capital utilisation with fixed costs spread over larger volumes of energy. This results in lower unit pricing. The opposite is true for lower load factors. As an example, South Australia's aggregate load factor is one of the worst in the Organisation for Economic Co-operation and Development (OECD), at just 0.42 (ESAA 2011). Capital utilisation rates for NSW and Queensland are provided in Table 1.

TABLE 1
UTILISATION RATES FOR CAPITAL IN NSW AND QUEENSLAND

	NSW Total Demand	NSW Residential Demand	QLD Total Demand	QLD Residential Demand
Maximum Demand (MW)	13,812	4721	8413	2386
Energy Demand (GWh)	78,289	16,869	52,183	8791
Utilisation Rate (%)	64.7	40.8	70.8	42.1

Poor capital utilisation rates are economically inefficient in most circumstances. Given the essential role electricity plays in producing other goods and services, it is critical that consideration be given to further pricing reform to drive macroeconomic objectives. Table 1 shows that the utilisation rate of households (around 40 per cent) is far lower than the average economy (between 65 per cent and 70 per cent). This is indicative of the greater uptake of spatial heating and cooling

devices which are only operated by households for very short periods of time over the course of a year. Current flat pricing of electricity results in businesses (producing goods and services and creating wealth and employment) effectively cross subsidising households. While providing an estimate of the reduction in economic activity associated with the cross subsidisation inherent in current pricing structures is beyond the scope of this paper, we note that the effective cross subsidisation is likely to become more pronounced as utilisation rates deteriorate even further.

Capital utilisation rates have declined materially over the past decade. Since 2004, peak demand in NEM jurisdictions has grown by 18 per cent while underlying energy demand has increased by only nine per cent. Unfortunately, the latest AEMO electricity demand projections show capital utilisation rates declining in at least two of the NEM regions. In previous eras, it was difficult to envisage pricing reforms that would arrest this decline in utilisation rates. However, demand-side participation now represents an important frontier for policy-makers because by shifting from mechanical to digital metering, is now possible and economical.

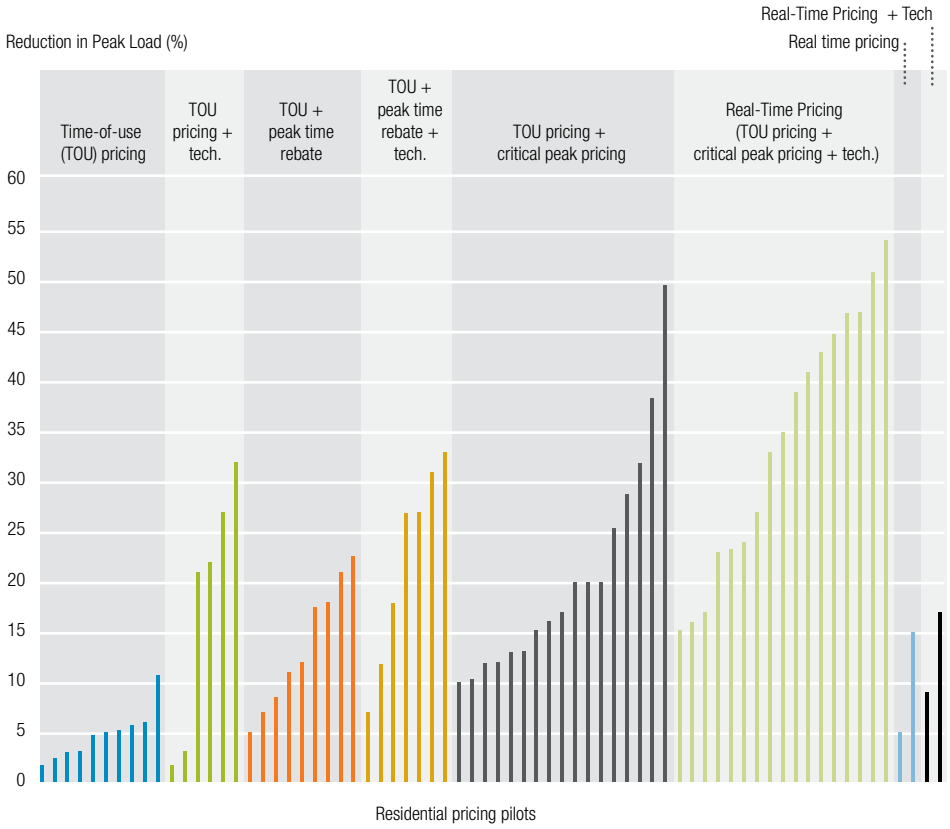
By shifting from mechanical to digital meters (and removing retail pricing regulation), the industry would be better placed to price electricity as a function of time (time-of-use or ToU pricing). Such an outcome would overcome the fundamental barrier to improvements in the utilisation of the existing (and potential future) capital stock – pricing and incentives. Unless pricing at the time of peak demand reflects the costs of underutilised capacity, electricity users will not have any incentive to reduce their consumption. In fact, alternative pricing methods (such as inclining block tariffs) which have been used in the past, are counter-productive. This is because when faced with higher prices for greater levels of overall energy consumption, energy users will restrain consumption at the time most convenient for them – non-peak demand times – effectively worsening the capital utilisation rate and increasing underlying prices. Only ToU pricing provides incentives for electricity consumers to reduce consumption at the time of relative scarcity – the time period where peak demand occurs.

But before policy makers proceed with dynamic pricing, not all dynamic pricing responses can be considered equal. However, we are fortunate that there is a rich history of pricing trials to learn from. The quintessential applied economic analysis of dynamic pricing and its effectiveness is contained in Faruqui (2010)[2], where 70 pricing pilots from North America, Europe and Australia were analysed for their reduction in peak demand. We have reproduced the results from Faruqui (2010) in Figure 2.

The pricing pilots documented in Figure 2 reveal that the mere shift from average to time-of-use tariffs reduces peak demand by 4.7 per cent on average. Where technology is added to households to provide for an automated demand response (i.e. the household does not need to sit at home waiting for electricity prices to spike in order to turn devices off), reductions averaged 17.8 per cent and spanned a range of two–32 per cent. Technologies that became economic due to the change in pricing included cycling switchers and programmable communicating thermostats which enable appliances, such as air-conditioning units, to be throttled back, “kill switches” which turn off all appliances on stand-by

FIGURE 2

DYNAMIC PRICING TRIALS AND REDUCTIONS IN PEAK DEMAND



Source: Dynamic Pricing and the Peak Electricity Load Problem, Paul Simshauser and David Downer, The Australian Economic Review, Vol 45, No 3, pp 1-20

mode, smart whitegoods which schedule their load by time and in-home displays. An alternative method of pricing, grouped together as peak-time rebate trials, involved consumers being rewarded for reducing demand below their average levels and in turn receiving a rebate on their bills. In these trials, peak demand was reduced by an average of 13.6 per cent and spanned a range of five–23 per cent. Where technology was added to automate demand response, the average reduction was 22.1 per cent.

Overall, Figure 2 shows that critical peak pricing pilots have averaged a 20.7 per cent reduction in peak demand at the household level, with results spanning 10–50 per cent. Technology driven demand response led to a surprisingly large 34.1 per cent reduction in peak demand. Such evidence provides a compelling reason for policy makers to urgently consider rolling out smart meters and deregulating retail electricity pricing to facilitate significant improvements in the capital utilisation rate of Australian electricity infrastructure. Such an outcome would not only improve economic productivity, it would correct a significant issue of equity in relation to current cross subsidies. Businesses and low-income households without access to air conditioning are effectively cross subsidising households with air conditioning. If introduced carefully, dynamic pricing would improve both economic efficiency and equity.

While the introduction of dynamic pricing is likely to provide overarching improvements in economic efficiency and equity, there are likely to be a small number of vulnerable consumers who struggle to pay peak rates for electricity. In broad terms, this band of consumers is likely to fit in one of two key segments of low-income consumers. The first group is peaky households that are high users of energy because of unemployment, disability or caring for young children or elderly relatives. The other group is peaky households with inelastic electricity use; that is, those unable to shift their usage due to the inability of appliances to be programmed to run in off-peaks. Policy makers will need to consider additional policy measures such as greater concessions for vulnerable consumers or exclusion from the program in the case of households using vital medical equipment.

Recommendation 1

- Amend the regulatory framework for electricity metering to introduce competition for metering services. Such an outcome would promote faster adoption of new smart metering technology;
- Deregulate electricity prices immediately and allow for ToU pricing at both the network and retail level (this pricing already effectively exists at the wholesale level through the operation of the NEM); and
- Governments and industry should develop a comprehensive education campaign for electricity consumers aimed at providing information about why electricity prices are rising and why reducing peak demand is in every customer's interests.

Engaging consumers

It is telling that the energy industry's annual *Electricity Statement of Opportunities* explicitly stops at the meter box. Yet the greatest opportunities in reforming the energy sector will come from engaging and empowering consumers. With the rapid advances occurring in information technology it is not difficult to imagine a future where households can utilise smart devices to exert control over their energy use.

When the energy sector was deregulated the intent was to introduce competition to protect the interests of consumers wherever possible. Where competition has been successfully introduced, particularly in the generation and retail areas, the experience has been broadly positive. However, regulation of the network service providers has been far from the light-handed approach initially envisaged. Instead:

> *"Economic regulatory processes in the NEM have become bureaucratic, inflexible, drawn-out, politicised, opaque, adversarial and heavily lobbied."*[3]

Proposals from NSPs frequently run to thousands of pages in length, accompanied by many technical reports. There are many bi-lateral discussions and information exchanges between the regulator and network service providers. Regulatory decisions can take several years to complete, and can be contested by organisations with strong financial interests in the outcomes. It has been recognised that there are clear information asymmetries between the regulators and NSPs.[4] While there is scope for consumer involvement in the decision making process, the asymmetric relationship is substantially worse.

