
Report prepared for Infrastructure NSW

Energy Infrastructure Strategy

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Glossary

AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
BREE	Bureau of Resources and Energy Economics
CCGT	Combined cycle gas turbine
CFBC	Circulating fluidised bed combustion
COAG	Coalition of Australian Governments
EIS	Energy Infrastructure Strategy
EPRI	Electric Power Research Institute
ESAA	Electricity Supply Association of Australia
ESOO	Electricity Statement of Opportunities for the National Electricity Market
GSOO	Gas Statement of Opportunities for Eastern and South Eastern Australia
GWh	Gigawatt hour
IGCC	Integrated gasification combined cycle
INSW	Infrastructure NSW
IPART	NSW Independent Pricing and Regulatory Tribunal
IRG	Investment Reference Group
LGC	Large-scale generation certificate
LNG	Liquified natural gas
LRET	Large scale Renewable Energy Target
MCE	Ministerial Council on Energy
MW	Megawatt
NEL	National Electricity Law

NEM	National Electricity Market
NER	National Electricity Rules
NGL	National Gas Law
NGR	National Gas Rules
NTNDP	National Transmission Network Development Plan
OCGT	Open cycle gas turbine
PJ	Petajoule
PV	Photovoltaic
QNI	Queensland/NSW Interconnector
RET	Renewable energy target
SCER	Standing Council on Energy and Resources
SGSC	Smart Grid, Smart City
TJ	Terajoule
VTPA	Voluntary Transitional Pricing Arrangement

Executive summary

Context

The NSW economy and community has benefited from low priced electricity and gas. Abundant reserves of coal in NSW and low cost gas from interstate have fuelled economic growth and prosperity.

However, the era of low cost energy is over. The challenge of transforming the economy to using cleaner energy, higher rates of electricity peak demand and replacing aged electricity network infrastructure have placed upward pressures on energy costs. The cost pressures have resulted in significant price increases for residential and business customers. Pressures on energy costs are expected to continue in the future.

In addition, new investment in energy infrastructure will be needed to ensure sufficient capacity in base load generation, electricity transmission and gas pipelines to meet the future needs of NSW residential and business consumers.

The challenge is to ensure that the right investments happen at the right time. This means creating an environment to encourage investment in NSW infrastructure including conventional energy infrastructure and emerging new technologies.

NSW is in good shape to meet the challenges emerging in the energy sector. Two decades of reform in the energy markets and establishment of independent governance and regulatory arrangements have helped to create a flexible and more dynamic energy sector. The next area of reform will involve adapting to cleaner energy technologies.

The objective of the NSW Government is to deliver secure, reliable and affordable energy supply and encourage cleaner energy sources. The best way to achieve this is to create an environment that encourages private sector investment in commercial opportunities.

The next twenty years will see significant changes to the energy sector in NSW. This Strategy document identifies emerging challenges and opportunities and proposes strategies to meet NSW infrastructure requirements that best achieve the NSW Government's objectives for the energy sector.

Key issues, challenges and opportunities

There are unprecedented changes ahead for the energy sector that will affect infrastructure requirements. The key challenges and opportunities for energy infrastructure identified in this Strategy are summarised here.

Electricity networks

Recent years have seen significant increases in capital investment by the Government owned electricity networks. Since 2007/08, capital investment by electricity networks has increased from \$2.2 billion a year to \$4.0 billion in 2011/12. The higher levels of investment have been driven by increases in demand for energy, including peak demand, higher reliability standards and the need to replace aged and uneconomic infrastructure. Increases in network investment requirements have led to higher network costs and have contributed to higher

electricity prices to residential and business customers. Capital investment is forecast to increase to an average of \$3.2 billion per year from now until 2021.

Further, medium term planning indicates the need for strengthening high voltage links to supply Sydney and surrounding areas.

Electricity generation

More so than other sector, electricity generation will see major structural changes over the next twenty years. The most pressing challenge involves responding to the policies to reduce reliance of the economy on carbon intensive energy sources. This represents an unprecedented investment challenge for the energy sector.

There is a concern that the changing policy environment has created uncertainty and this has delayed or discouraged investment in generation. This uncertainty is likely to continue because of a wide range of unknown factors associated with implementing the carbon price and other initiatives.

Significant private investment is needed in the next twenty years in electricity generation for both base load and renewable energy. By 2030, it is estimated that NSW will require around 7,000 MW of new base load generation. However, the uncertain impacts of the carbon price and renewable energy target may be affecting market signals for other types of viable investment such as base load generation.

To achieve its objective of ensuring affordable energy, it will be important for the NSW Government to reduce any barriers or uncertainty for investment in the lowest cost generation available. Improving policy certainty and reducing investment barriers will help to achieve an optimal generation portfolio.

Gas sector

There are both significant challenges and opportunities emerging in the gas sector. A key challenge is to ensure NSW has ongoing access to a secure and affordable supply of gas.

There are signs that security of supply may be an issue facing NSW in the medium to long term. The main reason for this concern is that traditional sources of natural gas that supply NSW are in decline. This, together with signs that more Australian gas is being earmarked for export markets, poses a potential issue for NSW. These factors are expected to place upward pressure on the wholesale price of gas.

This challenge is exacerbated as demand for gas in NSW is increasing at higher than historical rates with the commissioning of more gas fired generation. Increased investment in gas fired generation is occurring in response to the challenge to transform the economy to cleaner energy.

The large coal seam gas reserves in NSW provide an opportunity to alleviate these risks. NSW gas has the potential to meet future requirements of NSW and other jurisdictions. The emerging coal seam gas sector in NSW has the potential to provide significant economic benefits to this State. It is essential the NSW Government establish a safe and environmentally sensitive regulatory framework to help achieve the economic potential of this new energy source.

It is also important to ensure there is sufficient investment in gas pipeline infrastructure to transport the coal seam gas to NSW consumers and gas fired generators. New investment will be undertaken by the private sector. Therefore, the NSW Government has an important role to ensure there are appropriate and proportionate regulatory arrangements that will facilitate investment in a timely manner. This is necessary to ensure secure gas supplies at affordable prices.

New smart technology

New developments in electricity smart metering and grid technology have the potential to provide customers with more information about their electricity use. This type of technology provides scope for the introduction of time of use (or flexible) pricing. This type of pricing can be structured to provide a more accurate reflection to customers of the costs of using electricity infrastructure by the time of day. As such, this type of technology presents an opportunity to help reduce peak demand. For example, higher prices during peak periods are likely to encourage consumers to switch consumption of non-essential and discretionary appliances (washing machines, clothes dryers, pool pumps, dishwashers) to non-peak periods.

Smart metering and time of use pricing can potentially help to reduce average network prices by reducing the need for distributors to invest in infrastructure to meet peak demand. NSW needs to have a clear policy on smart metering to remove uncertainty in the industry and facilitate an optimal level of investment in new technologies.

Energy infrastructure strategies

This Strategy has focused on achieving the Government's objectives of energy affordability and security with investment by the private sector. The strategic themes are focused on tackling challenges in the energy sector such as energy price uncertainty, rising network costs and duplicative cleaner energy schemes. There are also significant opportunities for new investment in the gas sector and smart metering and smart grid technology.

The proposed infrastructure strategies are outlined below.

Strategic infrastructure priorities for electricity transmission and distribution

Infrastructure investment by the NSW Government owned network businesses has been the largest contributor to recent electricity price increases. The proposed strategies are aimed at achieving cost effective and reliable networks that enhance market security and better balance service with affordability.

It is proposed that, in the short term, the NSW Government:

- Conduct a full review of distribution capital proposals for 2012 to 2014 and for the next regulatory period (2014 to 2019) to identify potential capital savings (from all uncommitted projects).
- Support measures to reduce network capital costs including support for the Australian Energy Market Commission (AEMC) reviews into distribution reliability standards and rules governing the economic regulation process and rates of return.

The economic reforms that have taken place in the energy sector have successfully delivered competition in the wholesale and retail gas and electricity markets. The competition reforms are complemented by effective national regulation of the monopoly transmission and distribution sectors. The electricity transmission and distribution sector is subject to an effective regulatory framework covering technical, safety and economic matters. The Government, therefore, does not require direct ownership of electricity businesses in order to achieve reliability or other objectives.

As the owner of these businesses, the Government has the objective of maximising the financial and regulatory returns from these businesses. In its policy role it has the objective of placing downward pressure on costs to ensure affordability and competitiveness of the NSW economy. Having these two competing objectives creates a policy conflict for the NSW Government. Divesting ownership of the network businesses would allow the Government to focus on a single objective of maintaining pressure to lower costs and the regulatory returns of these businesses.

It is proposed that, in the medium term, the NSW Government:

- Review the appropriateness of owning the transmission and distribution businesses.
- Ensure that regulatory arrangements for transmission and distribution reliability standards and economic regulation are appropriate to balance the interests of the network businesses and the electricity consumers.

Strengthening the interconnectors between regions will enhance competition in the national wholesale market. Medium term planning indicates a primary need to develop the high voltage link to supply the Sydney area and to accommodate gas fired generation and renewable generation.

It is proposed that the NSW Government:

- Prioritise transmission projects to strengthen the capacity of interstate flows in the National Electricity Market.
- Prioritise transmission projects to strengthen supply to the Sydney metropolitan area.

Strategic infrastructure priorities for electricity generation

To support private sector investment in low cost base load generation in the longer term, the NSW Government should consider providing consented (by the Department of Planning and Infrastructure) development sites in the forthcoming generation sale packages which are fuel and technology neutral. This would enable the buyer to choose the most cost effective investment and accelerate the development of the project several years faster than would otherwise be the case.

It is proposed that the NSW Government encourage investment in the lowest cost generation technology. The proposed strategies to achieve this are:

- Providing a development consented site for base load technology in the generation sale

package. This is to provide an incentive for private investment in low cost base load plant.

- Facilitating the planning for upgraded transmission connections and augmentations that may be required to ensure unconstrained market access by generators.
- Supporting the upgrading of gas transmission interconnections with the Queensland market to ensure availability of cost effective gas for supply to gas powered generators.

Further, the renewable energy target (RET) scheme and other schemes to encourage cleaner energy need to be reviewed in light of the introduction of the carbon price. The aim should be to remove duplication of schemes that have the same policy objective. Streamlining the cleaner energy schemes will help to reduce electricity costs and prices in NSW.

It is proposed that NSW Government conduct a review of the impact of the renewable energy target scheme and other schemes with a view to removing duplication of schemes that have the same objective as the carbon price.

Strategic infrastructure priorities for the gas infrastructure

The economic potential of the coal seam gas sector is game changing for NSW. Over the next twenty years the production of local coal seam gas will boost economic activity in NSW. The capital investment required in the coal seam gas industry will provide opportunity for regional job development.

Coal seam gas is a low greenhouse emitter and will assist in containing electricity prices in a carbon constrained economy. Development of the coal seam gas industry will enhance the security of gas supplies to NSW which is critical in light of the declining gas reserves in the southern basins.

It is important that the NSW Government establish a regulatory framework that supports the co-existence of coal seam gas extraction with agricultural production and environmental protection. This needs to occur as a matter of priority to give businesses and the community increased certainty and assurance about the future of the emerging industry.

Fulfilling the potential economic contribution of the coal seam gas sector will require substantial new investment in infrastructure. The private investment in new gas production and transmission pipelines over the next twenty years will be significant.

The infrastructure strategies to support the development of the coal seam gas industry are presented below.

It is proposed that the NSW Government support the development of a safe coal seam gas sector by:

- Strengthening the regulatory framework that ensures the development of a safe and environmentally responsible coal seam gas industry that co-exists with agricultural production.

- Facilitating development of new industries, and in particular, investigating options for LNG export infrastructure jointly with the Queensland Government.

In order to facilitate development of new industries and in particular LNG export infrastructure (possibly jointly with the Queensland Government), the Government can provide support for the development of the coal seam gas industry in a number of ways.

It is proposed that the NSW Government support a more integrated inter-jurisdictional gas system. This will include support for:

- Augmenting gas transmission between Queensland and NSW jointly with the Queensland Government. And in particular, supporting a new north-south gas transmission pipeline from Bowen and Surat Basin and Gunnedah Basin to Newcastle.
- Investigating the potential for investment in reverse-flow capabilities for gas transmission facilities that currently supply NSW from Victoria.

Strategic infrastructure priorities for the new smart technology

The deployment of smart meters to residential customers provides an opportunity for active energy and demand management. Smart meters combined with time of use and flexible pricing offer a way of providing customers with the opportunity to manage their energy use. Flexible prices may involve higher prices during peak periods and lower prices during off peak and shoulder periods. This type of pricing structure provides customers with the incentive to shift discretionary energy use away from peak periods.

The wider benefit offered by smart meters and flexible pricing is the potential to reduce peak demand on the network. In turn, this reduces the need for investment. Pricing trials conducted in NSW show promising signs of consumer responsiveness to pricing signals.

It is proposed that the NSW Government support the introduction, on a commercial basis, of smart meter technology and flexible pricing as a way to encourage demand side participation by customers and demand management by networks.

The proposed infrastructure strategies are intended to support the Government's energy policy objective to deliver a secure, reliable and affordable energy supply and encourage more innovation and investment in cleaner energy sources.

1. Introduction

1.1 Outline of the Strategy

Sapere Research Group (Sapere) was engaged by Infrastructure New South Wales (INSW) to prepare an Energy Infrastructure Strategy (Strategy) to identify priority infrastructure strategies for the electricity and gas sectors (energy sector). The premise of the work was to focus on achieving the energy and infrastructure policy objectives of the NSW Government.

The objective of this Strategy is to present an outlook of the energy infrastructure requirements for NSW during the next 20 years. Analysing future infrastructure requirements involved appraising the changes occurring in the electricity and gas sectors.

There are significant and unprecedented changes occurring in the energy sector. Not least, is the challenge of transforming the generation sector to cleaner energy technology. Challenges in the electricity network sector include addressing upward pressures on infrastructure costs as well as conflicting objectives faced by the Government as the owner of network businesses. Coming to light in the gas sector are issues surrounding the threat of declining gas reserves coupled with increasing exports to overseas markets.

Amongst these challenges, important opportunities are also emerging in NSW. In particular, the emerging coal seam gas industry has the potential to make NSW self-sufficient in gas. The potential benefits to the NSW economy are significant. The issue, of course, is to ensure that the coal seam gas industry is safe and meets environmental standards expected from the community.

New technologies in smart metering, smart grids and distributed generation are offering alternative approaches to the provision of energy from the traditional generation and network technologies. The new technologies have the potential to facilitate a more dynamic and responsive energy sector.

This Strategy document proposes priority strategies and investments needed to address the challenges and maximise opportunities emerging in the gas and electricity sectors over the next 20 years.

1.2 Structure

This document is structured as follows:

- Chapter 1 sets out the outline of this Strategy and the structure of the document.
- Chapter 2 provides an overview of government policies and priorities that will influence future infrastructure investments in the energy sector.
- Chapter 3 looks at trends in actual and forecast consumption for electricity and gas, and the long term demand and supply balance.
- Chapter 4 examines trends in energy prices and underlying costs and presents an indication of future prices.

- Chapter 5 identifies key issues in the electricity transmission and distribution sectors and proposes strategies to address the issues.
- Chapter 6 identifies challenges in the electricity generation sector and proposes strategies to meet the challenges.
- Chapter 7 considers the infrastructure required to maximise the benefits from the emerging coal seam gas sector including ways to maintain security of gas supplies at affordable prices.

2. Energy and infrastructure policy

It has been estimated that up to \$240 billion of new investment will be required in electricity and gas infrastructure in Australia by 2030.¹ The scale of this investment in energy infrastructure is unprecedented.

A large proportion of the required investment will occur in NSW. A key challenge for the NSW Government is to ensure that policies impacting energy infrastructure are made transparently and are aimed at achieving efficient and optimal investment outcomes. Clear and transparent policy will provide investors in the energy sector with greater certainty. Policy certainty will flow through into lower costs and better prices for NSW consumers and businesses.

The energy sector is a high priority as governments seek to transform the economy to cleaner energy sources. At the same time, the NSW Government is focused on finding ways to place downward pressure on costs and maintain energy affordability for the residential, commercial and industrial sectors.

This chapter provides an overview of government policies and priorities that will influence the future infrastructure investments in the energy sector.

2.1 NSW policies and priorities

The NSW Government is committed to rebuilding the State's infrastructure to support economic growth, improve productivity, competitiveness and the quality of life for NSW citizens. This commitment is contained in the *NSW 2021 - A Plan to Make NSW Number One* (NSW Plan). The NSW Government's vision outlined in the NSW Plan is to restore strength and resilience to the NSW economy.

The Government established Infrastructure NSW (INSW) to provide strategic policy direction and oversight for infrastructure planning and delivery. In establishing INSW, the Government expressed a clear position that it wanted to maximise investment by and involvement of the private sector.

This Strategy draws on the Government's energy and infrastructure policy objectives to guide the development of the proposed infrastructure priorities for the energy sector. The Government is committed to achieving a range of objectives in the energy sector. The policy objectives include:^{2, 3}

- Placing downward pressure on household electricity bills by containing energy costs through encouraging energy efficiency and more cost effective energy supply

¹ Investment Reference Group 2011, *A Report to the Commonwealth Minister for Resources and Energy*, p.4.

² NSW Government 2011, *NSW 2021 A Plan to Make NSW Number One*.

³ NSW Government 2012, *Submission to Australian Government's Draft Energy White Paper*.

- Introducing its Strategic Regional Land Use Policy which is based on the premise that mining and resources industries need to co-exist with agricultural production and environmental protection.
- Ensuring secure sources of electricity and gas for residential and business customers. This includes diversifying NSW gas supplies to improve security and reliability of supply.
- Encouraging innovation in technologies that help manage energy use and provide information to consumers and businesses.
- Maximising investment by and involvement of the private sector in delivering State's infrastructure.⁴

The NSW Government objectives have provided direction for the infrastructure strategies proposed in this report. In particular, developing the Strategy has focused keep down energy prices and maintaining security and reliability in the provision of services.

2.2 Role of government in energy

Energy is critical to the well being of the economy and community. The NSW Government is seeking to enable investment in energy infrastructure that will enhance economic growth and productivity. The Government's involvement in the energy sector can be segmented into a number of roles including that of policy maker and reformer, performance and safety regulator and shareholder.

2.2.1 Policy maker and reformer

NSW has been at the forefront of energy reforms at the national and jurisdictional level. Australia's energy reform program spanning the past two decades has seen the emergence of successful competitive markets in the wholesale and retail energy sectors. Reforms in the energy sector have been successful and have delivered greater choice and product innovation to customers. Reforms in the national wholesale and retail markets as well as the contestability of customer network connections in NSW has seen the private sector play a pivotal role in the energy sector.

The energy sector in NSW is for the most part privately owned. In November 2011, the NSW Government announced plans to privatise the three NSW government owned generators but to retain ownership of the electricity and transmission sectors.⁵

The success of reforms in the energy markets is changing the nature and scope of government involvement in the energy sector, especially in the electricity sector. The role of the NSW Government is changing from one of having direct investment and ownership to one that is more focused on maintaining effective policy, governance and regulatory

⁴ Hansard 2011, *Infrastructure NSW Bill 2011*, 26 May 2011.

⁵ O'Farrell MP, The Hon B. 2011, *NSW Government to Implement Tamberlin Inquiry Recommendations*, Media Release, 24 November 2011.

frameworks in the energy sector. Stable and transparent policy, regulatory and governance frameworks have replaced to need for direct government ownership.

Government ownership of businesses that operate in competitive or fully regulated markets is not necessary or appropriate.

2.2.2 Government as owner of electricity assets

The NSW Government currently has a significant investment in the electricity sector. Government owned assets are valued (at 'fair value') in the NSW Budget Papers at around \$30.5 billion.⁶ This investment comprises a total of:

- \$4.2 billion invested in three generators Delta Electricity, Eraring Energy and Macquarie Generation
- \$26.3 billion invested four network service providers - TransGrid, Ausgrid, Endeavour Energy and Essential Energy.

The value of the Government owned electricity businesses represents 12 per cent of the \$246 billion in total value of State owned assets. However, capital expenditure represents a much higher proportion of the State's total capital program. In the past ten years, capital expenditure by electricity businesses represented around 28 per cent of the State's total capital program. This trend is forecast to continue. In the next ten years they are expected to account for 27 per cent of the total capital program.⁷

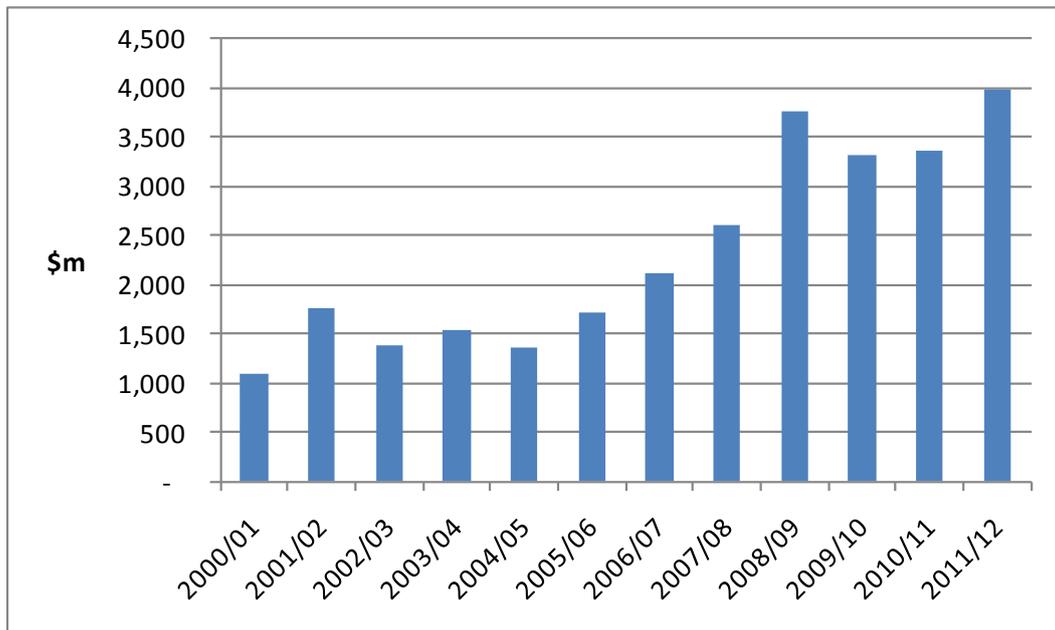
Figure 1 shows the trends in capital expenditure by Government owned electricity businesses since 2000/01. The capital investment information includes expenditure by the three generation businesses and the four network businesses.

The information presented in figure 1 shows a significant increase in capital expenditure by the government owned electricity businesses. From 2001/01 to 2011/12, total capital expenditure by this sector has increased from \$1.1 billion to \$4.0 billion. The average capital expenditure over this period was \$2.3 billion per year.

⁶ Information sourced from NSW Government, *Infrastructure Statement 2012-13, Budget Paper No. 4*. These values represent the physical values of the assets at fair value in accordance with accounting policies and standards. The values do not reflect market values or, in the case of the regulated electricity network businesses, the value of the regulatory asset base.

⁷ This information provided to INSW by NSW Treasury.

Figure 1 Capital expenditure by Government owned electricity businesses



Source: Information provided by NSW Treasury.

As well as the physical assets, the Government has a number of contractual obligations arising from the sale of the retail businesses and gentrader contracts in 2009. These obligations are for coal supply, wholesale supply and retail services. The Government will assess the generation businesses and gentrader contracts in 2013 following the recommendations of the *Final Report of the Special Commission of Inquiry into the Electricity Transactions* (Tamberlin Inquiry).

The NSW Government has announced that it will retain ownership of the transmission and distribution businesses. The Government has recently announced plans to merge the three state owned monopoly distribution corporations to reduce costs pressures in that sector. The merger will lead to savings of over \$400 million.

The Government as the shareholder of the network businesses has a role to protect their financial value while at the same time has a policy role to ensure electricity is affordable. Government ownership of these assets however creates contradictory and opposing objectives. This issue is discussed further in chapter 5.

2.2.3 Performance and safety regulator

A primary role of the NSW Government is to ensure the security and reliability of energy to meet the needs of customers. In NSW, participants in the wholesale and retail gas and electricity markets are required to be licensed and to comply with a range of safety and technical legislation.

The primary legislation applying to the electricity sector is the *NSW Electricity Act 1995* and the National Electricity Law and National Electricity Rules. The gas sector in NSW operates under the *Gas Supply Act 1996* and the National Gas Law and National Gas Rules.

These arrangements provide a comprehensive framework for regulation of technical performance of the energy sector.

2.3 National energy policy

Energy policy is increasingly being made at the national level. There are a number of reasons for this development including, most importantly, the establishment of national energy markets. A second important factor has been the Australian Government's policies and initiatives to transform the economy to cleaner energy technologies.

The commencement of the National Electricity Market in December 1998, the wholesale trading arrangements in gas, the opening up of energy retail markets and more recently the National Energy Customer Framework have led to the establishment of national governance and regulatory frameworks. Greater national harmonisation of arrangements in energy wholesale, transmission and distribution and retail markets have led to the establishment of:

- Coalition of Australian Governments (COAG) and Standing Council on Energy and Resources (SCER) as the institutions driving national energy policy reforms and initiatives.
- Australian Energy Market Commission (AEMC) providing advice on the national policy and administering changes to the National Electricity Rules (NER) and National Gas Rules (NGR).
- Australian Energy Market Operator (AEMO) performing the role of national transmission planner in electricity and operator of the National Electricity Market as well as the retail and wholesale gas markets of south eastern Australia.
- Australian Energy Regulator (AER) as the economic regulator for regulated transmission and network businesses and ensuring industry compliance to the NER and NGR.

These governance frameworks have been set up to pre-empt and address risks and challenges facing the energy sector. This framework has resulted in greater consultation on national reforms and policies.

Developments in the NSW energy sector are increasingly being influenced by the Australian Government policies and initiatives. To a large extent, the Australian Government's mandate has been driven by climate change. The *Clean Energy Future* package, the Renewable Energy Target and energy efficiency programs are key initiatives driven by the challenge of climate change. The Australian Government is preparing a White Paper on energy which is likely to influence future policies in the NSW energy sector.⁸

The AEMC is currently involved in a range of significant reviews relating to the monopoly networks.⁹ These reviews cover a range of topics including economic regulation, demand

⁸ The Australian Government released the *Draft Energy White Paper 2011: Strengthening the foundations for Australia's energy future* for consultation in December 2011.

⁹ Further, the AEMC is scheduled to commence a review into the competitiveness of the NSW energy retail sector in 2012.

side participation, distribution network reliability standards, transmission frameworks and distribution planning and investment arrangements. The reviews and proposed Rule changes will have ramifications on future planning and investment arrangements for the NSW owned networks businesses.

The national governance frameworks and recent energy policy initiatives are likely to have significant impacts on energy policy and infrastructure in NSW. The governance frameworks and policy initiatives are discussed in more detail below.

2.3.1 COAG and SCER

COAG plays an important role in shaping policy and key reforms in the energy sector. In the past two decades, COAG has developed and implemented nationally significant energy reforms on a cooperative basis with State and Territory Governments. The NSW Premier is a member of COAG.

SCER (formerly the Ministerial Council on Energy) has been established to achieve COAG's strategic themes. The SCER's policy responsibilities include oversight of Australian energy markets, including electricity and gas. There is a particular focus on enhancing the efficiency of energy supply; energy security; sustainable development of resources; and facilitating the economically competitive development of Australia's resources. The NSW Minister for Resources and Energy is a member of SCER.

The key strategic issues being discussed by SCER include:¹⁰

- Coal seam gas regulatory framework and agreeing to the development of a national harmonised regulatory framework for the coal seam gas industry.
- Gas market developments and actions that SCER may take to facilitate the timely market delivery of infrastructure to meet Australia's domestic gas needs.
- Energy market resilience noting the range of challenges facing the energy sector over the next few years.
- Smart meters.

The national governance frameworks are proving to be effective and efficient mechanisms for delivering continuous reforms across Australia's energy markets. The national energy policy priorities and directions established by COAG and SCER will have an important influence on the energy sectors in NSW.

2.3.2 Draft Energy White Paper

The Australian Government released the *Draft Energy White Paper* in December 2011. The *Draft Energy White Paper* provides a review of Australia's future energy needs to 2030 and sets out a strategic policy framework to guide future developments. The paper also integrates and complements many of the elements in the Australian Government's *Securing a Clean Energy Future* package.

¹⁰ Refer to SCER website <http://www.scer.gov.au/>

The *Draft Energy White Paper's* policy framework is based on the core energy objective to build a secure, resilient and efficient energy system that: provides accessible, reliable and competitively priced energy for all Australians; enhances Australia's domestic and export growth potential; and delivers clean and sustainable energy.

The paper identifies priority areas that will strengthen Australia's ability to fully realise its future energy potential. These priority areas are:

- strengthening the resilience of Australia's energy policy framework
- reinvigorating the energy market reform agenda (markets and energy productivity)
- developing Australia's critical energy resources – particularly Australia's gas resources
- accelerating clean energy outcomes.

The outlook presented in the *Draft Energy White Paper* is that while Australia's energy security to 2030 is robust and positive, there are possible risks and an unprecedented set of challenges. The challenges facing the energy sector include rising energy prices and unprecedented scope of the technological transformation and the scale of the investment task. The paper identifies that a large and sustained level of investment will be required in Australia's energy sector in the period to 2030 and beyond. This investment is necessary to provide reliability of supply to meet energy security needs while also supporting the transition to clean energy.

The *Draft Energy White Paper* has been developed as a basis for consultation on the future directions and priorities for Australian energy policy.

The NSW Government's submission¹¹ to the *Draft Energy White Paper* welcomed its release and commented that the challenges posed by costly energy infrastructure investment requirements, growing global demand for resources, rising Australian cost of living pressures and a growing share of renewable electricity generation are complex.

The NSW Government submissions called for co-ordinated policy responses across all levels of Government and noted in particular the Commonwealth's carbon pricing mechanism and minerals resource rent tax have substantially changed the policy landscape. These initiatives have given rise to a need for the Commonwealth to take on new areas of responsibility including financial assistance measures directed at rising energy costs.

In its submission, the NSW Government highlighted what it considered to be priorities for the Commonwealth in preparing the Energy White Paper. The priorities included gas supply security and reliability; protecting vulnerable households; energy financial assistance; and supporting low emission energy. The Australian Government's final White Paper will be released later in 2012.

2.3.3 Regulatory oversight

Electricity transmission and distribution networks, gas distribution and some gas transmission pipelines are considered to be monopolies in their geographic areas or markets.

¹¹ NSW Government 2012, *Submission to Australian Government's Draft Energy White Paper*.

These networks are subject to economic regulation by the AER. Economic regulation provides oversight of the prices, terms and conditions for access to the networks and pipelines.

The AER has submitted a Rule change proposal to the AEMC seeking to make changes to the Rules regulating transmission and distribution prices and revenues. This matter is discussed in more detail in chapter 5.

The AEMC is currently considering a range of other important matters that when finalised are likely to impact transmission and distribution investment incentives and decisions in future periods. The topics include:

- *Transmission Frameworks Review.* The MCE (now SCER) directed the AEMC to prepare a review into electricity transmission network frameworks. The focus of the Review is on network investment; network operations; network charging, access and connection; and management of network congestion.
- *Distribution Network Planning and Expansion Framework.* In March 2011, the SCER submitted a Rule change request to the AEMC in relation to the introduction of a new national framework for electricity distribution network planning and expansion. The Rule change request follows the AEMC's *Review of National Framework for Electricity Distribution Network Planning and Expansion*, completed in September 2009. As a result of the 2009 review, the AEMC recommended amendments to the national planning framework for distribution.
- *Distribution Reliability Standards and Outcomes Review.* SCER has directed the AEMC to undertake two reviews of distribution reliability standards and outcomes. The first review is to focus on distribution reliability outcomes in NSW and requires that the AEMC analyse the reliability standards and consequent outcomes to date, including verification that the NSW approach is appropriate, and estimation of willingness-to-pay for reliability in NSW.

Each of these matters, depending on the findings of the AEMC, may impact on the costs, operations and investment incentives on the transmission and distribution businesses. The reviews are discussed in chapter 5.