An alternative approach that is potentially quicker, less expensive and less adversarial is to introduce negotiated settlements into determining energy service characteristics. This process has successfully been used in North America to allow consumers and their representatives to settle the prices charged by monopoly providers through negotiation. The regulator's role is to facilitate negotiation and to act as the decision-maker of last resort where negotiated settlements cannot be reached.

The outcomes of negotiated settlements in the United States was summarised by Professor Littlechild, arguably the architect behind the regulatory framework adopted in Australia, as:

> *"The proof of the pudding is in the eating. The parties involved have increasingly preferred settlement to litigation over the course of the last half-century. This is a remarkable record of survival in an activity – utility regulation – that has been characterised by little or no reform and change over this period ... Traditional litigation has become essentially a method of dispute resolution limited to novel or exceptionally difficult rate case issues."*[5]

Empowering consumers is an important part of ensuring enduring improvements in the energy sector. This means creating a mechanism for consumers to effectively participate in electricity markets. Effective involvement of consumers in the regulation of networks can also promote better understanding that more accurately reflects the views of the parties and allows more creative solutions than regulatory commissions are capable of delivering.

Negotiated settlements can take a number of forms and be extended into many areas of regulation. To introduce a more dynamic role for consumers in determining the quality of the service provided the potential role of negotiated settlements should be examined, particularly with regard to the role and characteristics of the network service providers.

Recommendation 2

- That a mechanism for consumers to effectively participate in electricity markets via negotiated settlements be explored.

Energy services model

The relatively low cost of energy for most consumers (for example, about 2.6 per cent of household expenditure) means that energy efficiency is not the dominate concern in most purchases. This applies to the retail sector but also to most goods in the wholesale sector, unless energy is a major input into the cost structure of a business. Energy efficiency improvements are, generally speaking, a by product of innovation rather than its driving force. A proposal that would significantly restructure incentives would be to introduce an energy services model.

To appreciate how the energy services model could drive innovation, consider the market for mobile phones.

> *"Free or heavily discounted equipment (phones) are currently provided under varying contracts according to need, usage and desire to hedge against risk. In the case of an energy service approach, a consumer would buy an energy service, much in the same way they subscribe to a high use mobile phone service."*[6]

Such a model could enable competition in the energy sector from non-traditional sources, such as the retailers of white goods. However, the key advantage of an energy services model would be that it could create the same economies of scale and scope to energy services as exists for energy generation. These incentives currently exist, but are dulled and disbursed. An example of the consequence is that consumers frequently purchase air conditioners that may cost them $1500 but that impose costs on the energy system of $7000 when their contribution to the peak is factored in.

An energy services model would involve a return to how energy was initially sold. The industry pioneer Thomas Edison initially offered light and heating as a service on Manhattan Island. Creating a market that involves selling energy services rather than just selling kilowatt hours would realign the incentive structures of service providers so that they are encouraged to provide efficient solutions to consumers.

Recommendation 3

- The enabling regulatory and technological changes to facilitate an energy services model should be examined.

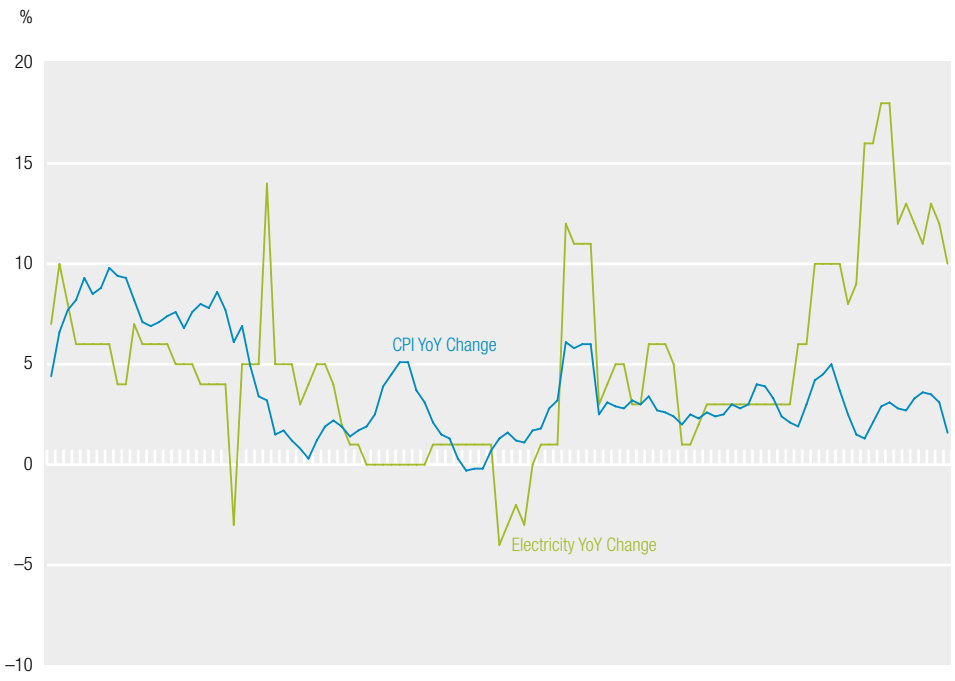
However, the capacity to quantify the benefits of energy efficiency would be dependent on fully cost reflective pricing that is based on energy ToU. These reforms should be addressed first.

Equity in energy – rethinking customer hardship and concessions frameworks

Electricity prices have increased significantly in recent years. However, it is likely that the "rate of change" that has been of most concern to consumers, not necessarily the absolute price level. Figure 3 shows the Consumer Price Index (CPI) and the electricity price index for the period from 1985 to 2012. With the exception of three single year periods, between 1985 and 2007 electricity prices declined in real terms as general inflation was greater than the electricity price index. However, since 2007 there has been a significant run-up in electricity prices while underlying inflation has been relatively modest. It is this rate of change to electricity prices that has been focused on in public policy debates and the popular media.

A simple, but incorrect, conclusion from Figure 3 would be to state that energy affordability is a significant issue. 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"*. While real electricity prices are now at their highest levels in decades, income growth and relatively flat average household consumption have acted to reduce the impact on consumers as a proportion of total energy bills relative to household disposable income. 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 – around 2.6 per cent of the average household budget. However, such analysis ignores the

FIGURE 3
CONSUMER PRICE INDEX AND ELECTRICITY PRICE INDEX (YEAR ON YEAR CHANGE)



Source: ABS

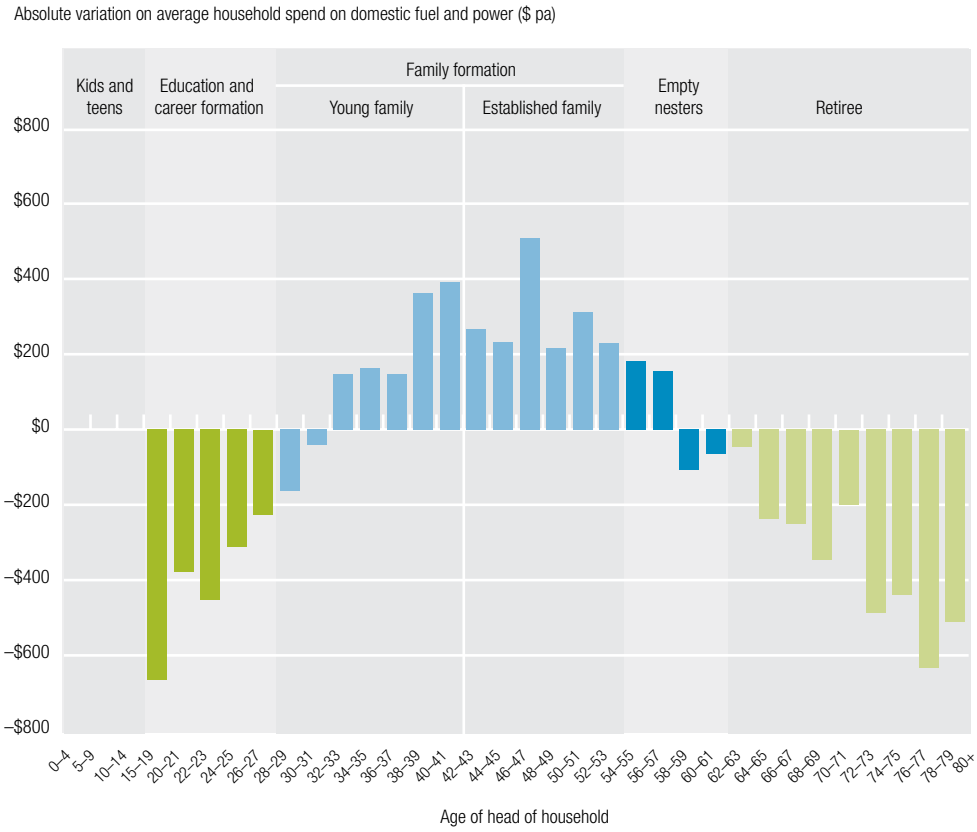
fact that individual households have significantly different incomes and consumption. It is this variability that leads to significantly different outcomes for different segments of electricity consumers.

Figure 4 shows the variability in consumption (measured as the absolute variation from the mean household spend on energy) for different electricity consumer segments in 2011–12. There are two very clear conclusions that can be drawn from this chart:

- Households in the family formation demographic (principal electricity account holder is aged between 35 and 55) consume significantly more electricity than the average; and
- All other demographic groupings (where the principal electricity account holder is aged less than 35 or greater than 55) consume significantly less electricity than the average.