The process for reviewing the rules by the AEMC is an integral feature of the governance arrangements under the National Electricity and National Gas Laws. The review process allows for proponents to request rule changes. This feature of the governance arrangements facilitates flexibility and adaptability of the regulatory framework and allows changes to be made in the energy markets on a continuous basis.

2.4 Implications for energy infrastructure

The reforms in the electricity and gas sectors have succeeded in delivering well-functioning competitive wholesale and retail markets. The success of the energy reforms has had two important impacts:

- Reduced the need for direct government investment and ownership of energy businesses.
- Increased the national character of the retail and wholesale markets in electricity and gas.

The success of competition reforms in the energy sector has seen an increase in private sector investment in the energy market. The willingness of investors to enter the market together with strong and comprehensive regulatory frameworks and governance arrangements reduce the need for direct government ownership and investment in assets.

The national character of the energy sector means it is important that national energy policy is developed on a national basis. The governance arrangement with COAG and SCER having national oversight and leadership provides an effective and transparent approach to policy setting on national energy matters. This model has been successful in delivering effective reforms in the energy sector.

The NSW Government participates in national policy development as a member of the COAG and the SCER. These governance arrangements will continue to influence future policy direction and therefore will affect infrastructure.

In this environment, the most important role for the NSW Government is to maintain stable and transparent policy, governance and regulatory frameworks. This will enhance transparent decision making processes and will result in greater certainty for customers and investors.

The proposed strategies in this report aim to provide greater policy certainty to assist the dialogue between NSW Government and the private sector by identifying challenges and opportunities in the next 20 years. Greater policy certainty will assist with timely planning and coordination of infrastructure required for the economic and social wellbeing of the community.

3. Energy consumption

Investment in electricity and gas infrastructure is driven by the need to meet energy requirements of residential and business consumers. Growth in demand for energy is driven by the interaction of a number of factors including economic activity, population growth, energy prices and lifestyle.

There has been a change in the pattern of energy use by residential consumers including an increase in the average number of household appliances rising from 46 in 2000 to 67 in 2010.¹² Further, NSW has been experiencing an upward trend in maximum demand. This has been driven by increasing penetration rates in NSW households of air conditioning units. The changing pattern of electricity use is an important factor influencing investment in electricity infrastructure – both networks and generation.

Projecting energy growth, however, is becoming an increasingly complex task due to the changing dynamics of the energy market. There is uncertainty about the impact of government policies (especially carbon pricing), evolving technologies and consumer responses. The full extent of the impact of the new policies is unknown and as such energy forecasts are only indications of future trends. The difficulty of forecasting energy requirements adds complexity to planning long term energy infrastructure requirements.

This chapter looks at trends in actual and projected demand for electricity and gas, and the long term demand and supply balance. This information will help to inform infrastructure requirements over the next twenty years.

3.1 Demand for electricity

3.1.1 Actual and projected energy

In 2011/12, the amount of electricity consumed in NSW was about 71,468 GWh.¹³ This represents the highest level of electricity consumption in Australia and significantly higher than Queensland with 49,374 GWh and Victoria 46,871 GWh.

The size of the energy consumption reflects the fact that NSW is the most populous state in Australia. And of all the jurisdictions, NSW has the largest manufacturing base in Australia, with steel, aluminium and metal production centres. NSW has a significant primary industry sector, particularly in the areas of agriculture and mining.

¹² Simshauser, P and Nelson, T 2012, *The Energy Market Death Spiral -Rethinking Customer Hardship*, Working Paper No.31, AGL Applied Economic and Policy Research, p.10. The authors comment that ‘Growth in the number of appliances within the household such as air-conditioning, clothes dryers, and the extent of discretionary goods such as computing equipment, flat screen televisions and set-top boxes has also been important, with the average household stock increasing from 46 appliances in 2000 to 67 appliances in 2010, with an average of 38 appliances plugged-in, and 25 appliances at anytime using standby power’.

¹³ AEMO 2012, *National Electricity Forecasting Report*. The figures for 2011/12 are estimates.

There are around 3.4 million customers in NSW, including 3.1 million residential and 372,000 business customers.¹⁴ While fewer in number the business sector consumes around 70 per cent of total electricity compared to 30 per cent by the residential sector.¹⁵ The high proportion of electricity consumed by the business sector highlights the importance of electricity to the health of the NSW economy.

For around that past 50 years, energy consumption¹⁶ was growing at an annual average rate of about 2 per cent then from 2007/08 started to trend into negative growth. Between 2005/06 to 2010/11, annual electricity consumption in NSW averaged 74,924 GWh.¹⁷ In 2011/12, consumption dropped by a significant 4.1 per cent to 71,468 GWh from 74,512 the previous year.¹⁸ This is shown in figure 2 on the next page.

Over the period from 2005/06 and 2010/11, energy growth in NSW slowed down to an average 0.3 per cent per annum.¹⁹ This was consistent with national trends in energy consumption.

There is no one simple answer to explain the significant decline in energy consumption.

In July 2012, AEMO published long term electricity forecasts for the National Electricity Market. The 2012 *National Electricity Forecasting Report* represents the first time AEMO has developed independent electricity demand forecasts on a consistent basis for the regions in the National Electricity Market.

The modelling assumes a range of growth scenarios. During 2012/13 to 2021/22, under a medium growth scenario, energy consumption is projected to increase in NSW by 1.2 per cent per annum. Under other modelled scenarios, energy is projected to increase at an average annual rate of 1.6 per cent under the high growth scenario and 0.3 per cent under the low growth scenario.

Despite the positive growth projections, the rate of growth is down from the projections published in the previous year by AEMO. In 2011, it was projected that energy consumption would grow by 1.6 per cent per annum.²⁰

AEMO explained that the most recent downward shift in projected growth was due to several reasons including:²¹

¹⁴ ESAA 2011, *Electricity Gas Australia*, table 3.2.

¹⁵ Analysis prepared from data using ESAA 2011, *Electricity Gas Australia*, tables 3.2 and 3.3.

¹⁶ The term 'energy' is used to describe the volume of electricity consumed. AEMO energy projections are presented on a 'sent-out' basis. Meaning that, energy projections include customer load and network losses, but not generator auxiliary loads.

¹⁷ Data for this analysis was sourced from AEMO 2012, *National Electricity Forecasting Report*, table 4-1.

¹⁸ Data used for this analysis was sourced from AEMO 2012, *National Electricity Forecasting Report*, p.4-4. The figures for NSW include the ACT.

¹⁹ Data for this analysis was sourced from AEMO 2012, *National Electricity Forecasting Report*, table 4-1.

²⁰ AEMO 2011, *Electricity Statement of Opportunities for the National Electricity Market*.

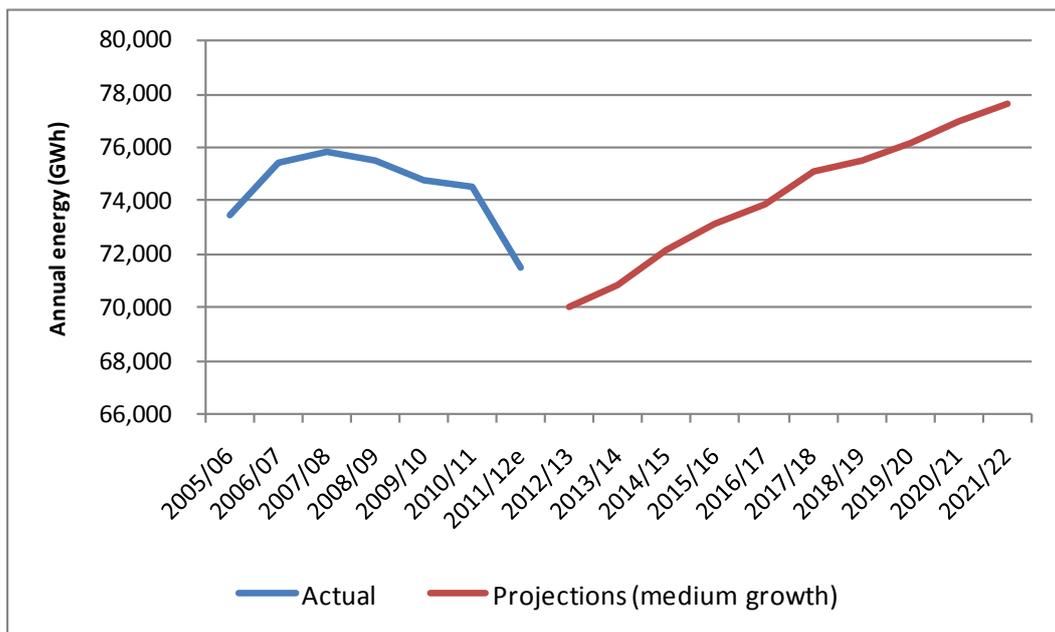
²¹ AEMO 2012, *National Electricity Forecasting Report*, p.4-2.

- reduced consumption from large industrial customers (including the aluminium smelter at Kurri Kurri)
- increased penetration of rooftop photovoltaic (PV) units
- reduced manufacturing in response to the high Australian dollar
- lower economic growth (measured by gross state product (GSP)) relative to the GSP assumptions in the previous year
- higher electricity prices resulting in consumers reducing their consumption
- energy efficiency measures reducing the amount of energy used by consumers.

The growth projections for NSW are lower than the National Electricity Market wide projections. In the National Electricity Market, under the medium growth scenario, electricity is projected to increase over the next ten years by an average annual rate of 1.7 per cent (down from projections published in 2011 of 2.3 per cent per annum).

Figure 2 shows the actual energy consumed and projected energy growth for NSW. It shows actual energy for 2005/06 to 2010/11 and an estimate for 2011/12. The projections are for the ten years from 2012/13 to 2021/22.

Figure 2 NSW actual and estimated energy from 2005/06 to 2011/12 and projections from 2012/13 to 2021/22



Source: AEMO 2012, *National Electricity Forecasting Report*, p.5-4.

Figure 2 shows the downturn in energy starting to occur in 2007/08 and a sharp decline in 2011/12. The negative growth is projected to continue in 2012/13 with negative growth of 2 per cent. From 2013/14 energy is projected to trend back to positive growth. From 2012/13 to 2021/22, energy consumption is projected to grow by 1.2 per cent per annum.

AEMO prepared a breakdown of forecast growth rates for the ‘mass market’ and ‘large industrial customers’. The results for NSW show that in the ten years from 2012/13 to 2021/22, the average annual growth is forecast to be 1 per cent for the mass market segment

and 1.4 per cent for the large industrial segment (under a medium scenario). AEMO explained that growth in the large industrial segment is expected to be buoyed by the expansion of gold and coal mines.

The energy projections need to be considered together with maximum demand projections.

3.1.2 Actual and projected maximum demand

Maximum demand²² is a significant driver of investment in electricity networks. Maximum demand represents the highest amount of electrical power delivered over a defined period.

Electricity is supplied the instant consumers want to use it. Networks are built to ensure there is sufficient capacity to transport electricity as it is demanded. Under the current regulatory arrangements, networks are required to meet mandated reliability standards. The regulatory requirement to meet reliability standards is a key investment driver for networks.

During the period from 2005/06 to 2011/12, the highest maximum demand in NSW occurred in 2010/11. In this year, maximum demand was 14,863 MW.²³

During 2005/06 to 2011/12, the level of maximum demand fluctuated greatly from year to year. From 2007/08 to 2008/09, maximum demand increased by 9.4 per cent but from 2010/11 to 2011/12 it fell by a substantial 18.3 per cent.

Until the large drop in 2011/12, maximum demand during the period from 2005/06 to 2010/11 had been trending upwards by a strong 2.3 per cent per annum. This trend in actual maximum demand is shown in figure 3.²⁴

AEMO forecast that under a medium growth scenario, maximum demand is projected to increase annually by 1.2 per cent over the period from 2012/13 to 2021/22.²⁵ This is significantly less than the projected annual increase of 1.9 per cent published by AEMO in 2011 (in the 2011 ESOO).

Maximum demand is influenced by a number of factors including weather conditions such as temperature and humidity. The upward trend in maximum demand from 2005/06 to 2010/11 can be attributed largely to increasing penetration rates of air conditioning in the

²² Maximum demand is defined as the highest amount of electrical power delivered, or forecast to be delivered, over a defined period (day, week, month, season, or year) either at a connection point, or simultaneously at a defined set of connection points. AEMO's maximum demand projections are presented on an 'as-generated' basis. This includes customer load, the network losses, and generator auxiliary load. In this report the terms 'maximum demand' and 'peak demand' are used interchangeably.

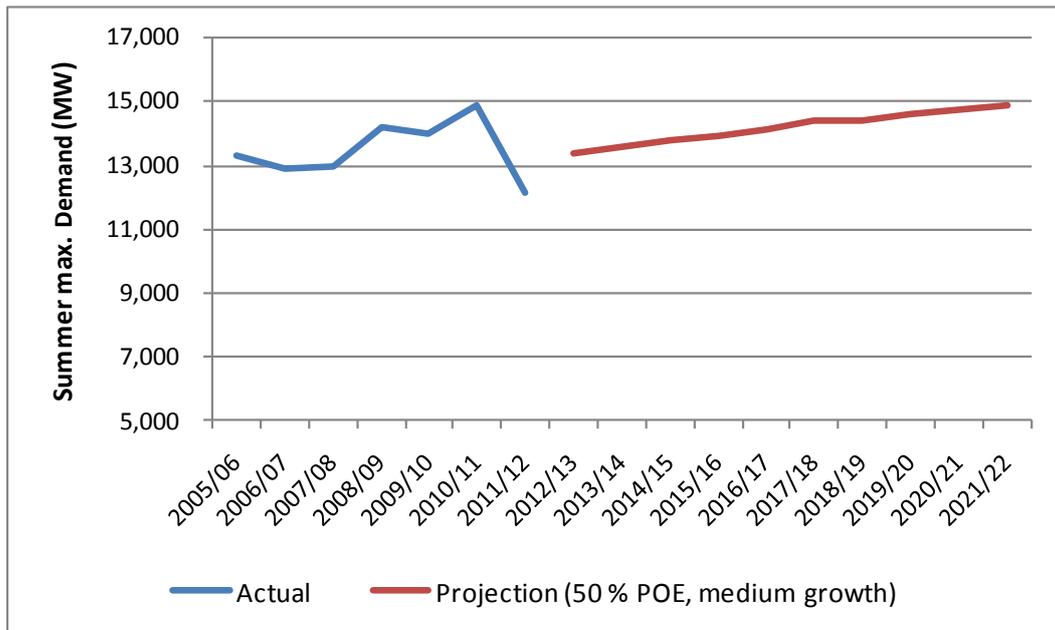
²³ AEMO 2012, *National Electricity Forecasting Report*, p.4.10.

²⁴ In NSW, the actual summer maximum demand is higher than the winter maximum demand and as such the analysis here is based on the summer maximum demand.

²⁵ Under the 50% probability of exceedence (POE). For any given season, the: 10% POE maximum demand projection is expected to be exceeded, on average, 1 year in 10; 50% POE maximum demand projection is expected to be exceeded, on average, 5 years in 10, and 90% POE maximum demand projection is expected to be exceeded, on average, 9 years in 10. Refer to AEMO 2011, *Electricity Statement of Electricity Opportunities*, pp.3-6.

residential sector.²⁶ For example, residential air conditioning unit penetration has risen to approximately 74 per cent in Western Sydney.²⁷

Figure 3 NSW actual maximum demand from 2005/06 to 2011/12 and projections from 2012/13 to 2021/22



Source: AEMO 2012, *National electricity forecast report*, p.4-10.

The upward trend in maximum demand of 1.2 per cent per annum is consistent with the projected growth in energy of 1.2 per cent per annum. These most recent projection showing similar rates of growth in energy consumption and maximum demand is contrary to the trend that has been occurring in recent years.

To recall the above discussion, from 2005/06 to 2010/11 annual growth in actual energy rose by a mere 0.3 per cent, while maximum demand grew by 2.3 per cent. The strong growth in maximum demand relative to energy has implications for the 'load factor' on the networks.