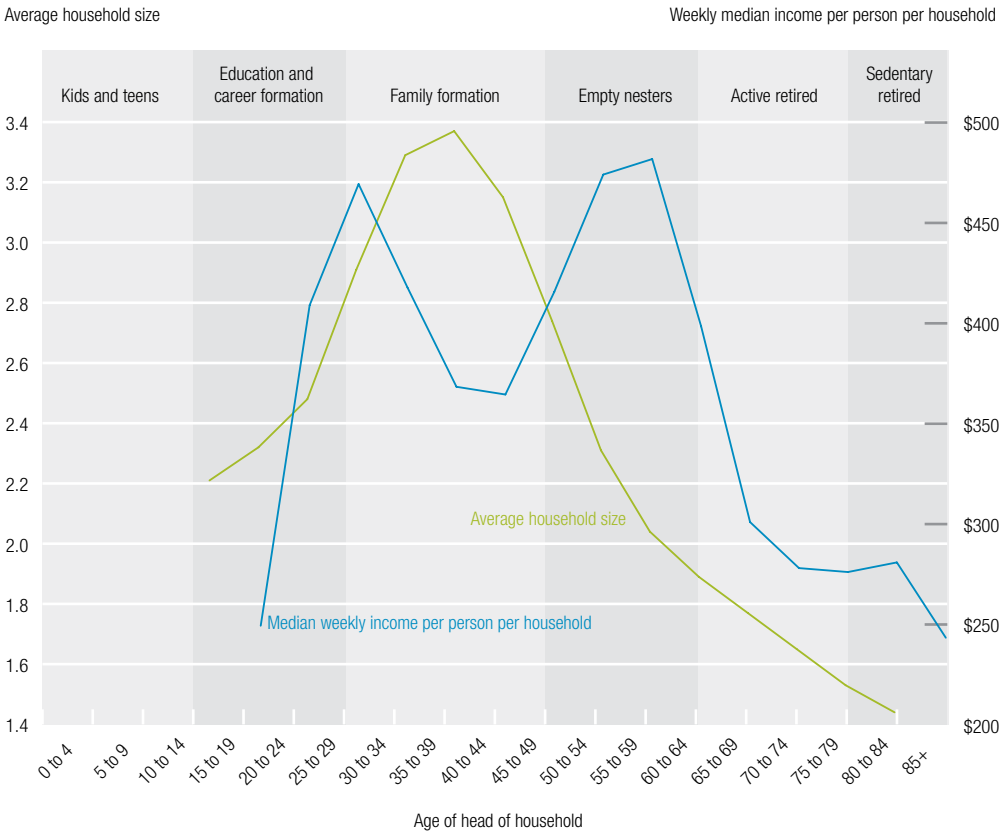
Few participants in economic and social policy debates would be surprised by these results. Households with greater numbers of people in the home (family formation) consume greater quantities of energy and young families generally have "uncontrollable consumers" in the form of children. Based upon this analysis and all other things being equal, households in the family formation demographic grouping are likely to be at greater risk of energy related financial hardship because of their greater consumption relative to other types of households. However, as

FIGURE 4
ABSOLUTE VARIATION IN HOUSEHOLD ENERGY COSTS



Source: AGL, ABS, KPMG Demographics

FIGURE 5
AVERAGE HOUSEHOLD SIZE AND AVERAGE HOUSEHOLD INCOME PER PERSON



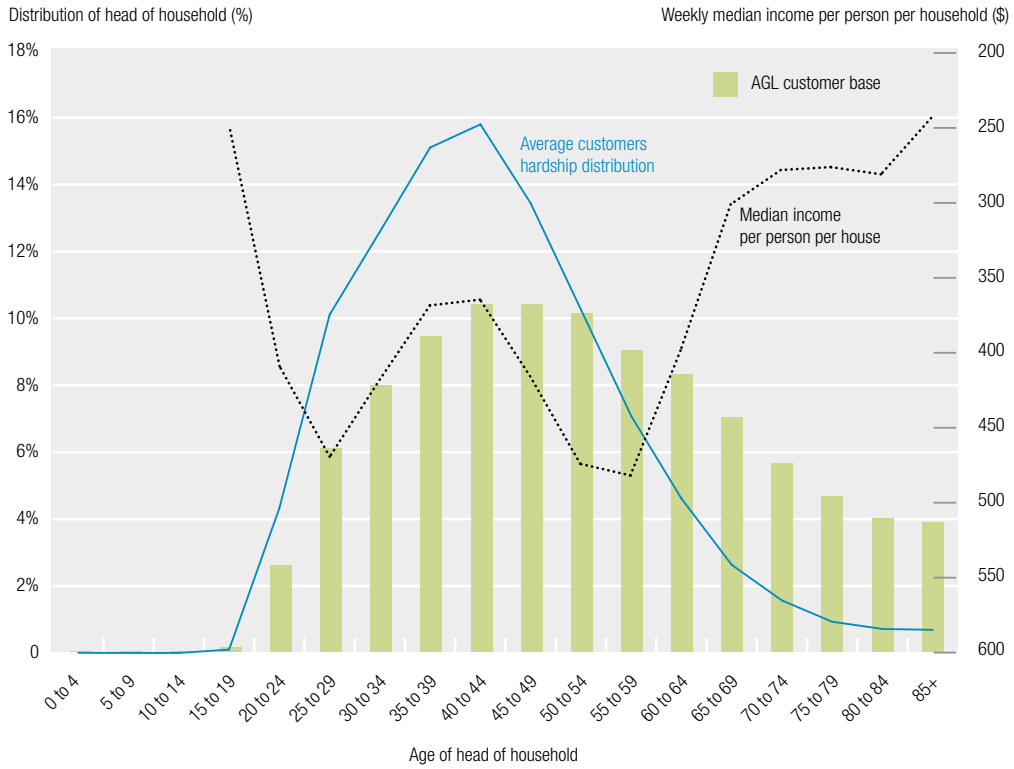
Source: AGL, ABS, KPMG Demographics

indicated earlier an equally important variable in defining customer vulnerability to financial hardship is the income per person within a household. This is shown in Figure 5.

Figure 5 shows the average household size and median weekly income per person per household across the same demographic age groupings used in Figure 4. Again, there are two key conclusions that can be drawn from the research. Firstly, the average household size is greatest when the principal account holder is in the age bracket 30 to 55. 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. Secondly, the median weekly income per person per household is lowest for the same age demographic – family formation. In other words, households where the principal electricity account holder is likely to have a dependant family have lower household income per person than other households. This is a function of the likelihood of non-income producing dependants (for example, children and a stay at home parent).

When combined, the evidence outlined in Figure 4 and Figure 5 presents a disturbing picture. At the stage of life when income per person is lowest, spending on energy is highest. The family formation demographic cohort are evidently proportionately, the group of households most likely to be at risk of hardship. Simshauser and Nelson (2012) presented evidence that about one in four

FIGURE 6
CUSTOMERS IN HARDSHIP



Source: The energy market death spiral – rethinking customer hardship, Paul Simshauser and Tim Nelson, AGL Applied Economic and Policy Working Paper Series, Working Paper No. 31, AGL Energy, Brisbane

households in the family formation demographic cohort currently show some sign of energy vulnerability (for example inability to pay a bill on time, failure to pay a bill or disconnection). Figure 6 shows that the end result of higher than average consumption and lower than average household income per person, is over-representation of the family formation demographic in groupings of customers in, or at risk of, hardship. Therefore, a key question that must be focused on by policy makers in an environment of rising electricity prices is the extent to which current frameworks for electricity related transfer payments and concessions are targeted at the demographic most at risk of hardship.

Table 2 shows the electricity concessions available to households in the mainland NEM states. It is clear from Table 2 that in all states except Victoria, concessions are paid as a lump sum irrespective of consumption. This is a poor public policy outcome. Energy vulnerability and financial hardship is a function of both household income per person and the total expenditure on electricity consumption. Given the significant variability in average household income outlined previously, it would be prudent for policy makers to commission an urgent review of electricity concessions frameworks to determine whether adopting the Victorian model (where concession vary as a function of consumption) is a more effective way of addressing rising electricity bills and customer hardship.

TABLE 2
STATE BASED ENERGY (ELECTRICITY AND GAS) CONCESSIONS

State	Summary of standard energy concessions (2011)
Victoria	Annual electricity concession: 17.5 per cent off consumption and service charges Winter energy concession: 17.5 per cent off consumption and service charge Off-peak concession: 13 per cent 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

Another key issue in relation to the provision of energy concessions relates to eligibility criteria. The eligibility criteria outlined in Table 2 varies. 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. 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 in 2012, there has been no comprehensive national or sub-national response to the issue of customer hardship in relation to energy supply.

Existing eligibility criteria may well have been effective in preventing customer hardship in some demographic groupings. In fact, existing criteria may be the reason that the groups of people over 55 and under 35 are underrepresented in the indicators of hardship presented in Figure 2. However, there is no eligibility criteria designed to identify hardship within the family formation demographic and it is this demographic grouping which has above average consumption and below average household income per person. We consider this to be a “yawning gap” in energy policy hardship frameworks.

Recommendation 4

- Customer hardship should not be used as a reason to avoid completing the energy market review process. Smart meters and dynamic pricing are necessary reforms to increase economic productivity within the energy sector and the broader economy. However, it is clear that there needs to be a comprehensive national review of concession frameworks with a view to better aligning concession and transfer payments with customers in need (i.e. payments based on household income and consumption rather than one or the other).

Energy in a greenhouse gas constrained environment

The Australian electricity sector will need to adjust to unprecedented changes in the relative cost of electricity generation technologies as innovation, movement in the fuel price, and climate change policies take effect. Modelling by the Federal Government suggests that renewable technologies could grow from less than 10 per cent market share to be the dominant source of energy by 2050.[7] For such a transformation to be at all feasible requires a robust basis for public policy decisions that can guide the investment and research decisions required to meet Australia's long term emissions reduction targets.

Decisions in the energy sector involve substantial capital investments and are for long time periods. Australia cannot afford the boom and bust cycle that has dominated renewable energy industries, nor for the level of policy uncertainty that typified energy debate for almost a decade, to continue[8]. Effective climate change mitigation is of such a long timeframe and represents such a transformation of the energy sector, that it demands a more rigorous assessment of the issues than what is frequently evidenced in political decisions.