A load factor measures the ratio of maximum demand compared to energy consumption. A declining (worsening) load factor means that maximum demand is growing more quickly than energy consumption. Worsening load factors means that utilisation of the network is

²⁶ It has been reporting that typically about 30-40 per cent of commercial sector demand and 40-50 per cent of residential sector demand on system peak summer days is due to air conditioning. Sourced from George Wilkenfeld and Associates 2004, *A National Demand Management Strategy for Small Air-conditioners*, Report prepared for the National Appliance and Equipment Energy Efficiency Committee and the Australian Greenhouse Office.

²⁷ Integral Energy 2008, *Regulatory proposal to the Australian Energy Regulator 2009 to 2014*, p.7.

becoming less efficient. This places pressures on per unit cost of electricity transported by networks.

To meet the growth in maximum demand (and to meet mandated reliability standards) networks build more infrastructure capacity. Maximum demand has played a role in driving up average electricity prices. Analysis by Ausgrid (formerly EnergyAustralia) indicated that ten per cent of network capacity is used for less than one per cent of the time.²⁸ That is, ten per cent of the distribution network assets are used for less than four days of the year.

As previously discussed, growth in energy volumes through the network has slowed down relative to maximum demand in recent years. This has resulted in higher levels of network infrastructure investment being recouped from lower volumes of energy. Worsening load factors add pressure to electricity costs and this has contributed to increasing electricity prices.

There are ways to help improve NSW load factors and potentially reduce pressure on infrastructure costs. This is discussed in section 3.6.

While most attention has focused on the impact of peak demand on network prices, there is also an impact on wholesale prices. High demand, in the absence of demand management, also requires sufficient investment in peaking generation such as open cycle gas turbines. Generators that are built to meet peak demand (and in some cases mitigate the risk of volatile wholesale spot prices for their owners) are not dispatched for many hours of the year. This type of plant needs to recover the capital and operating costs for a small amount of output in a short amount of time. This makes the prices bid by peaking plant higher relative to base load plant.

3.2 Electricity demand and supply outlook

3.2.1 Ten year outlook

AEMO prepares a ten year demand and supply outlook which assesses the adequacy of electricity supplies in the National Electricity Market for each region including NSW. The modelling considers a number of factors including maximum demand projections, demand-side participation, existing and committed generation capacities and transmission network capabilities. The ten year outlook of demand and supply indicates potential timing for generation and demand side investment.

AEMO modelling identifies the timing of low reserve condition points which indicate when reserve margins will potentially fall below minimum reserve levels. A low reserve condition point indicates when the power system will drop below long term system reliability standards. A low reserve condition point does not mean that load shedding will occur.

²⁸ EnergyAustralia 2003, *Public regulatory presentation to IPART* and IPART 2004, *NSW Electricity Distribution Pricing 2004-05 to 2008-09 - Final Report*, p 89.

In the 2012 ESOO, AEMO modelling indicated that NSW will not face a reserve deficit prior to 2021/22.²⁹

The 2012 outlook is in contrast to the one made in the 2011 ESOO which indicated NSW would reach its low reserve capacity point in 2018/19 with a deficit of between 190 and 367 MW.³⁰

A number of factors have contributed to improving the demand and supply outlook. These factors include significant reductions in annual energy and maximum demand projections.

A large part of this reduction would have been due to the recent closure of the Kurri Kurri aluminium smelter. In March 2012, AEMO updated the low reserve condition for NSW projected in the 2011 ESOO. At that time, it estimated the low reserve deficit would reduce by 86 MW from 190 to 104 MW because of Kurri Kurri reducing its output by one third).³¹ Therefore the complete closure of the aluminium smelter announced in May would have made a significant contribution to pushing back the NSW low reserve point by a number of years.

3.2.2 The next twenty years

AEMO in its role as the National Transmission Planner prepares the National Transmission Network Development Plan (NTNDP) on an annual basis. The NTNDP presents a 20 year strategic plan for the electricity transmission network and energy needs for the eastern and south eastern states. AEMO develops the NTNDP in collaboration with the electricity industry, governments and key stakeholders. AEMO takes into consideration the whole National Electricity Market transmission system including interconnectors between regions.

The 2010 NTNDP considered five scenarios in detail, ranging from a high economic growth, high carbon price scenario (Fast Rate of Change) to a low economic growth, low (or no) carbon price scenario (Slow Rate of Change). The scenarios consider whether new generation investment will be in the form of larger, centralised power stations or smaller, distributed generation close to load centres. The scenarios outline a range of possible key issues facing the energy industry and investors including the impact of carbon pricing.

AEMO's modelling assumed that NSW will experience the lowest percentage energy growth across most scenarios. NSW maximum demand growth is only slightly higher than South Australia's which has the lowest growth.

Figure 4 shows the results for existing and projected generation installed capacity to 2029/30 under the Decentralised World scenario with medium carbon price.

The location and type of installed generation capacity modelled varies significantly across the scenarios, reflecting the differences in each scenario's assumed fuel costs, though there

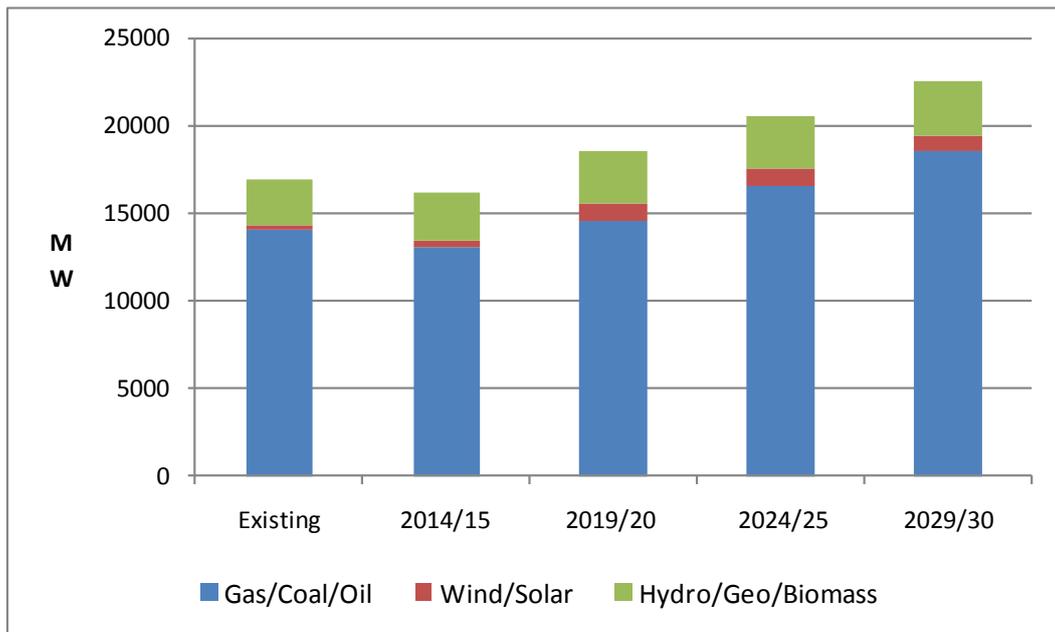
²⁹ AEMO 2012, *Electricity Statement of Opportunities for the National Electricity Market*, p.2-2.

³⁰ AEMO 2011, *Electricity Statement of Opportunities for the National Electricity Market*, p.7-10.

³¹ As of January 2012, the Kurri Kurri aluminium smelter closed one of its three potlines, As of May 2012, Norsk Hydro announced a total curtailment of production. Refer to www.hydro.com/en/Press-room/News/Archive/2012/Hydro-is-considering-full-curtailment-of-the-Kurri-Kurri-aluminium-plant-in-Australia

remain significant amounts of existing base load black coal generation across all scenarios. In the data shown in figure 4, the proportion of projected generation capacity of gas, coal and oil averages around 80 per cent of total capacity for the period from 2014/15 to 2029/30.

Figure 4 Existing and projected NSW installed generation capacity – decentralised world



Source: AEMO 2010, *National Transmission Network Development Plan*, p.93.

Based on AEMO’s scenario modelling in the 2010 NTNDP, between \$40 billion and \$130 billion in investment will be required to augment the shared transmission network and develop new generation assets across the National Electricity Market to meet demand over the next 20 years.³² The implications for NSW are discussed in chapters 5 and 6.

The 2011 NTNDP expands and updates the work prepared in 2010. This includes the way demand projections are developed and includes potential impacts of electric vehicles, small-scale generation and the projected increase in wind generation.

Data released with the 2011 NTNDP provides indicative figures for future generation capacity requirements. According to the modelled scenarios, NSW may require around 7,000 MW of new base load generation by 2029/30.³³

While the figures are indicative, the analysis suggests there will be a need for investment in large scale generation by around 2029/30.

³² AEMO 2010, *National Transmission Network Development Plan*, p.34.

³³ AEMO 2011, *National Transmission Network Development Plan*, data for figure 7-6.

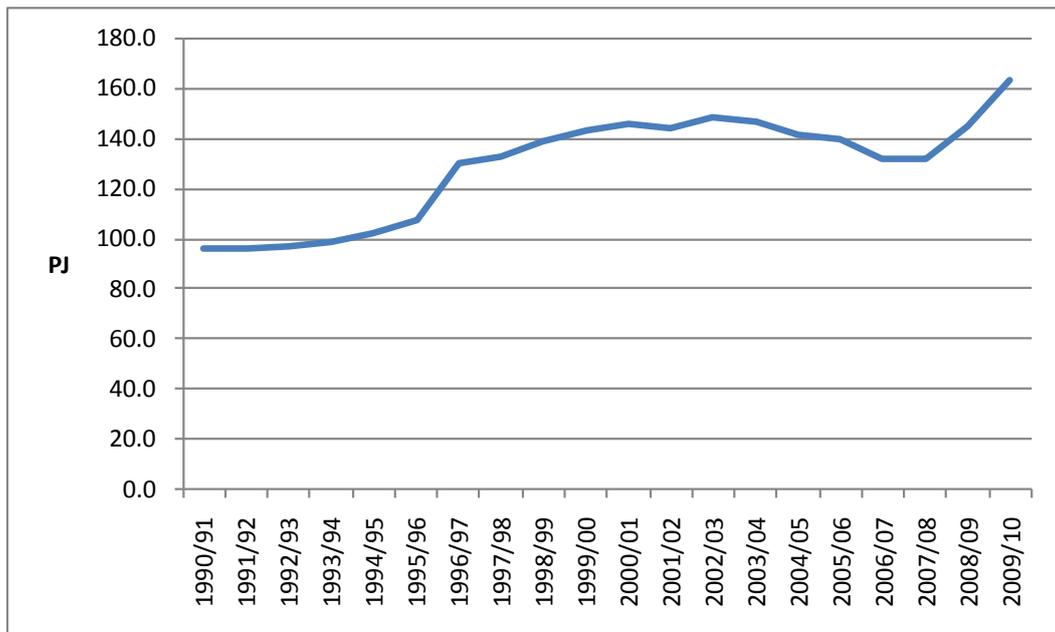
In addition to the findings by AEMO, the Australian Government has indicated that under the *Clean Energy Future* package up to 2,000 MW of generation will be invited to tender for closure by 2020.³⁴ The closure of this amount of base load plant is likely to impact on the demand and supply balance after 2020.

3.3 Demand for gas

3.3.1 Actual and projections

In 2009/10, NSW consumed 164 PJ of gas which represents around about 14 per cent of the total consumption in Australia (1,049 PJ). In the twenty years from 1990/91 to 2009/10 consumption of gas in NSW increased by 70 per cent (from 96 PJ to 164 PJ per annum).³⁵ The trend in gas consumption is shown in figure 5.

Figure 5 Gas consumption in NSW 1990/91 to 2009/10



Source: Prepared from data released with Bureau of Resource Economics 2012, *Energy in Australia*.

The increase in consumption of gas averaged 3.5 per cent a year. Of note, gas consumption in 2008/09 and 2009/10 increased by 10 per cent and 13 per cent respectively. This is attributed to the increased in gas used to supply three gas fired generation plants in NSW.

In 2009/10, there were 1,277,766 residential, small commercial and industrial gas connections and 448 large commercial and industrial connections.³⁶ Of the total gas

³⁴ Australian Government 2011, *Securing a clean energy future, The Australian Government's Climate Change Plan*, p.71

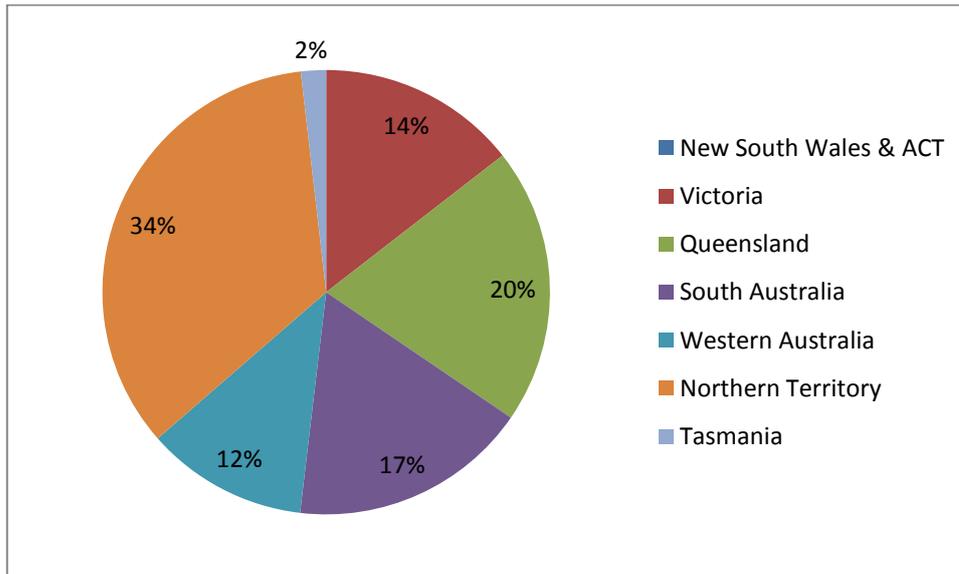
³⁵ Gas consumption data sourced from information released with Bureau of Resources and Energy Economics 2012, *Energy in Australia*.

³⁶ ESAA 2011, *Electricity Gas Australia*, table 5.5.

consumption in NSW, 34 per cent was used by the mass market; 53 per cent by large industrial customers; and 13 per cent by gas fired generation.³⁷ This analysis shows that gas is an important source of energy for industrial customers and electricity generation.

From a national perspective, NSW is the fourth largest consumer of gas (14 per cent) after Western Australia (34 per cent), Victorian (20 per cent) and Queensland (17 per cent).³⁸ This is shown in figure 6.

Figure 6 Primary natural gas consumption by jurisdiction



Source: ESAA 2011, *Electricity Gas Australia*, table 5.1.

3.3.2 Projections for gas consumption to 2030

NSW gas consumption is projected to grow to around 505 PJ in the next twenty years.³⁹ This is an average annual rate of growth of around 7 per cent. This projection is based on a medium growth scenario.⁴⁰

This projection is based on work prepared by AEMO for the regions in the National Electricity Market. The AEMO projections use three different scenarios Fast Rate of Change, Decentralised World (medium growth) and Slow Rate of Change.⁴¹ Projections prepared by AEMO show that annual demand is projected to grow at average rates ranging

³⁷ AEMO 2011, *Gas Statement of Opportunities for Eastern and South Eastern Australia*, p.5-9.

³⁸ Gas consumption data sourced from ESAA 2011, *Electricity Gas Australia*, table 5.1.

³⁹ Information released with the AEMO 2011, *Gas Statement of Opportunities for Eastern and South Eastern Australia*. This is the projection under a “decentralised world” scenario.

⁴⁰ The information presented excludes gas demand for export of LNG from NSW.

⁴¹ The NSW/ACT demand groups includes the Sydney area; ACT area; northern NSW area; along the Eastern Gas Pipeline and along the Moomba to Sydney Pipeline.