Quantifying uncertainty and guiding policy decisions

The core challenge for setting robust climate change policy is determining the merit of different choices given the magnitude of uncertainty that needs to be dealt with. Quantifying the uncertainty of technological innovation, future greenhouse gas emission costs and capital and operating costs over time allows for the comparison of alternative policies to encourage the deployment of low carbon technologies.

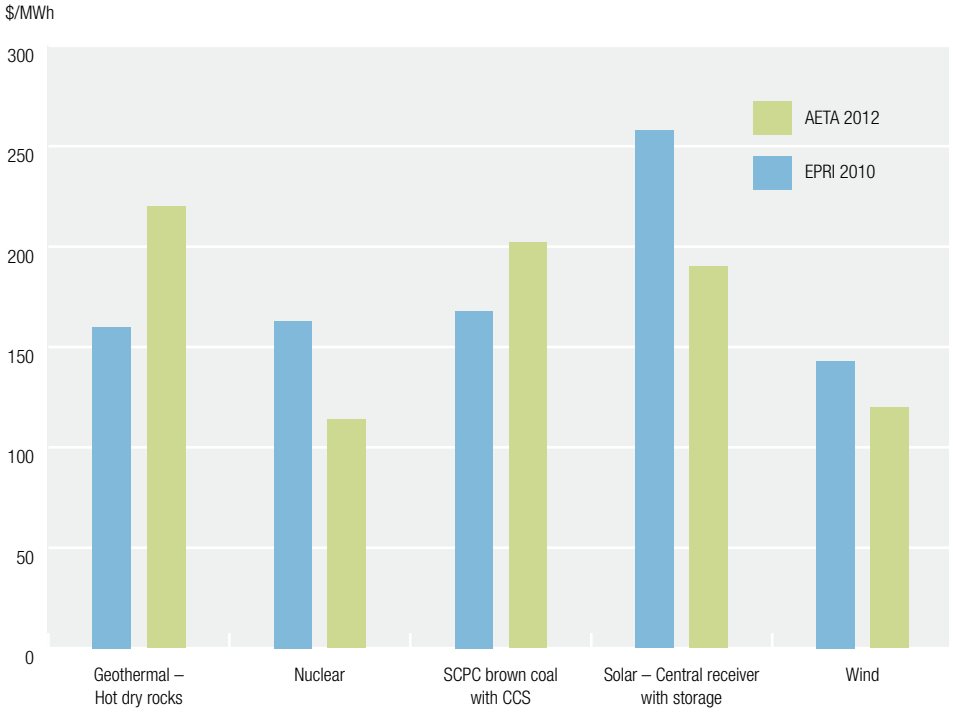
The basis of quantifying uncertainty involves viewing low carbon technologies as representing a call option for Australia whereby the nation has the option to deploy them in the future if feasible.[9] Owning a call option gives someone the right, but not the obligation, to purchase something in the future. Australia has the right to deploy more low carbon emission technology in the future if the levelised cost of low carbon emission technology is less than a similar assessment of a conventional existing technology with the cost of greenhouse gas emissions internalised.

The value of the low carbon emission technologies for Australia can be estimated by:

- Examining the estimate of the future cost of energy from different technologies; and
- Assigning probabilities to these forecasts.

When combined with a projection of the cost of carbon, this approach allows the value of various technologies to be quantified under different scenarios for technological progress. While these projections are complicated, the Australian Energy Technology Assessment (AETA) represents the best available current cost

FIGURE 7
LEVELISED COST OF ELECTRITY (LCOE) IN 2030



Source: Electric Power Research Institute 2010 and Australian Energy Technology Assessment 2012

estimates for a number of energy generation technologies to 2050 and highlights how rapidly expected costs can change. Comparing the AETA projections with an earlier forecast of energy expectations conducted by the Electric Power Research Institute (EPRI) highlights how estimates of different technologies can change rapidly due to global innovation or to the technical challenges associated with accessing various forms of energy. For instance, solar photovoltaic renewable technology is now expected to have one of the lowest levelised costs of electricity by 2030 due to technological advances and the expansion of global manufacturing capacity.

Assigning probabilities to the process of innovation and the technological breakthroughs necessary to reduce the costs of low carbon technologies is the next stage of quantifying the future value of a technology. While any forecast is limited in its accuracy, making assumptions explicit ensures a common basis for comparison between anticipated technological advances and provides an ability to compare public policy options. An Australian Academy of Technological Sciences and Engineering (ATSE) study used a Monte Carlo method to create a distribution of investment profiles for Australia's portfolio of low carbon emission technologies based on the EPRI technology cost estimates.[10]

Assigning a probability distribution to anticipated technological advances is an important step in evaluating where Australia should spend funds to encourage the deployment of low carbon emission technologies. While recognising Australia is predominately a technology taker, there is scope to enhance research and development and value in having a focus on the innovations that will make a technology commercially viable.

Consider the case of solar thermal central towers which, if a range of technological breakthroughs identified in the Scandia Laboratories roadmap occur, will see the levelised costs of electricity shift significantly from approximately $200–$250/MWh to $80/MWh by 2020.[11] The technological advances required to achieve those cost reductions include:

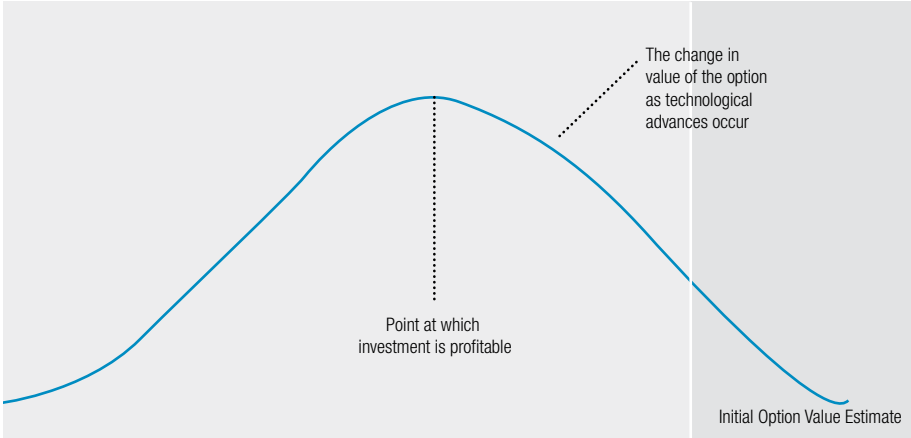
- Improving high temperature molten salt storage;
- Reducing the parasitic power load; and
- Reducing capital expenditure and operations and maintenance costs.

The technological advances identified in the roadmap essentially shift the anticipated probabilistic distribution from that described in the initial ATSE report to another more positive one, as described below. If or when the required technological advances occur, the overall value of that technological option increases until such a time as it represents a positive investment for the nation.

The merit of the ATSE approach is that if the net present value (NPV) distribution is positive at any stage there is the potential it will create wealth in the future and so can justify taking action now to capture that wealth. For example, action may take the form of reserving land for future generating capacity. Since such an initial action can be undertaken with less expense than the widespread deployment of the technology, it may create value by making the technology available in the future.

Nuclear power provides a very effective case study as the ATSE study concluded that it had one of the highest net present values of all technologies. CEDA's research has found that nuclear power may not be commercially viable at this point for Australia. However, technological innovation being explored, particularly in the form of small modular reactors, has the potential to change that significantly.[12] This is why CEDA has recommended that Australia "purchase" a call option on the right to deploy nuclear power by developing a suitable regulatory framework and building domestic skills now.

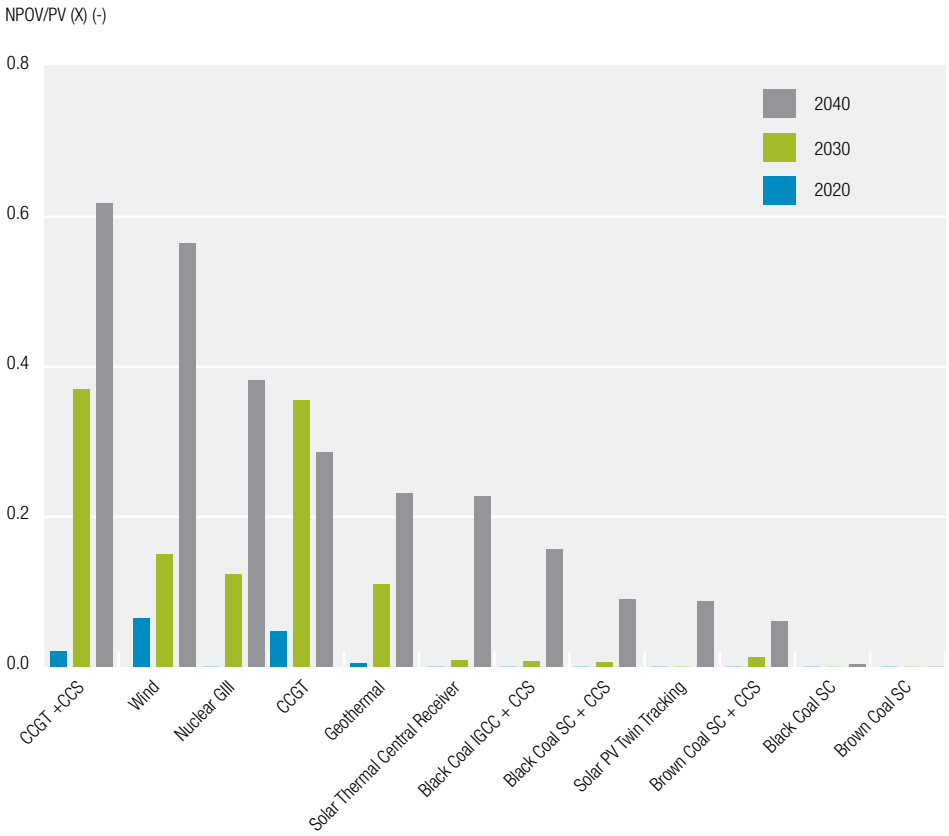
FIGURE 8
STYLISTIC PROBABILITY DISTRIBUTION OF NET PRESENT VALUE FOR SOLAR THERMAL TOWERS



Source: Adapted from Burgess 2012 CEDA Australia's Energy Options: Renewables and efficiency.

FIGURE 9

NET PRESENT OPTION VALUES (NPOV) FOR DIFFERENT NEW ELECTRICITY GENERATING TECHNOLOGIES FOR INVESTMENT NORMALISED BY DIVIDING NPOV BY THE PRESENT VALUE OF THE CAPITAL EXPENDITURE, PV(X)



Source: With permission, Australian Academy of Technological Science and Engineering (ATSE), Low Carbon Energy: Evaluation of new energy technology choices for electrical power generation in Australia, December 2010, pp22.

Focusing climate change policy

A key failing of technology neutral government policies is they have focused on facilitating the deployment of technology that is currently deployable rather than on maximising the long term capacity to deploy low carbon emission technology. For instance, the Clean Energy Finance Corporation (CEFC) was established with $10 billion to "overcome capital market barriers that hinder the financing, commercialisation and deployment of renewable energy, energy efficiency and low emissions technologies".[13] The explicit intent to enable the deployment of renewable energy may result in Australia creating a more expensive energy generation mix in the long term than is optimal.

The introduction of the emissions trading scheme provides an opportunity to refocus the objectives of proposed new climate change policies.[14] Any new additional support for low carbon technologies should be based on the value of the call option they represent. Essentially, this represents a shift from encouraging deployment to encouraging the potential for deployment. For the CEFC this will involve using the insights of the options analysis to spend funds addressing the discrete barriers to renewables being deployed. Key examples of ways in which the potential for low carbon emissions can be encouraged include:

- Focusing research and development on enabling technology breakthroughs, such as what would be required for geothermal power to be commercially viable;
- Developing robust regulatory regimes for all energy sources prior to their deployment, including nuclear power;
- Working to ensure a social licence to operate exists for all energy sources, including nuclear power, wind generation and coal seam gas extraction;
- Integrating low carbon emission energy sources with the transmission and distribution system; and
- Developing domestic skills in implementing the initial investments in emerging technologies.

This approach would not be technologically neutral. Instead it would focus on trying to capture as much of the potential positive net present value of each low carbon technology. While this may result in greenhouse gas emissions being marginally higher in the short term, Australia would be spending funds to maximise their long term reduction.

Recommendation 5

- That any new additional support for low carbon technologies should be based on the value of the call option they represent for Australia. Essentially, this represents a shift in new policies from encouraging deployment to encouraging the potential for deployment.

Harnessing the benefits of reform

The reform agenda initiated in the 1990s was predominately based on structural changes to the supply side of the electricity industry. Formerly state owned electricity commissions were disaggregated (and in some cases privatised). Excess generation capacity that was built up prior to the reforms was better utilised with net reductions in unit pricing and better outcomes for consumers. Due to the apparent obvious nature of the benefits of supply-side reform, it would appear that the appetite to complete the process by removing constraints in relation to demand-side response dissipated.

It is in this context that many of the reforms identified in this paper are not new. In fact the 2002 Parer Review stated that: “All states and territories should enable customer choice of energy supplier, work towards removing retail price caps and mandate the installation of interval (or smart) meters.” This recommendation was made at a time of real declines in electricity prices. Accordingly, it is understandable that complex reforms such as these remained unimplemented given the absence of pricing pressures at the time.

The environment of today is very different. Electricity prices have increased substantially since 2008 due to a range of factors: spending on electricity networks; poorly coordinated and overlapping renewable energy policy; and a decline in the utilisation of electricity infrastructure. What is unambiguously clear is that reforms

to the supply-side of the market are unlikely to produce significant and ongoing benefits as these have largely been exhausted through the creation of the NEM. If rising electricity prices are to be addressed, the common thread related to underlying cost pressures must be considered – greater consumer choice and engagement.

The large capital expenditure programs of distribution businesses in some areas of Australia since 2008 cannot be undone. Infrastructure has been constructed and will be on the ground now for several decades. Like the supply-side reforms of the 1990s, Australia has a significant opportunity to make the best of a bad situation and introduce reforms which better utilise this infrastructure. Better utilisation of the existing capital stock will result in lower unit pricing for all customers. Such an outcome would be undoubtedly in the national interest.

The reform agenda:

To address the peak in energy demand:

- The regulatory framework for electricity metering should be amended to introduce competition for metering services, promoting faster adoption of new smart metering technology;
- Electricity prices should be deregulated and allow for ToU pricing at both the network and retail level (this pricing already effectively exists at the wholesale level through the operation of the NEM); and
- Governments and industry should develop together a comprehensive education campaign for electricity consumers aimed at providing information about why electricity prices are rising and why reducing peak demand is in every customer's interests.

To empower consumers:

- A mechanism for consumers to effectively participate in electricity markets via negotiated settlements be explored; and
- In the longer term, the enabling regulatory and technological changes to facilitate an energy services model should be examined.

To improve assistance to customers experiencing energy hardship:

- Undertake a comprehensive national review of concession frameworks with the objective of better aligning concession and transfer payments with the requirements of customers in need (for example payments based on household income and consumption rather than one or the other).

To effectively address climate change:

- Ensure any new additional support for low carbon technologies should be based on the value of the call option they represent for Australia. Essentially, this represents a shift in new policies from encouraging deployment to encouraging the potential for deployment.

Appendix 1: Reforming network service provision

While energy prices have risen between 70 and 100 per cent in different parts of the NEM since 2007, a major portion of these price rises are not a consequence of economic forces or unique geographic characteristics. Rather, the ownership and regulatory structure of network service providers (NSPs) that are unique to the NEM provide a compelling case for reform. Addressing the causes of Australia's internationally unusual growth in energy prices could reverse the trend while failing to do so will guarantee escalating energy prices.[15]

When energy reforms were introduced in the mid-1990s, it resulted in what were previously vertically integrated state government owned electricity commissions being broken into generation, distribution and retail components. The reform was motivated by evidence that the industry was inefficient, and that through the introduction of competition wherever possible, costs would reduce and services improve. Competition was introduced into elements of the system, particularly in retail and generation. In contrast, the costs of the natural monopoly NSPs, the transmission and distribution services, are determined by regulation that attempted to replicate the incentives of competition.

Apart from in Victoria, it has not succeeded.

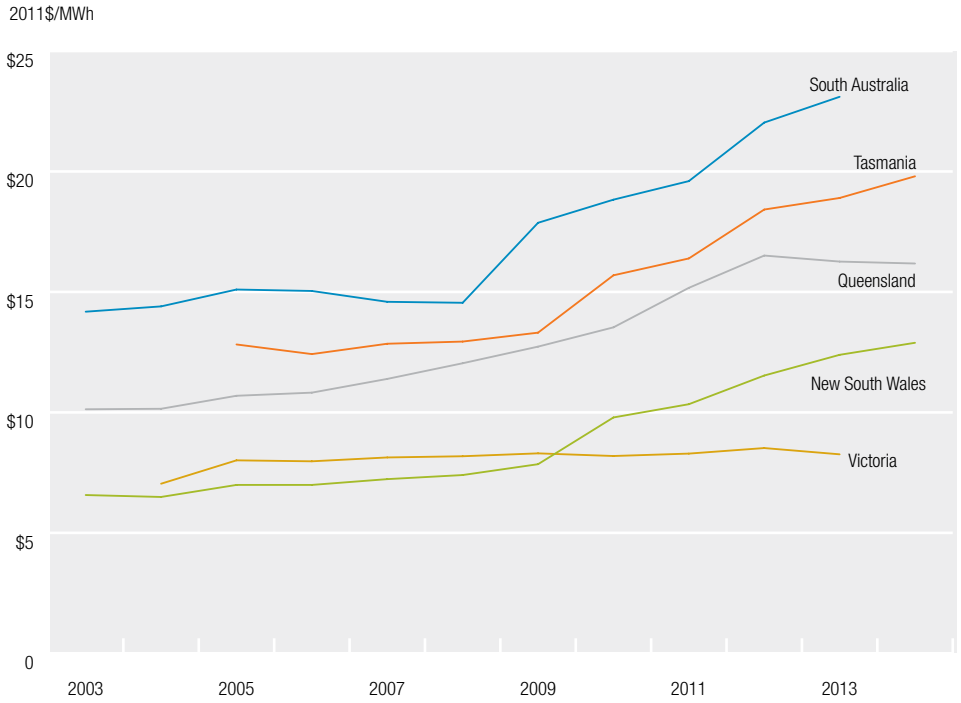
The outcomes in the generation market have been broadly positive. The risks associated with the development and operation of generators now reside with competing producers, rather than consumers. Supplies have been reliable and average prices are lower than when the reforms were adopted. In contrast, consumers bear the investment and price risks for NSPs. The distribution and transmission costs are now beginning to dominate energy price changes as they represent almost 65 per cent of revenue in the energy sector. The annual price increase for distribution businesses has been around 14 per cent and almost 12 per cent for transmission networks from 2005 to 2011. In contrast, the annual price change for generation businesses declined by more than one per cent over the same period.

The revenue growth has been driven by increases in the regulated asset base of the network service providers as their operating expenses have been relatively stable. The Australia Energy Regulator (AER) determines the size of the regulatory asset base, and its remuneration, by making five year determinations on the infrastructure required to meet forecast demand. It also makes a determination about the overall price, or revenue for some activities, based on the operating expenditure, depreciation on regulated assets and allows for a return on regulated assets.