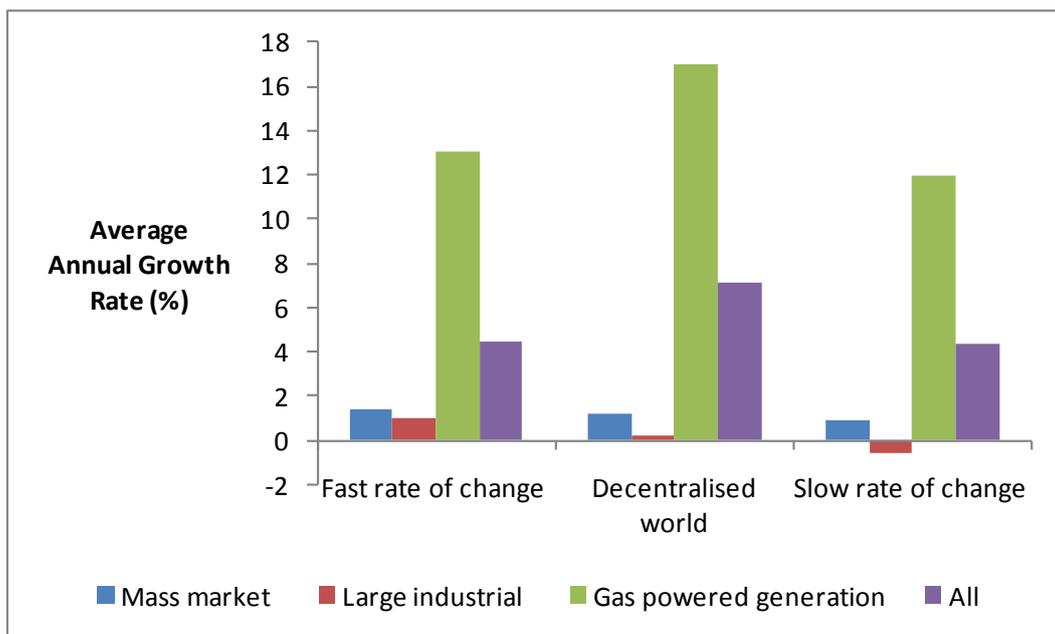
from 4.5 per cent to 7.1 per cent depending on the modelled scenario.⁴² Projections for NSW are higher than the projections for all other National Electricity Markets regions which range from 2.9 to 4.8 per cent per annum.

The modelling has been broken down into three segments: mass market, large industrial and gas powered generation.

The most significant factor influencing demand for gas in NSW will be supplying gas fired generation. As discussed previously, demand from gas fired generation significantly drove up gas consumption in 2008/09 and 2009/10. Other key factors that will influence future gas demand include economic activity and population growth; and growth in new residential developments such as in the north and south west growth areas in Sydney, South Wollongong, Central Coast and Hunter regions.⁴³ Energy efficiency requirements for new housing (BASIX) will increase the demand for gas at the expense of electricity.⁴⁴

The average annual rate of growth in demand for each of these market segments in the next twenty years is shown in figure 7. As shown, demand from gas fired generation outstrips demand from other market segments.

Figure 7 Gas demand average growth rates by market segment – 20 year projections



Source: Data sourced from AEMO 2011, *Gas Statement of Opportunities for Eastern and South Eastern Australia*.

⁴² AEMO 2011, *Gas Statement of Opportunities for Eastern and South Eastern Australia*, p.5-56.

⁴³ GHD analysis prepared for INSW.

⁴⁴ Every development application for a new home must be submitted to Council with a BASIX Certificate. BASIX is a planning tool aimed at ensuring homes are designed to use less potable water and be responsible for fewer greenhouse gas emissions by setting energy and water reduction targets for house and units.

In all three scenarios, gas demand by gas fired generation increases at an average rate of 12 per cent per annum. This increase is influenced by the carbon price assumptions and favourable gas prices. The large industrial market segment which is larger than the mass market segment is projected to grow by 0.2 under the Decentralised World scenario.

In its submission to the NSW Coal Seam Gas Inquiry, the NSW Government commented that the demand for gas from gas fired generation will increase 12 fold from around 30 PJ in 2011 to 350 PJ per annum in 2030. That is, in around twenty years, gas demand from gas fired generators will make up two thirds of total NSW gas demand.⁴⁵

The Sydney area, Newcastle and Wollongong have the largest gas demand base from residential and commercial users in NSW. Annual gas demand in these areas is projected to grow at average rate of 8 per cent under a medium growth scenario.⁴⁶

In 2010/11, daily demand for gas in NSW averaged 436 TJ per day. Peak demand ranged from 250 and 620 TJ per day. NSW winter peak day gas demand is forecast to increase by 480 TJ to over 1,100 TJ by 2020.⁴⁷ Gas pipeline are able to store enough gas to be able to manage the daily variations in peak demand (unlike in electricity where there is no option for storing electricity and demand and supply must be matched simultaneously).

Meeting the increasing demand for gas, and in particular, from new gas generation will be a significant factor influencing infrastructure requirements. New pipelines will be required to transport gas to the generators. The importance of gas fired generators in the next twenty years also highlights the need to ensure the security of gas supplies in NSW.

3.3.3 Potential supply to LNG export markets

This section presents annual demand projections prepared by AEMO that include potential export of LNG from Newcastle. Modelling of gas demand under the Fast Rate of Change scenario, results in significant increases in demand for gas. In contrast, there is no increase in the Slow Rate of Change and the Decentralised World scenarios.

The Fast Rate of Change scenario assumes high economic growth, high gas prices after 2017 and a high carbon price. Under the Fast Rate of Change scenario, four stages of LNG export facility development are added to the domestic demand projections. In this case, gas demand in NSW/ACT increases by a factor of ten over the 20 year outlook period.⁴⁸

The modelling appears to be predicated on developments in Queensland. AEMO projections of gas demand for LNG export in a range of scenarios found that the large Queensland coal seam gas reserves have led to a burgeoning LNG export industry. The Queensland LNG processing facilities will be sited primarily at Curtis Island, Gladstone. At

⁴⁵ NSW Government 2011, *Submission to NSW Legislative Council General Purpose Standing Committee No.5, Inquiry into Coal Seam Gas*, p.10

⁴⁶ NSW Government 2011, *Submission to NSW Legislative Council General Purpose Standing Committee No.5, Inquiry into Coal Seam Gas*, p.10.

⁴⁷ NSW Government 2011, *Submission to NSW Legislative Council General Purpose Standing Committee No.5, Inquiry into Coal Seam Gas*, p.10.

⁴⁸ AEMO 2011, *Gas Statement of Opportunities for Eastern and South Eastern Australia*, p.5-58.

the time AEMO's work was prepared, five LNG trains had reached financial close and up to six more trains were being actively studied. Curtis Island development regulations allow for a total of 17 trains.⁴⁹

It is projected that by 2016, gas demand for LNG export is projected to exceed 1,000 PJ per year as the first five Curtis Island LNG trains reach full production.

Under the fast rate of change scenario, by 2031 gas demand for LNG export may rise to more than 5,000 PJ per year. This would require the construction of 20 LNG trains that would consume over 150,000 PJ of gas if the life of each train constructed by 2031 is assumed to extend to 2050.

Availability of sites in Queensland, under the highest growth assumptions was projected to be limited. Therefore some of the modelled LNG facilities were located in Newcastle. Supply for the LNG was sourced from the Gunnedah Basin.

The AEMO projections provide an indication of the potential size of the LNG export industry. NSW is poised to benefit from LNG exports if the proposed development of the LNG processing facilities at Newcastle goes ahead. This of course will depend in the commercial decisions of participants in the gas sector.

At the time the modelling was published in August 2011, a pre-feasibility study was underway for LNG export facilities at Newcastle. The preliminary project included up to two LNG trains that would produce up to three million tonnes of LNG per year.⁵⁰ (This project appears to be on hold following the purchase of the original project proponent by Santos).

3.4 Gas demand and supply outlook

While demand for gas is expected to increase, there is uncertainty about the security of gas supplies to NSW. Currently, the majority of gas supplied to NSW is sourced from the Cooper Basin in South Australia and basins in Victoria.

With regards to the supply outlook in the southern states, AEMO states that gas reserves in the southern states (Victoria, Tasmania and South Australia) are projected to decline gradually over the 20 year outlook period.⁵¹ The declining gas reserves signals a potential risk to supply security for NSW.

A further issue for NSW is securing long term supply contracts for the available reserves. A recent report by ACIL Tasman indicates that NSW is materially uncontracted post 2017.⁵² The three major gas retailers in NSW (AGL, Origin Energy TRUenergy) will see the majority of their contracts with gas producers expire over the next five to ten years.

⁴⁹ AEMO 2011, *Gas Statement of Opportunities for Eastern and South Eastern Australia*, p.5-35.

⁵⁰ AEMO 2011, *Gas Statement of Opportunities for Eastern and South Eastern Australia*, p.6-9.

⁵¹ AEMO 2011, *Gas Statement of Opportunities for Eastern and South Eastern Australia*, p.xxix.

⁵² ACIL Tasman 2012, *Coal Seam Gas in NSW: implications for energy security and economic sustainability A High Level Assessment*, Prepared for Santos, p.11.

ACIL Tasman reports that the established reserves in the Cooper Basin are fully contracted and that there are currently no uncontracted reserves from that Basin available to replace the current contracts with NSW when they expire. Further, while exploration is continuing there is no guarantee that additional reserves will be certified in the next few years.

With regards to the Victorian sources, the Gippsland Basin has around 15 years of reserves but a significant part of the available reserves are already contracted. The report, however, indicates that the Bass Strait region is considered to be prospective and that more reserves are likely to be discovered.

Strong demand for gas in Victoria highlights the need for discovery and development of new reserves in the Gippsland Basin. A key factor for the strong demand for gas in Victoria is due to the proposed closure of brown coal fired generators by 2020 and the need to transition to other technology such as gas fired generation. ACIL Tasman has raised questions over the availability of supply to allow rollover of NSW contracts as they expire.

ACIL Tasman highlighted that given the increasing cost of finding and developing new reserves and the high level of forecast gas demand, it should be expected that gas supply from the Gippsland Basin will be significantly more expensive in the future.

This analysis highlights that without the development of new sources of gas, such as the coal seam gas industry in NSW, that there is uncertainty about the ability to secure gas supplies to meet future demand. This discussion is continued in chapter 7. A further issue of concern is the uncertainty about the future cost of supplies from the southern basins. The uncertainty about gas prices is discussed in chapter 4.

3.5 Consumer responsiveness

In recent years, the price of energy, and in particular, electricity has risen significantly. At the same time, there has been a reduction in energy consumption. Evidence suggests that there is a direct relationship between price and electricity consumption.

The Independent Pricing and Regulatory Tribunal's (IPART) survey of residential households found that the average amount of energy (electricity and gas) that households used fell between 2006 and 2010. IPART found that, between 2005/06 and 2009/10, average electricity consumption in NSW fell by 6 per cent, and average gas consumption in NSW fell by 5 per cent.⁵³

IPART reported that, during the same period, in nominal terms, average residential electricity prices increased by 50 per cent.⁵⁴ Further, the gas bill for an AGL customer on a regulated tariff increased by 18 per cent.

The price increases for electricity were significantly larger than the increase in both in the Consumer Price Index (12 per cent) and average earnings in NSW (18 per cent). IPART

⁵³ IPART 2010, *Residential energy and water use in Sydney, the Blue Mountains and Illawarra, Results from the 2010 household survey Electricity, Gas and Water — Research Report*, p.4.

⁵⁴ IPART 2010, *Residential energy and water use in Sydney, the Blue Mountains and Illawarra, Results from the 2010 household survey Electricity, Gas and Water — Research Report*, p.34.

identified a number of factors that could have contributed to this declining trend, including higher utility prices, particularly for electricity. IPART considered that these price increases may have encouraged households to use less energy. Further, they may have encouraged some households to turn to gas or solar power rather than electricity as a source of household energy.

As discussed previously, forecasts by AEMO have revised down the growth in energy relative to forecasts in previous years. In modelling conducted by AEMO in 2011, the differences were due to changes in key assumptions such as higher forecast electricity prices and the incorporation of new and ongoing energy efficiency policies (such as the NSW Energy Savings Scheme). The AEMO projections indicate that price and energy efficiency initiatives can have an impact on energy consumption.

AEMO estimated that the own price elasticity for electricity demand in NSW is -0.16.⁵⁵ This means that a ten per cent rise in electricity prices will reduce electricity consumption by 1.6 per cent. AEMO's estimates for the jurisdictions in National Electricity Market range from -0.16 (NSW) to -0.38 (Victoria). This analysis indicates that consumers are responsive to changes in electricity prices and provides scope for further trialling of time of use pricing. This issue will be discussed in section 3.7.

With regards to consumer price responsiveness, Garnaut noted that while there were variations in estimates of price elasticity of demand for electricity among various studies, there was widespread agreement that residential demand for energy responds less to price in the short term than in the longer term.⁵⁶

This suggests consumers will respond to price increases by reducing consumption in their every day behaviour in the short term but more so in the longer term. This probably implies that, in the longer term, consumers are able to respond to price increases by purchasing more energy efficient appliances.

3.6 Smarter electricity infrastructure

Emerging new electricity technologies such as interval meters and smart meters offer better opportunities for consumers to manage their electricity demand and energy use. An interval meter (or time-of-use meter) is an electronic meter that measures electricity use in discrete intervals of time such as 30 minutes. A smart meter is an interval meter that has in-built wireless communications capability. This allows for meters to be read remotely.

A smart grid is a new type of electricity network that uses advanced communication, sensing and metering that more efficiently manages electricity supply and demand.

The new metering and grid technology has the potential to provide customers with more information about their energy use. It offers scope for the introduction of flexible or time of

⁵⁵ AEMO 2011, *Electricity Statement of Opportunities for the National Electricity Market*, p.3-59.

⁵⁶ Garnaut, R 2011, *Update Paper eight: Transforming the electricity sector*. Garnaut Climate Change Review – Update 2011.

use pricing. This type of pricing can be structured to provide a more accurate reflection to customers of the cost of using the network by the time of day.

The NSW Government owned distributor Ausgrid won the bid for the Australian Government's *Smart Grid Smart City* (SGSC) program. The SGSC entails the development of Australia's first commercial-scale smart grid in Newcastle in a demonstration project that will help identify technical and economic opportunities and challenges in implementing a new generation of innovative electricity distribution technology. The trial includes pilot installation of electric car chargers, small scale renewables and battery storage.

Parts of the trial will also be conducted in Newington, Sydney's CBD, Ku-ring-gai and Scone. This initiative will provide information about the costs and benefits of smart grids to inform future decisions by government, electricity providers, technology suppliers and consumers across Australia.

The program will run for three years, during which time Ausgrid will receive up to \$100 million in funding from the Australian Government. The NSW Government through Ausgrid is investing \$400 million in this project.

Recently, the Government announced it is commencing a cost benefit analysis of meters in NSW. The analysis will consider both benefits and costs for consumers, businesses and electricity networks. The review will focus on considering the consumer choices and the costs and benefits to consumers of time of use tariffs compared with flat, all day tariffs.⁵⁷

The deployment of smart meters to residential customers provides an opportunity for active energy and demand management. Smart meters combined with flexible prices are a way of providing customers with the opportunity to manage their energy usage. Flexible prices may involve higher prices during peak periods and lower prices during off peak and shoulder periods. This type of pricing structure provides customers with an incentive to shift discretionary energy use away from peak periods.

The wider benefit is that smart meters and time of use pricing can potentially help to reduce peak demand on the network. In turn, this reduces the need for investment. As discussed in the next section, pricing trials conducted in NSW show promising signs of consumer responsiveness to pricing.

3.7 NSW pricing studies

NSW Government owned distributors have been at the forefront of metering and pricing innovation in Australia. Since 2004, Ausgrid has been undertaking a meter replacement program which involves replacing disc meters with interval meters at the majority of medium sized customer premises. All new and upgraded residential and business customer connections receive an interval meter. This program is separate to the SGSC project.

As at April 2011, Ausgrid has rolled out around interval meters to around 300,000 customers. By June 2014, it is anticipated that over 500,000 customers will have an interval

⁵⁷ NSW Government 2012, *Submission to Australian Government's Draft Energy White Paper*.

meter installed in their premise. This program is being rolled out by Ausgrid on a commercial basis without the need for a Government mandate.

Ausgrid has transferred most customers with interval meters to time of use pricing. In general, time of use pricing is intended to reflect the cost of the service at different times of the day. For electricity networks, the cost is intended to reflect times of network congestion or utilisation.