The level of capital expenditure in Australia by some NSPs in the NEM is internationally exceptional. For instance, the allowed capital expenditure in NSW in the current regulatory period is approximately six times higher per connection than the amount allowed in Great Britain,[16] while in 2011 the total allowed capital expenditure on transmission and distribution per MWh produced is more than seven times higher in the NEM than in North America.[17] It is unsurprising that Australia's energy prices have begun to diverge from those experienced internationally.

FIGURE 10

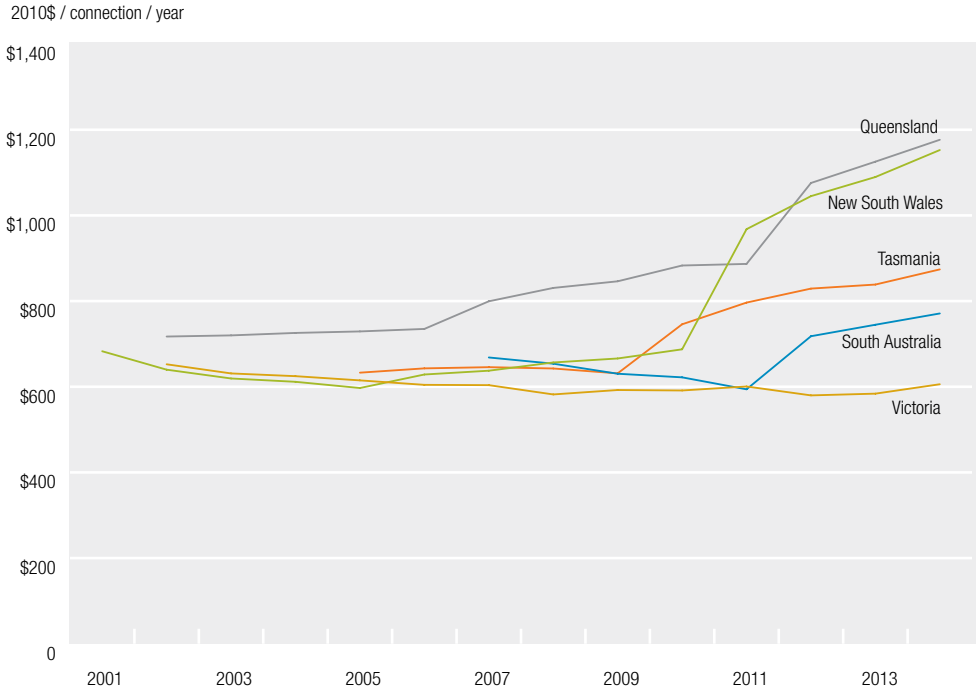
REGULATED REVENUE OF TRANSMISSION SERVICE PROVIDERS PER MWH TRANSMITTED (2011$/MWH)



Source: Mountain 2012

FIGURE 11

DISTRIBUTION SERVICE PROVIDERS PER CONNECTION (2010$/CONNECTION)



Source: Mountain 2011[18]

Without significant reform, Australia will experience continuing energy price escalation as transmission service providers and distribution service providers add considerable capital stock to their regulated asset bases.

A frequent explanation for the capital deployed in Australia is the geographic features of the nation. While the NEM energy distribution networks are long per customer connection, it is not the cause of Australia's much higher investment in the regulated asset base. The population of the NEM is highly urbanised and, with the exception of Tasmania, have energy generation sources close to the main load centres. Also, much of the network involves relatively inexpensive infrastructure servicing a few isolated rural users. While this use adds to length, it does not make a difference to total cost. Finally, Australia's overall network constitutes relatively inexpensive overhead lines, 86 per cent, compared with 40 per cent of overhead powerlines in the UK.

Network planning standards were made more stringent in NSW and Queensland from around 2005 and this is a commonly cited explanation of the increasing expenditure on capital. However, it is not clear that this has been the primary cause of growth in the regulated asset bases of NSPs in these jurisdictions. It is important to note that there was no meaningful attempt to assess end user preferences and whether they were willing to pay more when the standards were changed.

Another major justification for investment in the network has been to address rising peak demand. However, analysis of the demand-related expenditure to the growth in peak demand of different service providers highlights a considerable variation in the cost of doing so. The charts below show that government owned service providers in NSW, Queensland and Tasmania have incurred significantly more expenditure to meet rising demand, than the privately owned service providers, particularly in Victoria, and the privately-owned service provider in SA. While it is obvious that excessive growth in peak demand and lower utilisation rates of the capital stock must be addressed, it is clear that ownership structures have a significant role in how organisations respond to it.

Furthermore, there has been a long-standing over estimation of peak demand growth by NSPs (AEMO 2012). This has been particularly pronounced in NSW, Queensland and Tasmania and highlights the importance of effectively engaging consumers in pricing determinations.

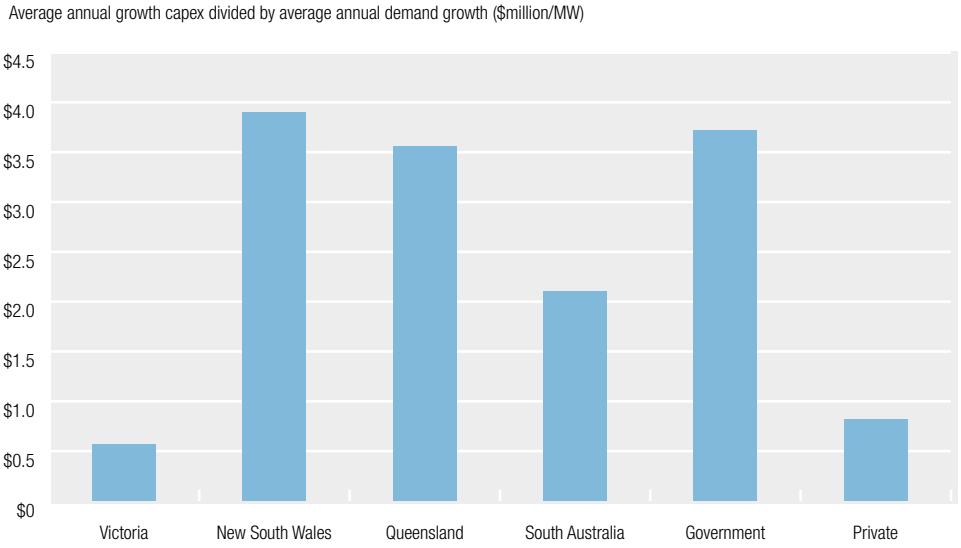
A far stronger explanation of the discrepancy in service costs of network service providers is their ownership structure. As Bruce Mountain states:

> *"The main reasons for higher capex do not lie with external factors but rather they can be attributed to state ownership, and the adoption of a form of regulation that has failed to provide incentives for government owned services to reduce expenditure."* [19]

When state governments operate energy businesses they receive extraordinary benefits from a number of sources. The first is through the constitutional right of state governments to claim the income tax associated with the delivery of energy services through publicly owned state enterprises, the income tax equivalents. If

FIGURE 12

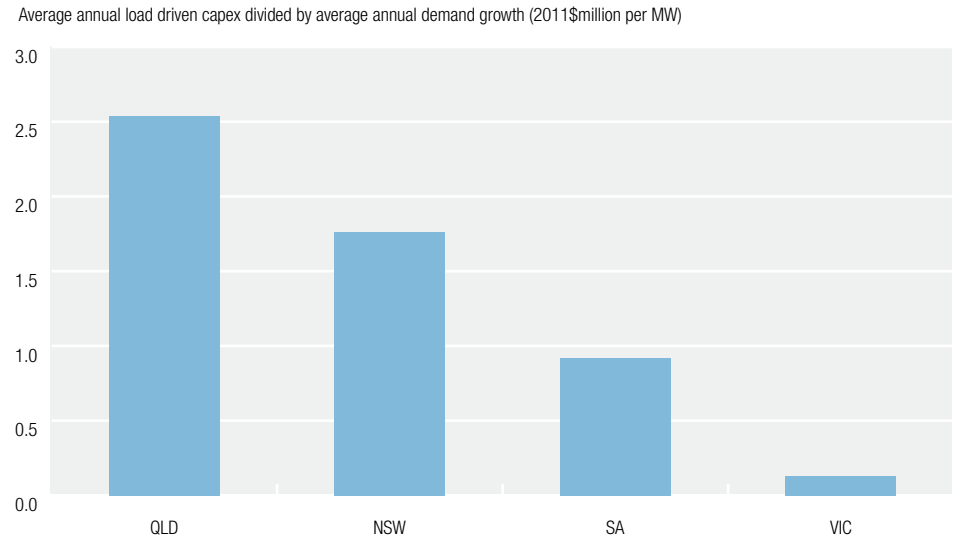
REGULATED ASSET BASE OF DISTRIBUTION SERVICE PROVIDERS PER CONNECTION, AND BY OWNERSHIP (2010$/CONNECTION)



Source: Mountain, B. R. (2011). Australia's rising electricity prices and declining productivity: the contribution of its electricity distributors. A report commissioned by the Energy Users Association of Australia.

FIGURE 13

REGULATED ASSET BASE OF DISTRIBUTION SERVICE PROVIDERS BY OWNERSHIP (2010$/CONNECTION)



Source: Mountain, B.R, (2012). A comparison of outcomes delivered by electricity transmission network service providers in the National Electricity Market. A report commissioned by the Energy Users Association of Australia.

the state government does not own the business, it is unable to claim any income tax collected on its revenues.