As parts of the network become congested businesses need to take action to ensure that reliability standards of service are met. Over the long term, networks will invest to upgrade the network to prevent supply interruptions to customers.

Time of use pricing is a way of signalling to customers the level of congestion on the networks. This can be achieved by setting higher prices in peakier and more congested periods.

Ausgrid has undertaken a Strategic Pricing Study designed to investigate whether customers would respond to changes in their prices and pricing structures.⁵⁸ The key results from the trials found that:

- customers were able to understand the concept of dynamic prices
- domestic customers respond well to dynamic tariffs, and are willing to reduce their air conditioning usage on hot days.
- small business customers (0-160 MWh pa) showed no response to dynamic tariffs during the trial.

Ausgrid concluded these results demonstrate that innovative network pricing has the potential to play a role in demand management by residential customers. However, more work is required to better understand the equity, economic, financial and regulatory implications.

The results of Ausgrid's Strategic Pricing Study are consistent with economic studies into the own price elasticity of demand for electricity (as discussed above, AEMO⁵⁹ estimates own price for each National Electricity Market region).

Providing consumers with information about their energy use by time of day has potential to reduce the problem of higher peak demand. The introduction of flexible or time of use pricing can signal costs of using energy during peak times relative to non-peak times. Higher prices during peak times and lower prices during non-peak times are likely to encourage consumers to switch consumption of discretionary appliances (washing machines, clothes dryers, pool pumps, dishwashers) to non-peak times.

If in the longer term, enough customers respond to these types of price signals, it has the potential to shift demand and reduce levels of peak demand. This can help to improve the efficiency of network utilisation, reduce investment requirements and ultimately reduce average network prices.

⁵⁸ Ausgrid 2011, *Network Pricing Proposal, for Financial Year Ending June 2012*, p.16.

⁵⁹ AEMO 2011, *Electricity Statement of Opportunities for the National Electricity Market*, 2011, p.3-59.

3.8 Implications for energy infrastructure

An upward trend in peak demand has resulted in worsening network load factors and driven up average electricity network prices. Smart technologies may provide a way manage peak demand by facilitating time of use pricing.

Strategic infrastructure priority

It is proposed that the NSW Government support introduction, on a commercial basis, of smart meter technology and flexible pricing as a way to encourage demand side participation by customers and demand management by networks.

AEMO modelling suggests that post 2020 there are likely to be opportunities for further investment in large scale electricity generation in NSW. This is further explored in chapter 6.

NSW faces uncertainty about the future security of gas supplies from South Australia and Victoria. This presents opportunities for increased investment in coal seam gas production in NSW and augmentation of gas transmission between NSW and other jurisdictions. This is further discussed in chapter 7.

4. Energy costs and prices

Until recently, energy prices in NSW have been low and this contributed positively to the competitiveness of the NSW economy. In recent years, NSW energy prices have risen significantly. This has brought hardship to some sectors and placed energy prices at the forefront of business and community attention.

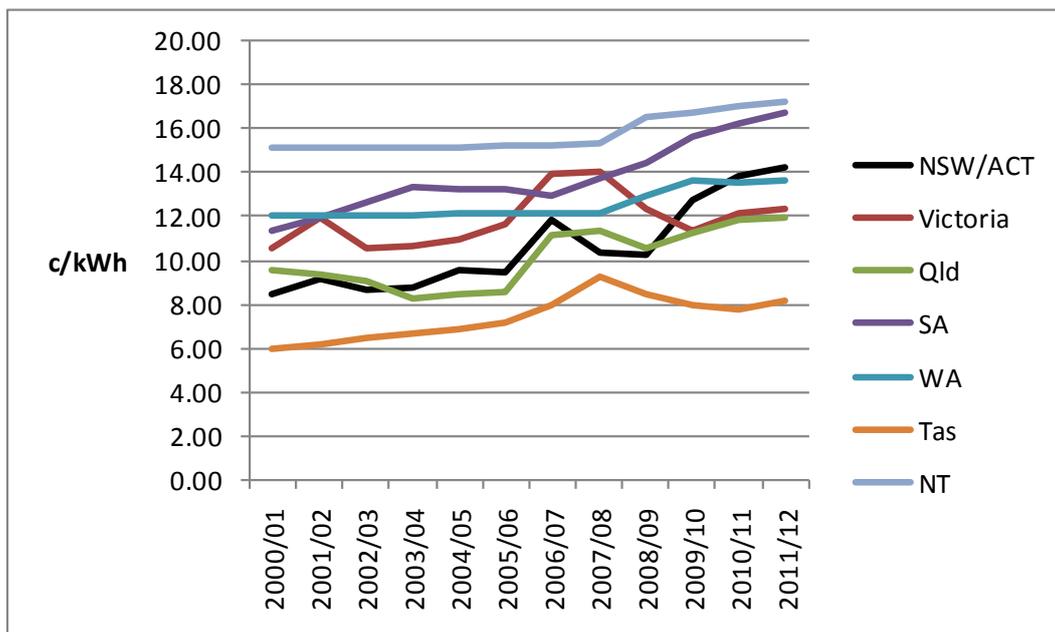
The indications are that energy prices will continue to rise in the next few years.

4.1 Electricity prices

4.1.1 Recent trends in electricity prices

In 2000/01, NSW had the second lowest level of retail electricity prices in Australia. This situation started to change by around 2009/10 with prices starting to rise steeply. By 2011/12, NSW had the third highest level of retail electricity prices in Australia.

Figure 8 Comparison of national electricity retail prices from 2000/01 to 2011/12



Source: Prepared from information released with KPMG 2011, *Stage 2 Report: Economic Scenarios and Forecasts 2010-11 to 2034-35. A report to the Australia Energy Market Operator*. The information can be found at <http://www.aemo.com.au/en/Electricity/Planning/Electricity-Statement-of-Opportunities>

Figure 8 tracks the trends in the average electricity prices in each jurisdiction from 2000/01 to 2011/12.⁶⁰ The information is based on the average of electricity prices for residential and non-residential customers. Significantly, the data shows that NSW experienced the highest increase in electricity prices over this period. From 2000/01 to 2011/12, NSW average retail prices increased by 69 per cent, compared to South Australia 48 per cent and Tasmania 38 per cent.

NSW electricity prices are becoming relatively more expensive compared to other jurisdictions and are now above the national average.

The indications are that electricity price increases in NSW are likely to continue. The Independent Pricing and Regulatory Tribunal (IPART) determines the maximum prices that retailers can charge for regulated electricity services in NSW. The regulated services apply to residential and small businesses customers who have not entered into a market contract (non-regulated) and have remained on regulated arrangements. Around half of all residential and small business customers in NSW remain on regulated arrangements. The retailers that provide regulated retail services are TRUenergy (formerly EnergyAustralia) and Origin Energy (formerly Country Energy and Integral Energy).

In June 2012, IPART released its final determination for regulated electricity services from 1 July 2012.⁶¹ IPART's final determination will result in average price rises of 18.1 per cent for NSW customers who are on regulated retail tariffs. This is on top of an average increase of 17.4 per cent on 1 July 2011. Since 2008/09 the regulated retail price has increased by approximately 80 per cent on average across NSW.⁶²

IPART explained that the 1 July 2012 increase in price is primarily driven by the continuing rise in forecast network costs which is responsible for around half of the average price increase. The introduction of a carbon pricing mechanism is responsible for the other half. The cost of government initiated cleaner energy schemes is also having an impact on electricity prices. IPART has calculated that from 1 July 2012, the cost of complying with these schemes will add \$315 on average to an "indicative" regulated electricity bill in NSW.⁶³

In particular, the introduction of the carbon pricing mechanism will add 9 per cent to average regulated retail electricity prices across NSW (or \$170 on average to the annual bill). Increases from other schemes include: the small scale renewable energy scheme (\$64); climate change levy (\$38); large scale renewable energy target (\$32); and NSW energy savings scheme (\$13).

Reasons for the price increases

Electricity prices to residential and business customers consist of generation costs, transmission and distribution (network) costs, metering costs, retail margins and government initiated cleaner energy programs. The main drivers of the recent increases in electricity

⁶⁰ Residential electricity prices in Western Australia and the Northern Territory are not fully cost-reflective.

⁶¹ IPART 2012, *Changes in Regulated Electricity Retail Prices from 1 July 2012 Electricity — Final Report and Determination*.

⁶² Prepared from information provided by IPART to INSW.

⁶³ IPART 2012, *The Impact of Green Schemes on Regulated Electricity Retail Prices from 1 July 2012*.

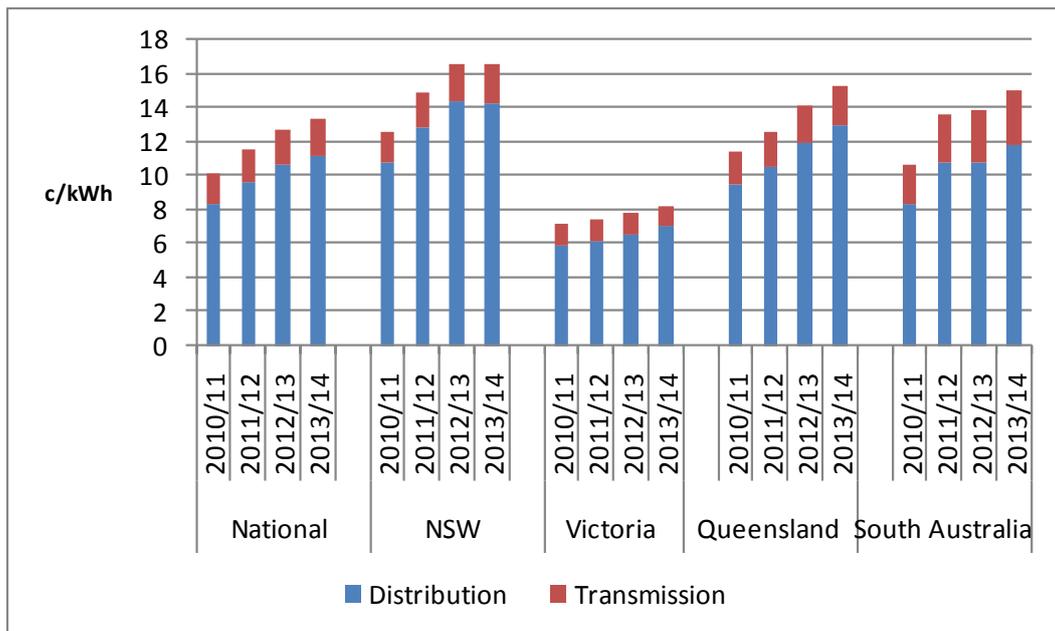
retail prices can be attributed to increases in network investment on infrastructure and government initiated cleaner energy schemes.

In December 2010, the NSW Inquiry into Electricity Network and Prices was established to examine options to reduce or defer electricity network charges in order to place downward pressure on electricity price increases. The Inquiry found that at least 80 per cent of indicative percentage increases of the regulated retail tariff (applying to residential and small business customers) were attributed to increased network charges. In addition, the costs of government schemes to promote renewable energy sources and reduce emissions of greenhouse gases increased but from a low base. The culmination of these cost increases occurring simultaneously was described in the Inquiry as a “perfect storm”.⁶⁴ A summary of the key findings from the Inquiry is set out in Appendix 1.

Recent trends in network prices

Recent analysis by the AEMC compared current and future possible residential electricity prices from 2010/11 to 2013/14.⁶⁵ Figure 9 below shows the trend in network prices for NSW, Victoria, Queensland, South Australia and Australia.

Figure 9 Comparison of network prices from 2010/11 to 2013/14



Source: AEMC 2011, *Final Report, Possible Future Retail Electricity Price Movements: 1 July 2011 to 30 June 2014*.

⁶⁴ NSW Industry and Investment 2010, *NSW Electricity Network and Prices Inquiry. Final Report*, p.4.

⁶⁵ AEMC 2011, *Final Report, Possible Future Retail Electricity Price Movements: 1 July 2011 to 30 June 2014*.

The AEMC information shows that network prices in NSW are the highest in Australia. By 2013/14, the combined transmission and distribution prices are predicted to be 16.54 c/kWh compared to the national average of 13.38 c/kWh. Network prices in other jurisdictions are Queensland, 15.33 c/kWh; South Australia, 15.06 c/kWh; and Victoria, 8.23 c/kWh.

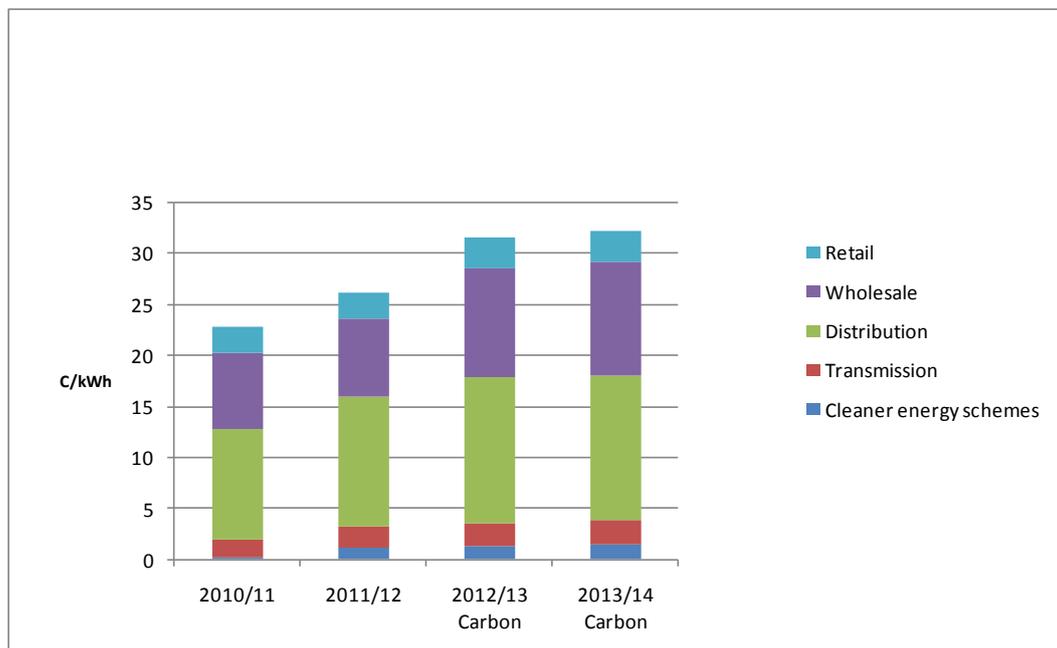
In the period from 2010/11 to 2013/14, network prices are expected to increase by 32 per cent in NSW. While this is a significant increase it is in line with trends in other jurisdictions including South Australia, 41 per cent; and Queensland, 35 per cent. The national average increase is 35 per cent. Victoria has the lowest predicted increase amongst this group with a 16 per cent rise in network prices.

4.1.2 Indications of future electricity prices

The AEMC has prepared analysis indicating future trends in changes to residential electricity prices and the drivers behind them. The future price trends have been prepared for the financial years from 2011/12 to 2013/14. This has been prepared at a national level and in each state and territory in Australia with indicative prices included for 2010/11 as the base year.

Figure 10 shows the components of the prices and the trends for NSW including an estimated impact of the carbon price on wholesale prices and retail margins.

Figure 10 NSW current and possible residential prices with carbon price



Source: Information sourced from AEMC 2011, *Future Possible Retail Electricity Price Movements*.

The analysis for NSW indicates that between the base year 2010/11 and 2013/14 residential prices are projected to increase:⁶⁶

- by 33 per cent in nominal terms without a carbon price. This is approximately 10 per cent per annum. In unit prices, this equates to an increase of 7.5 c/kWh.⁶⁷
- by 42 percent in nominal terms with a carbon price. This is approximately 12 per cent per annum. In unit prices, this equate to an increase of 9.5 c/kWh.

The AEMC analysis assumes that over the projected period the key drivers behind the future prices trends include:

- Wholesale generation prices, including an estimate of the carbon price, will increase by 3.65 c/kWh in nominal terms over the projection period. This compares to 1.62/kWh without the inclusion of the carbon price.
- Distribution component costs are expected to increase 33 per cent or 3.44 c/kWh. This is a contribution of around 46 per cent to the overall projected increase in residential prices (without the carbon price included).
- Transmission network costs are expected to increase by 34 percent or 0.59 c/kWh. This represents a contribution of around 8 per cent to overall projected residential prices increases (without the carbon price included).
- Cleaner energy schemes, without a carbon price, increase the unit price by 1.31.c/kWh which is a 17 per cent contribution to the overall forecasted increase. With a carbon price, the nominal increase for the cleaner energy component decreases from 17 per cent to 12 per cent.