The second source of gain for state governments occurs because they can raise capital at lower rates than the regulatory model assumes. The regulatory process establishes an overall cost for network service provision or an overall revenue. Both approaches use the cost of capital a private company would pay to generate a reasonable return on the investment in the regulated asset base. However, state governments raise debt at levels substantially lower than that of private sector

FIGURE 14

REGULATED ASSET BASE (RAB) OF DISTRIBUTION SERVICE PROVIDERS PER CONNECTION BY OWNERSHIP (2010$/CONNECTION)

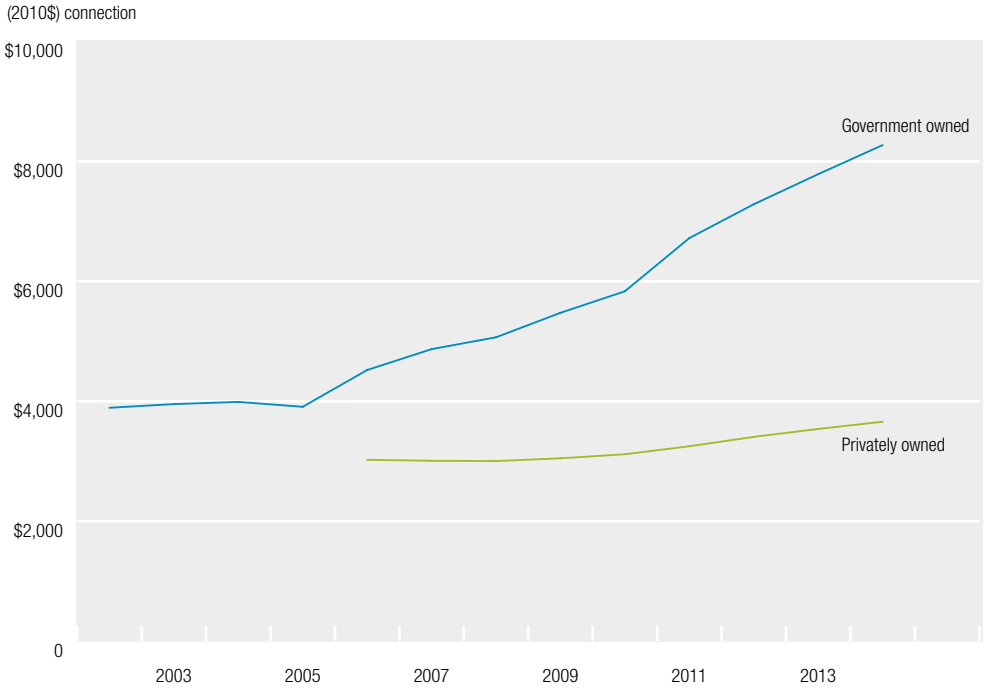
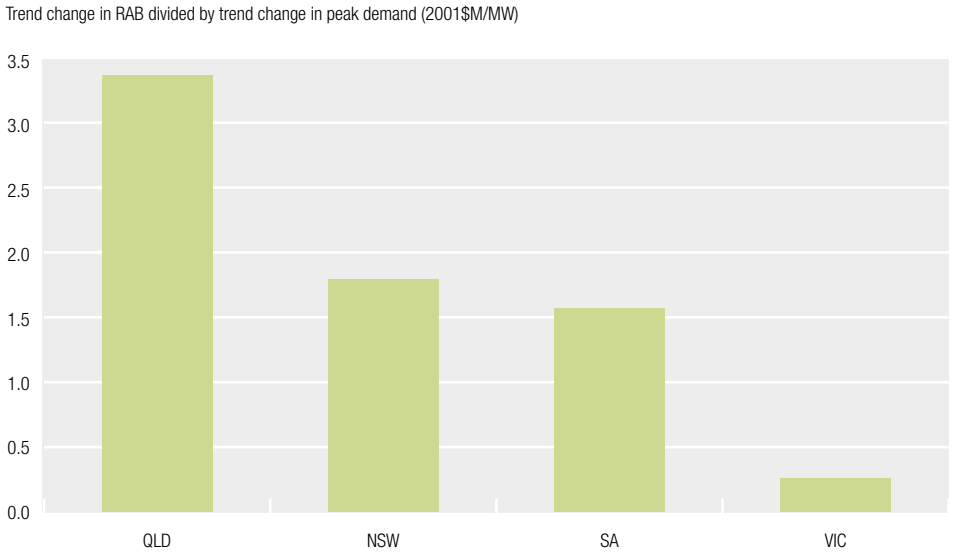


FIGURE 15

THE TREND GROWTH IN RAB COMPARED TO TREND GROWTH IN PEAK DEMAND FROM 2005 TO 2011



Source: Mountain, B. R. (2011). Australia's Rising Electricity Prices and Declining Productivity: The contribution of its electricity distributors. A report commissioned by the Energy Users Association of Australia.

companies. For instance, for the NSW Government, the yield on 10-year bonds issued by the government is currently around four per cent. Yet the regulatory controls currently in place allow network service providers to charge their customers as if interest rates were more than twice as high.[20] The difference between the two interest rates is returned to state governments via either "competitive neutrality" or "debt guarantee" fees.

State governments also control the regulatory structure applied to NSPs. Unlike the generation market, the prices set in the transmission and distribution networks are not subject to competitive price pressure nor do the businesses bear the investment risk, the consequence has been systemic overestimation of energy demand.[21]

The benefits state governments derive from their ownership of the network service providers creates incentives for network service providers to "gold plate" their asset base. The NSW government receives $596 million in income tax equivalents and competitive neutrality fees from its distribution and transmission service providers and retailers. These utilities also paid dividends of $575 million at the same time.

When the 1990s' reforms introduced regulatory structures for transmission and distribution networks, they were modelled on the relatively successful structure that had been developed in Great Britain for private companies and successfully adapted to Victoria. However, the growth in the regulated asset base of public companies clearly suggests that regulatory reform is required so that the ownership of an organisation is recognised in the price setting process. As Mountain stated:

> *"The evidence of expenditure outcomes across all government owned network service providers and over long periods – at least three five year regulatory control periods – shows a consistent pattern of sharply rising capital expenditure."* [22]

The best solution is for state governments to divest their ownership of NSPs. However, if this is politically problematic then the regulatory arrangements should be adjusted to take account of government ownership. This would involve setting rates of return for state government owned service providers, and recognising their receipt of income taxes and competitive neutrality fees, in addition to their claim on attributable profits.

Regulatory reform should include re-examining the existing five year price or revenue controls to government owned service providers. Errors in major parameters – such as demand forecasts and the cost of capital have been locked-in for five years as a result of this form of regulation. This has resulted in excessive over-investment, particularly by government owned NSPs. Making regulatory assessments over shorter periods will reduce the consequence of this.

Greater use of benchmarking would also improve the regulatory framework. Prices, expenditures, asset values, service outcomes and rates of return should be benchmarked, and this information used to ensure that inefficient service providers are required to improve their efficiency in order to achieve comparable financial returns to those of their more efficient peers. The benchmarking should also include international comparisons in countries with comparable reliability standards.

The regulatory oversight of the energy sector should also be examined given the significant influence state government ownership has on the performance of network service providers. The case for politically-independent regulation of government owned network service providers is strong.

Recommendation 1

- That state governments divest their ownership of network service provision assets.
- If state governments do not privatise the provision of network services, then the following should be undertaken:
  - The ownership structure of NSPs is considered when determining a suitable return on the regulated asset base;
  - Reassess the timeframe over which regulatory price or revenue controls are imposed;
  - Expand the use of benchmarking for prices, expenditures, asset values, service outcomes and rates of return to best domestic and comparable standards; and
  - Examine the regulatory oversight arrangements for jurisdictions where state governments maintain ownership.

Appendix 2: Description of the three previous energy policy perspectives

Australia's Nuclear Options

Historically, nuclear power was not an option that needed to be considered due to Australia's abundant and cheap alternative sources of energy. However, the need to address climate change has altered this historical trend. To not consider the nuclear option when trying to decarbonise the economy is tantamount to committing economic and environmental vandalism.

There is a substantial opportunity for Australia to play a more fundamental role in the global nuclear fuel cycle. Australia's twin stabilities of political and geographic systems make it uniquely placed to hold nuclear waste material.[23] The economic opportunity for Australia is to sell uranium, then be paid for its storage and, eventually, be able to sell today's waste product as a fuel source for the next generation of reactors. This could be a lucrative industry built on world leading technology developed in Australia.

For Australia to capitalise on its nuclear potential, it first needs to address several hurdles to the development and deployment of nuclear power. These include the financial viability of nuclear power based upon current (Generation III+) technology, the lack of suitably qualified nuclear engineers and a lack of a social licence. The developments in small modular reactors (SMRs) may make nuclear fuel appropriate for Australia's energy needs while future generations of nuclear power reactors may provide sources of clean energy with high levels of safety.[24] SMRs, unlike current technology, may prove to be financially viable in the Australian context.

There is little chance nuclear power will be accepted as a source of energy in a highly populated location without an established track record supplying energy to Australia. As a consequence, the most likely deployment option available would

involve SMRs displacing coal or diesel generation in remote parts of Australia. Once the Australian public has become comfortable with nuclear energy, and it has a proven safety track record, it will represent an option for greater deployment in the future.

The following authors contributed to the policy perspective:

- Professor Anthony Owen, Academic Director of UCL School of Energy and Resources;
- Professor Barry Brook, University of South Australia, Sir Hubert Wilkins Chair of Climate Change;
- Dr Tom Quirk, who has spent 15 years as an experimental research physicist, university lecturer and Oxford don;
- Tony Wood, Program Director, Energy, Grattan Institute; and
- Tony Irwin, Chartered Engineer with 30 years' experience commissioning and operating nuclear reactors for British Energy in the UK.

Regardless of the eventual economics of SMRs, climate change is necessitating a reassessment of the deployment of nuclear power in Australia, the opportunity cost of which is clear. Even without deployment innovations, nuclear power should be a part of Australia's portfolio of policy responses to climate change.