In addition the AEMC commented that distribution businesses faced higher debt financing costs following the global financial crises as well as having to pass on costs of the solar bonus scheme.

Long term price forecasts

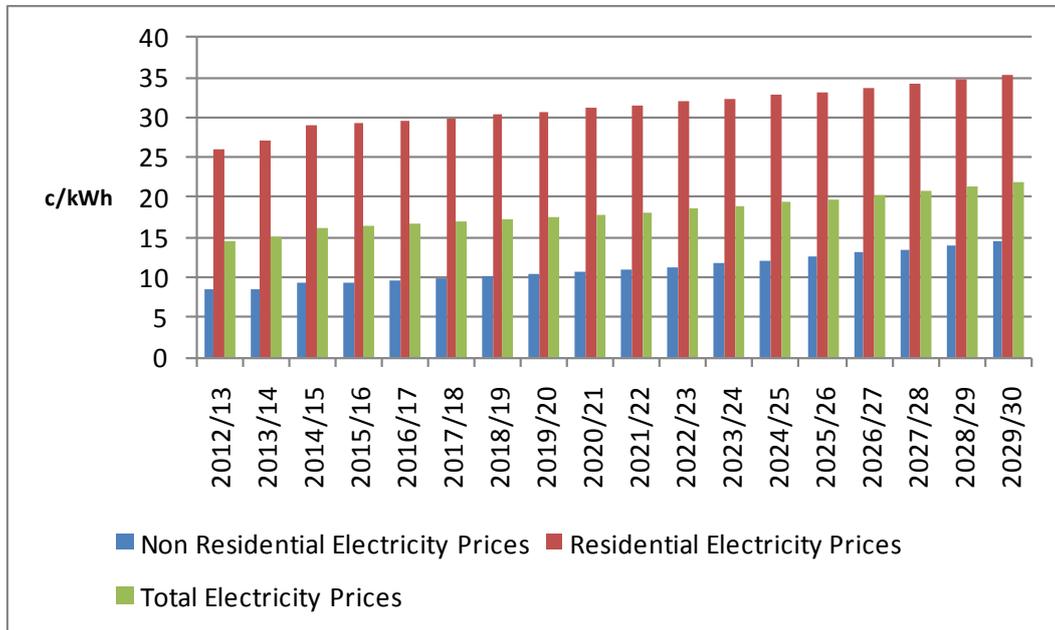
This section presents modelling prepared for AEMO of future electricity prices.⁶⁸ The information presented here is for the period 2012/13 to 2029/30. AEMO commissioned modelling of electricity and gas forecasts under different economic scenarios (medium, high, low and potentially other scenarios) with and without carbon policy impacts. The indications of future electricity prices increases are shown in figure 11.

⁶⁶ AEMC 2011, *Possible Future Retail Electricity Price Movements, 1 July 2011 to 30 June 2014, Final Report*.

⁶⁷ The prices represent residential customers on standing offer contracts.

⁶⁸ KPMG 2011, *Stage 2 Report: Economic Scenarios and Forecasts 2010-11 to 2034-35 A report to the Australia Energy Market Operator*.

Figure 11 Indications of future electricity prices for NSW/ACT from 2012/13 to 2029/30



Source: Prepared from information released with KPMG 2011 *Stage 2 Report: Economic Scenarios and Forecasts 2010-11 to 2034-35. A report to the Australia Energy Market Operator.* The information can be found at <http://www.aemo.com.au/en/Electricity/Planning/Electricity-Statement-of-Opportunities>

The scenarios were based on assumed trajectories for different factors influencing the supply and demand for energy and the way in which it is produced or consumed. These include economic growth; population growth; and carbon emissions reduction policy. The modelling was prepared in 2011 at a time when there was uncertainty about the introduction of a price on carbon. The modelling makes certain assumptions about a carbon price.⁶⁹

Figure 11 shows the results for the baseline scenario for the NSW/ACT region. There are three forecasts – residential, non-residential sector and the total electricity prices (an average of these prices).

Under the assumptions used in the modelling, the results are that total electricity prices will increase by 50 per cent from 2012/13 to 2029/30. It is forecast that the residential sector will experience an increase of 73 per cent and the non-residential sector an increase of 36 per cent.

⁶⁹ The modelling assumes that a transitional scheme is put in place and a carbon price is initially introduced at \$10/t CO₂ in 2013/14, before the full scheme is implemented in 2014/15. Under the baseline scenario the carbon price (in 2009/10 prices) is set at \$37.44/t CO₂e in 2014/15. In addition, the carbon price under each scenario is assumed to grow by a real rate of 4 per cent per annum from 2014/15 onwards, reflecting the fact that carbon permits are financial assets and are bankable over time. The assumptions in the modelling are different to the announced carbon price but still provide a reasonable indication of future prices.

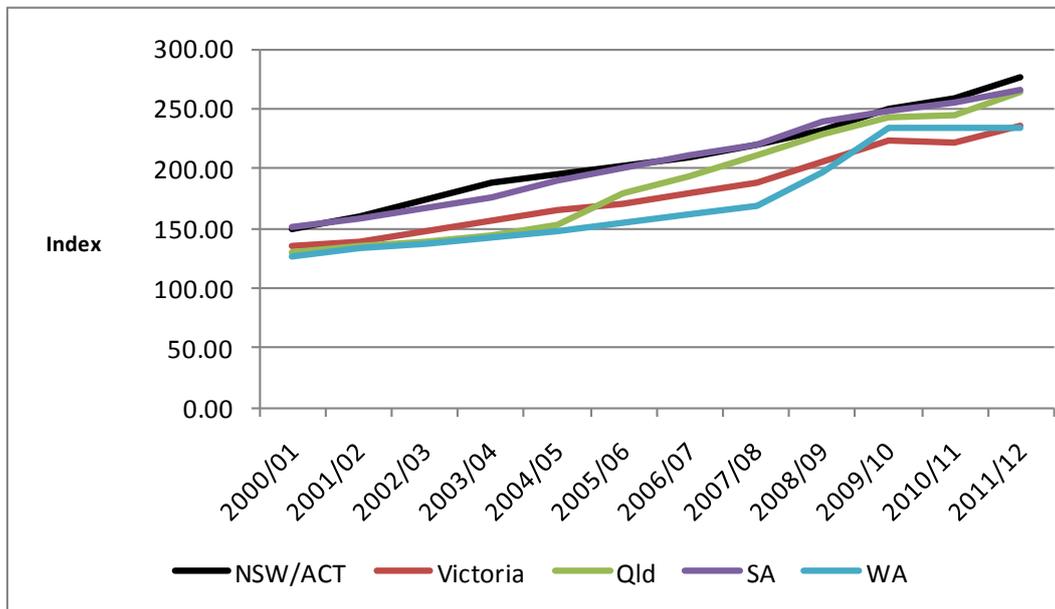
4.2 Gas prices

4.2.1 Recent trends in gas prices

As with electricity prices, gas prices have increased significantly in recent years. Figure 12 shows an index of gas prices (not actual gas prices) for the five largest gas consuming jurisdictions in Australia. The index measures changes in gas prices from a starting point in 1989/90.

In the 12 years from 2000/01 to 2011/12, NSW experienced an increase in gas prices of around 86 per cent (or around 7 per cent per annum). The highest level of prices increases were experienced by Queensland (103 per cent).

Figure 12 Comparison of national gas price index from 2000/01 to 2011/12



Source: Prepared from KPMG 2011, *Stage 2 Report: Economic Scenarios and Forecasts 2010-11 to 2034-35. A report to the Australia Energy Market Operator.* The information can be found at <http://www.aemo.com.au/en/Electricity/Planning/Electricity-Statement-of-Opportunities>

The information shows price increases for gas in NSW have increased at greater rates than for electricity. However, gas use in the residential sector is much lower than electricity use and comprises a lower proportion of household disposable income. Therefore the impacts of price increases are not as significant on overall household budgets.

Regulated retail prices

As for electricity, gas customers in NSW can choose their retail supplier or remain on regulated retail gas prices with the standard retailer in their area. In NSW, IPART agrees on the maximum prices for regulated gas services. Currently in NSW, regulated gas services are provided by AGL, ActewAGL and Origin Energy.

Under arrangements for regulated gas services, IPART agrees to Voluntary Transitional Pricing Arrangements (VTPAs) with each standard gas retailer in NSW. The standard

service retailers set their regulated retail gas prices in line with their VPTAs. The covered retailers must submit proposed changes to their prices to IPART prior to any increase.

On 1 July 2011, each of the retailers' regulated retail gas tariff increased by an average of 4 to 4.8 per cent. The prices increases were attributed to an increase in the gas networks costs and the retail component of the price. The current VTPAs provide for standard retailers to increase retail gas prices to reflect the additional costs of the Australian Government's carbon pricing mechanism from 1 July 2012.

Following submissions from the standard retailers, IPART, agreed to increases in retail gas prices from 1 July 2012. For a typical residential customer, prices will rise between 9 per cent to 15 per cent from 1 July 2012.⁷⁰ IPART explained that these price increases are larger than previously estimated and were due to the introduction of the carbon price and larger than expected increases in gas distribution network prices.

Pressures on the cost of gas

Currently, the energy sector is facing uncertainty about future gas prices for Australian consumption. Compared to international prices, gas prices in Australia are at the lower to mid end of the global gas price range. This situation is likely to change in the future. Global demand for gas is increasing and Australia is exporting (or planning to export) more LNG to overseas markets. This is likely to impact Australian domestic gas prices.

Recently, as part of the carbon price modelling, the Australian Treasury modelled the price path for domestic gas prices for the east coast of Australia. The results indicated a potential for domestic gas prices on the east coast to reach export parity from 2020. This is primarily influenced by LNG exports in Queensland. Gas prices are forecast to double between 2011 and 2037.⁷¹

This analysis is supported by work by AEMO. AEMO projected that construction of an export LNG industry in eastern Australia could result in domestic gas prices rising toward parity with international prices. This assessment is based on the Queensland Government's *2011 Gas Market Review* suggesting that current market price expectations and behaviour indicate a high price scenario is likely, with prices rising from current prices of approximately \$3/GJ to \$5/GJ to over \$8/GJ.⁷²

At present, many large gas producers are securing sufficient reserves so that they can enter into LNG supply contracts with overseas customers. A recent paper suggested that gas producers across eastern Australia are targeting the Queensland LNG industry. This includes:⁷³

- Santos entering into an agreement to supply 750 PJ of Cooper Basin gas to the Gladstone LNG project over a period of 15 years

⁷⁰ IPART 2012, *Information Paper, Changes in Regulated Retail Gas Prices in NSW from 1 July 2012*.

⁷¹ Commonwealth of Australia 2011, *Strong Growth, Low Pollution: Modelling a Carbon Price*.

⁷² AEMO 2011, *Gas Statement of Opportunities for Eastern and South Eastern Australia*, p.2-15.

⁷³ ACIL Tasman 2012, *Coal Seam Gas in NSW: implications for energy security and economic sustainability A High Level Assessment* Prepared for Santos, p.2.

- AGL's gas supply and storage arrangement with Queensland Gas Company
- Esso/BHP Billiton flagging their interest in directing gas from Bass Strait to the Queensland LNG projects.

Ownership of provable and probable (2P) reserves are 94 per cent owned by LNG aligned parties.⁷⁴ This raises the concern that gas will be earmarked for higher priced overseas markets. This is likely to flow through to higher gas prices for domestic users in the eastern states.

NSW is heavily dependent on interstate gas supplies. Therefore the export of gas to overseas markets may place pressure on gas availability and prices in NSW.

4.2.2 Indications of future gas prices

This section presents indications of future gas prices prepared for AEMO.⁷⁵ The information presented here compares price trends for the NSW/ACT region to Queensland and Western Australia for the period 2012/13 to 2029/30. As with electricity, the results presented here are for the baseline scenario with carbon price impacts. The approach uses a gas price index rather than actual gas prices. The results of the modelling are shown in figure 13.

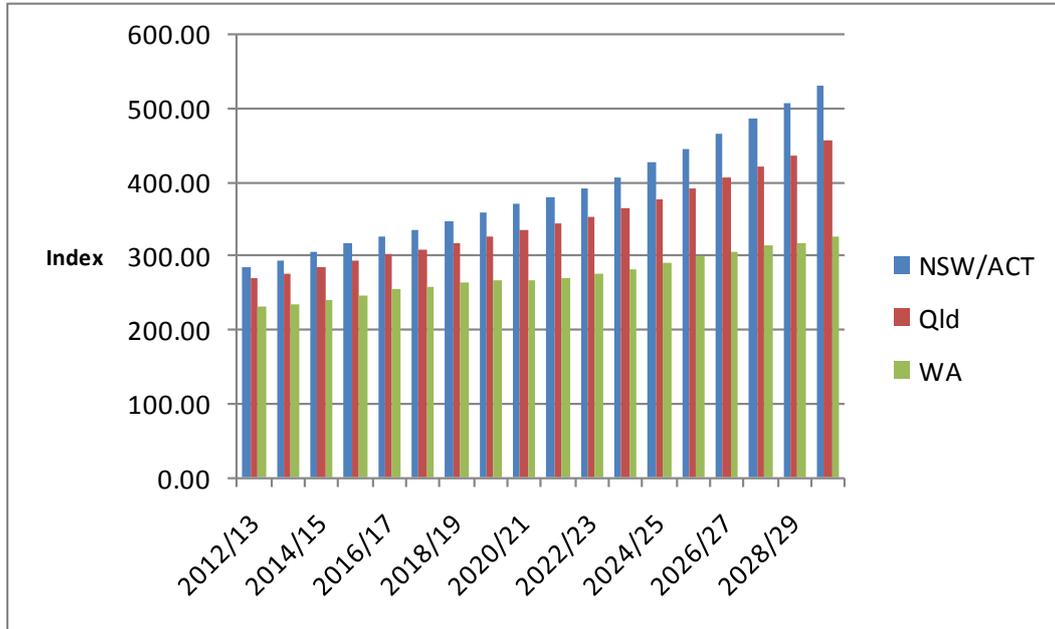
The results show that gas prices are forecast to increase significantly over the forecast period. Gas prices for the NSW/ACT are forecast to increase at a much greater rate than prices in Queensland and Western Australia.

From now until 2029/30, NSW/ACT prices are forecast to increase by about 85 per cent in contrast to Queensland by 69 per cent and Western Australia by 40 per cent. Western Australia and Queensland are gearing up to be major LNG exporters in the future. The results for other major gas consuming jurisdictions (not shown in the figure) are gas prices in South Australia to increase by 80 per cent and in Victoria by 48 per cent.

⁷⁴ Investment Reference Group 2011, *A report to the Commonwealth Minister for Resources and Energy*, p.31.

⁷⁵ KPMG 2011, *Stage 2 Report: Economic Scenarios and Forecasts 2010-11 to 2034-35 A report to the Australia Energy Market Operator*.

Figure 13 Comparison of indications of future gas prices from 2012/13 to 2029/30



Source: Prepared from information released with KPMG 2011, *Stage 2 Report: Economic Scenarios and Forecasts 2010-11 to 2034-35. A report to the Australia Energy Market Operator*. The information can be found at <http://www.aemo.com.au/en/Electricity/Planning/Electricity-Statement-of-Opportunities>

The modelling indicates that NSW will continue to experience increasing upward pressure on gas prices.

4.3 Impact of energy prices on households

The impact of energy price increases on NSW households has been significant. Figure 14 shows the trend in the electricity bills since 2004/05 to 2012/13 for EnergyAustralia and Integral customers on the regulated price. The analysis calculates the bill for an average customer using 7,000 kWh per annum of electricity. Since 2004/05, electricity bills for customers on regulated tariffs have doubled.