Two key steps to enabling nuclear power deployment involve:

- Establishing a national regulatory regime to oversee and monitor any potential deployment of nuclear power; and
- Training nuclear engineers by establishing an equivalent of the previous School for Nuclear Engineering or the Australian School of Nuclear Technology.

Given the potential for commercial SMRs to be available in 2020, the Federal Government should undertake these two steps immediately.

The costs of establishing a nuclear regulatory framework and developing suitably qualified technicians can be considered as the cost of purchasing a call option on greater flexibility for future energy supply. The value of any option is critically determined by the variability of the underlying asset. Given the uncertainty about the cost of decarbonised energy, purchasing a nuclear call option may prove to be an invaluable investment.

Australia's Energy Options: Renewables and efficiency

Renewable energies are forecast to grow at a rapid pace, with some technologies, such as wind, forecast to rise by more than 900 per cent from 2010 to 2040.[25] While the social cost of carbon is set to increase substantially over time,[26] it will continue to be an externality requiring government intervention to quantify. Any government initiative should have clear objectives that define what magnitude of carbon emissions are being mitigated both now and in the future, with explicit examination of underlying assumptions about technological progress and the future cost of carbon.

To move beyond ad hoc decision making requires a robust quantification of the probabilistic outcomes of a full suite of energy technologies. Such an approach

would model the net present value (NPV) of an investment in an energy generation technology under a range of scenarios such as various carbon price levels of technological development.

Understanding the contours of investment risk around the deployment of low carbon emission technologies also allows the merit and effectiveness of various policy initiatives to be quantified. For instance, while the net present value (NPV) of solar thermal towers may not be positive at this point, analysis may suggest a range of policy options (for example funding research and development) that can be undertaken now to facilitate future deployment should technological advances occur.

Developing the capacity to deploy low carbon emission technologies in the future can be considered as equivalent to the nation buying a call option, which is a right but not an obligation to purchase the underlying asset in the future, on this form of energy. Initial estimates would suggest that Australia has a portfolio of renewable energy call options worth approximately $12 billion. The anticipated social benefit of individual policy interventions can also be quantified. All government programs should be assessed to ensure they are returning an efficient amount of mitigation.

Australia could delay the need to deploy more energy generation capacity by more effectively managing the peak period of energy demand. While residential consumers, who drive peak demand, only constitute 27 per cent of electricity use, there are no incentives for them to avoid using the peak.[27] One way to address peak load growth would be to establish long term predictions for energy supply requirements for network distribution and transmission networks, and then inviting energy service providers and demand side participation companies to engage in competitive bidding to address them.[28] Further, adopting an energy services model, whereby customers pay for the service energy makes available rather than paying for the commodity of energy itself, could create substantive incentives for a wide range of participants to find innovative ways to achieve improved levels of energy efficiency.

The following authors contributed to the policy perspective:

- Professor Paul Hardisty, Global Director of Sustainability & EcoNomics™ for WorleyParsons;
- Tony Wood, Program Director, Energy, Grattan Institute;
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- John Dashwood, Chairman of ExxonMobil Australia; and
- Andrew Pickford, Managing Director, ISSA Indo-Pacific.

Australia's Unconventional Energy Options

Unconventional energy resources such as shale and coal seam gas are now technologically feasible and economically viable thanks to ongoing innovation. As climate change mitigation continues to be a policy priority, secure, relatively cheap gas can act as an environmentally superior substitute as its carbon dioxide emissions in energy production are up to 45 per cent less than coal.[29]

Australia has also been identified as having the fifth largest potential shale gas reserves in the world. In Queensland alone, if the coal seam gas industry reaches its forecast potential, it will be responsible for more than 20,000 jobs, provide $243 billion in tax to the Australian Government and result in real incomes in Queensland rising by $28,300 per person over the period from 2015 to 2035.[30] In order for the full potential of Australia's unconventional energy options to be realised, several issues must first be addressed.

The issue of property rights over land use is creating conflict between farming communities and mining companies, holding back the coal seam gas industry from its full potential. While mining companies have very strong legal property rights over their ability to access and extract unconventional energy, the legal frameworks which grant these property rights have been developed for energy extraction predominately in remote areas with little interaction with the broader community. The existing regime is too complex and difficult to govern the interaction between the two groups.

The use and treatment of water by the mining industry represents a major source of community concern and is a critical challenge to the widespread acceptance of unconventional energy sources. To ensure economically efficient and sustainable unconventional energy extraction occurs, it is important that those who benefit from its extraction pay for all costs associated with the activity. There is also scope for industry to improve the quality of its activities to minimise disruption and environmental risks, while addressing community concerns. In the case of unconventional gas, adopting best practice has been estimated to be less than 10 per cent of total costs.[31]

The regulatory framework in eastern Australia has been categorised by catch-up regulation and widespread community opposition to unconventional gas resource activities. Substantial community concern has been generated because of the perceived lack of effective regulation overseeing the development of unconventional gas resources. Having a seamless regulatory framework could help reduce the administrative burden imposed on businesses operating in numerous states, while assisting in maintaining community confidence that the industry is regulated in a responsible and sustainable manner.

The following authors contributed to the policy perspective:

- Professor Quentin Grafton, Executive Director and Chief Economist, Bureau of Resources and Energy Economics (BREE), Department of Resources, Energy and Tourism;
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- Dr Tina Hunter, Fellow, TimFischer Centre for Global Trade and Finance, Bond University; and
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References

1 Council of Australian Governments Energy Market Review (known as the Parer Review), 2002, Towards a truly national and efficient energy market, http://www.ret.gov.au/Documents/mce/_documents/FinalReport20December20022005060212463 1.pdf

2 Faruqui, A. 2010, 'The ethics of dynamic pricing', *Electricity Journal* , vol. 23, no. 6, pp. 13–27.

3 Mountain, B., 2012, CEDA. "The contribution of monopoly network service providers to electricity price rises in the National Electricity Market: outcomes, reasons and possible solutions."

4 Australian Energy Market Commission, 23 March 2012, *Power of choice review directions paper*, Supplementary Paper: Demand Side Participation and Profit Incentives for Distribution Network Businesses, page 4.

5 Littlechild, S. C. (2011). "The process of negotiating settlements at FERC." EPRG Working Paper 1116.

6 Pickford, A., May 2012, *Dealing with peak demand: The potential of an energy services model*, Australia's Energy Options: Renewables and efficiency, CEDA.

7 Department of Resources, Energy and Tourism, December 2011, Draft Energy White Paper: Strengthening the foundations for Australia's energy future, page 40.

8 See for example Nelson et al, 2010; Frontier Economics, 2010; Sinclair Knight Merz, 2011a; Deloitte, 2011; Nelson et al, 2012a; and Simshauser and Nelson, 2012.

9 State how this concept was developed and articulated in ATSE's paper.

10 Burgess, J., *Financial uncertainty of technology change*, Renewables and efficiency, CEDA Policy Perspective, 2011.

11 Klob G J, Ho C K, Mancini T R, Gary J A, *Power Tower Technology Roadmap and Cost Reduction Plan*, 2011, Sandia National Laboratories, USA Department of Energy, SAND2011-2419, April.

12 Irwin, T., *Small Modular Reactors*, Australia's Nuclear Options, CEDA Policy Perspective, 2011.

13 Clean Energy Finance Corporation, http://www.cefcexpertreview.gov.au/content/Content.aspx?doc=thecefc.htm

14 While CEDA has identified major policy failings associated with the Emissions Trading Scheme it represents a relatively efficient mechanism to reduce greenhouse gas emissions.

15 Australian Energy Market Operator (2012). National Electricity Forecasting Report, for the National Electricity Market. Melbourne.

16 Mountain, B. R. and S. C. Littlechild (2010). *Comparing electricity distribution network revenues and costs in New South Wales, Great Britain and Victoria.*

17 North American data from "Transforming America's Power Industry", The Brattle Group. Prepared for the Edison Foundation, November 2008. NEM data from AER Decisions. Conversion at 2011 PPP rates.

18 Mountain, B. R. (2011). *Australia's rising electricity prices and declining productivity: the contribution of its electricity distributors*, Energy Users Association of Australia.

19 Mountain, B. R. 2012. "The contribution of monopoly network service providers to electricity price rises in the National Electricity Market: outcomes, reasons and possible solutions."

20 While part of the difference is explained by the decline in the risk free rate between the time the regulator set the control, the larger part is explained by the debt risk premium which is set as if the bonds were issued by a privately owned firm.

21 Australian Energy Market Operator (2012). National Electricity Forecasting Report, for the National Electricity Market. Melbourne.

22 Mountain, B. R. 2012. "The contribution of monopoly network service providers to electricity price rises in the National Electricity Market: outcomes, reasons and possible solutions", CEDA.

23 Quirk, T., 2011, *Opportunities in the Nuclear Fuel Cycle*, CEDA policy perspective: Australia's Nuclear Option.

24 Irwin, T., 2011, Small modular reactors, CEDA policy perspective: Australia's Nuclear Option.

25 Dashwood, J., 2012, *The Outlook for Energy: A view to 2040*, CEDA.

26 Hardisty, P.E., 2012, *Making renewable energy sustainable*, CEDA.

27 Australian Government, 2011, *Draft Energy White Paper 2011: Strengthening the foundations for Australia's energy future*, Department of Resources, Energy and Tourism, page 173.

28 Pickford, A., 2012, *Dealing with peak demand: The potential of an energy services model*, CEDA, page 3.

29 Grafton, Q., *Challenges and opportunities for Australian unconventional gas production*, CEDA.

30 Ferguson, M., 2012, speech to *CEDA State of the Nation Conference: The Security of Energy Markets*, accessible from here: http://minister.ret.gov.au/MediaCentre/Speeches/Pages/CEDAConference.aspx

31 International Energy Agency (IEA) 2012, *Golden Rules for a Golden Age of Gas*, IEA, Paris.

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