IPART prepared analysis of the proportion of household expenditure that is devoted to paying energy bills. In addition to the increases in electricity prices, gas prices have also increased by more than 15 per cent in real terms between 2006/07 and 2011/12 and with a further increase on 1 July 2012. Household incomes have also increased, but by less than energy prices in percentage terms. Consequently, for the same amount of energy, the

majority of households will spend a larger share of their disposable income on energy in 2012/13 than they did in 2006/07.⁷⁶

IPART found that despite the large increases in energy prices, energy bills for all households in metropolitan NSW:

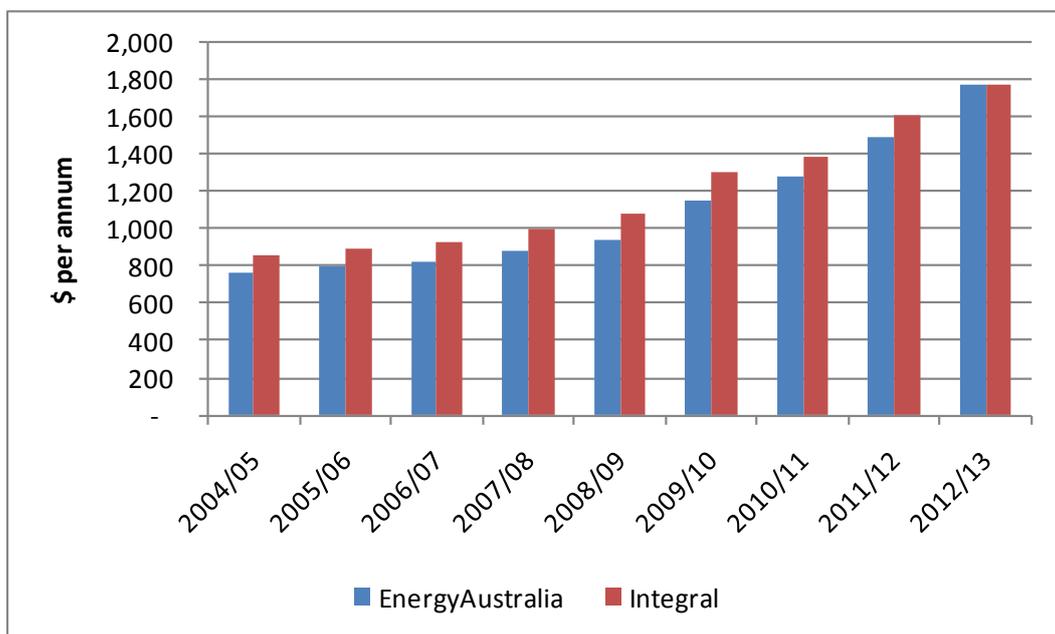
- represent less than 6 per cent of disposable income for around 80 per cent all households in 2012/13
- represent less than 4 per cent for about half these households
- represent more than 8 per cent for 11 per cent of these households.

For low-income households, the impact of the increases in energy prices is much greater. Energy bills in 2012/13 will represent:

- less than 6 per cent of disposable income for about 30 per cent of the low income households
- more than 8 per cent for about 45 per cent of these households. This compares to 8 per cent of disposable income for less than 20 per cent of these households in 2006/07.

Therefore more low income households are allocating more of their disposable income to paying energy bills.

Figure 14 Electricity bills for residential customers in NSW



Source: Prepared from information provided by IPART to INSW.

⁷⁶ IPART 2012, *Changes in regulated electricity retail prices from 1 July 2012 Electricity — Final Report*.

Recently IPART expressed concern about overall affordability of electricity and the effectiveness of customer hardship policies.⁷⁷ Electricity retailers who supply small retail customers are required to develop and implement customer hardship charters as a condition of their retail licence. The purpose of a customer hardship charter is to assist customers in financial difficulty to better manage their energy bills on an ongoing basis.

IPART has indicated that it will undertake a review of the effectiveness of energy retailers' hardship charters to identify opportunities to improve the delivery of hardship programs and reduce customer disconnections where possible.

The Government has established an Energy Accounts Payment Assistance Scheme (EAPA) Advisory Group to provide advice on options to strengthen and improve delivery of the EAPA Scheme. The EAPA Scheme helps financially disadvantaged people experiencing difficulty paying their electricity or gas bill because of a crisis or emergency situation.

The EAPA Advisory Group will provide advice on options to strengthen and improve delivery of the EAPA Scheme.

4.4 Implications for energy infrastructure

This analysis shows that NSW consumers have experienced significant increases in energy prices. The indications are that both electricity and gas prices will continue to increase in the future.

Increases in energy prices are detrimental to the competitiveness of the NSW economy. The key issue is to understand the underlying reasons for these prices increases and develop strategies to minimise the extent of the increases.

The following chapters are focused on addressing the challenges facing the electricity and gas infrastructure sectors.

⁷⁷ IPART 2012, *Changes in regulated electricity retail prices from 1 July 2012 Electricity — Final Report*, p.126.

5. Electricity networks

A reliable and efficient transmission and distribution network is essential for the competitiveness of the economy and well being of the community. Appropriate levels of investment in the networks are needed to maintain system security and reliability in the delivery of electricity to NSW homes and businesses.

5.1 Issues and challenges

Transmission and distribution networks are natural monopolies. The high cost of providing network services means that the most efficient industry structure is to have a single service provider in a defined geographic area. Traditionally government ownership of electricity networks helped achieve certain social objectives such as ensuring all consumers were connected to the electricity grid.

The need for government ownership to achieve social objectives is now less necessary with the establishment of strong and independent regulatory frameworks. Twenty years of competition reform in the electricity sector has been complemented by the implementation of strong regulatory frameworks. The regulatory frameworks cover economic matters such as pricing and access to the networks, reliability performance and system security. The regulatory arrangements are intended to prevent the misuse of monopoly power by electricity networks in pricing and quality of service provided.

Recently, concerns have been raised about the level of investment by network businesses and the impact on retail electricity prices. The past few years have seen significant increases in the capital investment programs of the transmission and distribution sector in NSW. The increase in the level of capital investment by the networks has increased the cost of providing network services (as shown in chapter 4). The higher cost structures have contributed to large increases in electricity prices faced by residential and businesses customers in NSW. The increases in prices are detrimental to the competitiveness of NSW businesses.

As a result of these increases in capital investment and network prices, a number of reviews have been initiated to investigate the reasons for the price rises and to assess the effectiveness of a number of aspects of the regulatory framework.

In NSW, the transmission and distribution of electricity is undertaken by Government owned businesses.⁷⁸ The Government, as the owner of the electricity network businesses, earns a return from network revenues in the form of shareholder dividends and tax equivalent payments.

Ownership of the network businesses places the Government in a difficult position with respect to exerting pressure to reduce electricity prices. On the one hand, the higher the

⁷⁸ The one exception is the privately owned Directlink which is a 63km line operating between NSW and Queensland.

revenues and profits the higher the dividends and tax equivalent payments made to the Government. On the other hand, the higher the electricity prices, the worse it is for residential and business customers. The Government has opposing objectives in relation to the direction of electricity prices and the returns made from the network businesses.

The question arises as to whether, given the years of reforms and implementation of effective regulatory frameworks, it is appropriate for Government to retain ownership of the electricity transmission and distribution sector.

5.2 Structure of the network sector

The Government owned entities that own and operate the electricity transmission have undergone major restructuring since the 1990s. TransGrid was disaggregated from generation assets and the three distribution entities (now formed into Networks NSW) started out as 26 separate entities that were vertically integrated with retail businesses. The structure of the sector is described briefly below.

5.2.1 Structure of transmission sector

The transmission network is owned and operated by TransGrid. TransGrid's network transports electricity from generators to the distributors along a high voltage network. TransGrid's network consists of 91 substations and over 12,600 kilometres of transmission lines. The network operates at voltage levels of 500, 330, 220 and 132 kV. TransGrid employs around 1,017 employees and 287 contractors across NSW.⁷⁹

TransGrid's customers are the connected generators - Delta Electricity, Eraring Energy, Macquarie Generation and Snowy Hydro Limited; the three NSW distributors, ActewAGL and directly connected loads including Tomago Aluminium and Visy Pulp & Paper.

TransGrid's transmission network is linked to the transmission networks in Queensland and Victoria by high voltage interconnectors. The interconnectors facilitate interstate trade in the National Electricity Market. In addition, the interconnectors enhance national system security by allowing for the flow of electricity between regions.

5.2.2 Structure of distribution sector

The distribution of electricity from TransGrid's transmission points to end users is performed by three government owned corporations – Ausgrid, Endeavour Energy and Essential Energy. The Government recently announced the restructure of the three state owned distribution corporations into one organisation.⁸⁰

A new State owned corporation will be created to own and operate the electricity distribution network. Three subsidiary businesses – Ausgrid, Endeavour Energy and Essential Energy – will provide operational services to the state owned corporation under the current brands.

⁷⁹ TransGrid 2011, *New South Wales Annual Planning Report*.

⁸⁰ NSW Department of Trade and Investment website www.trade.nsw.gov.au.

The aim of the restructure is to help contain the rising costs of delivering electricity by reducing waste and duplication and generate savings from economies of scale. The merger is expected to deliver more than \$400 million in efficiency savings over four years. The savings will be used to fund electricity bill rebates for low income households and families aimed at helping to assist families facing hardship paying electricity bills. These reforms are aimed at placing downward pressure on electricity prices in future years.

The merged organisation serves approximately 3.4 million connected customers with over 274,000 km of overhead and underground lines. The network statistics are summarised in the table 1 below.

Table 1 Distribution network statistics

	Ausgrid	Endeavour	Essential	Total
Transmission substations	43	0	20	63
Zone substations	185	152	322	659
Distribution substations	30,261	29,568	134,524	194,353
Customers	1,605,635	866,724	801,913	3,364,272
Transmission system km	962	0	0	962
Sub-transmission system km	3641	3458	12352	19,451
Number of poles	510,217	305,667	1,387,734	2,203,618
Streetlights	250,143	187,234	147,733	585,110
HV overhead km	10,277	11,330	144,661	166,268
HV underground km	7,178	3,547	1,911	12,636
LV overhead km	20,895	8,881	26,939	56,715
LV underground km	6,539	6,601	4,981	18,121

Source: Australian Energy Regulator 2011, *State of the Energy Market 2011*, table 2.2; and GHD analysis for INSW.

The Government has announced that it intends to retain ownership of the electricity network sector.

5.3 Regulation of the electricity networks

The transmission and distribution of electricity are monopoly services and, as such, are heavily regulated. TransGrid, Ausgrid, Endeavour Energy and Essential Energy have been

subject to economic, planning and service regulation under the National Electricity Rules (NER) and jurisdictional legislation. The regulatory arrangements provide a solid framework for ensuring an efficient, reliable and secure electricity system.

A number of important elements of the regulatory framework are currently subject to review by the AEMC. The regulatory framework and the status of the current reviews (as at August 2012) are summarised below.

5.3.1 Economic regulation

As monopoly service providers, TransGrid and the three distributors are subject to economic regulation by the Australian Energy Regulator (AER) in accordance with the NER. Economic regulation is intended to ensure that the network businesses are able to earn sufficient revenue to at least cover efficient costs and receive a commercial return.

The revenues earned by the networks are regulated by the AER subject to a building block model that accounts for a network's efficient operating and maintenance expenditure, capital expenditure, asset depreciation costs and taxation liabilities and a commercial return on capital. The largest component is the return on capital, which may account for up to two-thirds of revenue earned by the networks. The return on capital is calculated by applying a weighted average cost of capital to the value of the regulatory asset base.

Under the processes set out in the NER, every five years the network services providers each submit a regulatory proposal to the AER setting out its revenue requirements and a proposed negotiating framework for connection services.

The AER assesses the regulatory proposal based on capital expenditure criteria and operating expenditure criteria set out in the NER. If the AER is not satisfied that the forecasts in the regulatory proposal meets the criteria, it can replace them with its own estimates.⁸¹

Proposed changes to regulatory frameworks

In 2011, the AER conducted an internal review of the regulatory framework for the economic regulation of transmission and distribution network services under the NER. The AER's internal review identified that potential improvements could be made to better promote efficient investment in, and use of, energy services for the long term interests of consumers. The AER found that, while, many aspects of the framework operate well, it considered that several deficiencies were leading to consumers paying more than necessary for energy services.

In September 2011, the AER submitted a proposal to change the way network prices are regulated under the NER. The proposal was submitted to the AEMC who administers the process for making changes to the NER as proposed by Rule change proponents.⁸²

⁸¹ Refer to clause 6.12.1 of the NER for approach applying to distribution networks; and clause 6A.13.2 for approach applying to transmission.

⁸² Refer to electricity rule change page on the AEMC website at www.aemc.gov.au

For electricity, the Rule change request submitted by the AER covers the capital and operating expenditure framework, capital expenditure incentives, cost of capital provisions, and the efficiency of the regulatory process as set out in the NER.⁸³

The AEMC published a draft Rule determination in August 2012 which proposes to change the Rules covering the economic regulation of electricity networks: In summary, the AEMC proposed changes include:⁸⁴

- A new rate of return framework that will be common to electricity distribution and transmission and gas. The AER will be required to make the best possible estimate of the rate of return at the time the determination is made.
- Establishing a new approach to capital expenditure incentives aimed at achieving the objective that only capital expenditure that is efficient should form part of the regulatory asset base.
- Providing greater clarity about the AER's powers in relation to the capital and operating expenditure allowances.
- Lengthening the regulatory process by six months.

The AEMC's draft Rule determination seeks to improve the economic framework by clarifying and enhancing the regulatory tools available to the AER in regulating the networks. The impact of the AER's proposed Rule change on TransGrid and the three distributors will depend on the final decision made by the AEMC. The AEMC will make its final Rule determination in November 2012.

5.3.2 Regulation of service standards

The transmission and distribution businesses are required to comply with the NER and jurisdictional standards in accordance with their licence requirements under the *Electricity Supply Act 1995*.

The NER sets out high level performance requirements for the level and standard of power transfer capability that the relevant network should provide; and technical requirements to facilitate management of the national grid. In addition to the technical performance requirements in the NER, Government instruments sets out service standards for the transmission and distribution sector.

Performance of the transmission network relates principally to reliability and network congestion. Transmission networks are generally engineered and operated with sufficient capacity to allow for planned and unplanned interruptions in the power system. The transmission networks are designed to deliver high rates of reliability.

In addition, TransGrid is subject to the AER's national service target performance incentive scheme. The scheme is designed to provide financial incentives for transmission businesses

⁸³ At the same time as submitting the proposed changes to the National Electricity Rules, the AER also submitted a proposal to change the rate of return provisions in the National Gas Rules.

⁸⁴ AEMC 2012, *Economic Regulation of Network Service Providers, and Price and Revenue Regulation of Gas Services*, Draft Rule Determinations, 23 August 2012.

such as TransGrid to maintain or improve performance. The scheme sets performance targets on indicators such as transmission circuit availability; the average duration of transmission outages; and the frequency of ‘off supply’ events.

Under the scheme, the over or underperformance of a network against its targets results in a gain (or loss) of up to 1 per cent of its regulated revenue. This type of scheme is intended to prevent TransGrid from reducing operating expenditure at the expense of service performance.

Transmission reliability standards

In December 2010, the NSW Government put in place the *Transmission Network Design and Reliability Standard for NSW* and directed TransGrid, to implement this standard in planning the transmission network. TransGrid is required to plan and develop its transmission network to ensure there is no inadvertent loss of load following an outage of a single circuit (a line or a cable) or transformer, during periods of forecast high load (known as ‘n-1’).

The *Transmission Network Design and Reliability Standard* requires TransGrid to supply NSW distribution network service providers with a level of reliability commensurate with the *Design, Reliability and Performance Licence Conditions* applying to distributors for sub-transmission lines and zone substations supplying loads greater than or equal to specified minimums.

At the national level, in November 2011, the MCE asked the AEMC to provide implementation and transitional advice and recommendations in relation to the necessary changes to establish a nationally consistent framework for transmission reliability standards. This is an important part of COAG's transmission reform agenda and has the objective to optimise investment between transmission and generation across the power system by improving the provision of information to private and public investors.

Distribution reliability standards

In 2005, the NSW Government introduced the *Design, Reliability and Performance Licence Conditions* for licences held by the three Government owned distribution network businesses. These were further amended in 2007. The licence conditions set out design planning criteria that defined security standards for the network; defined reliability standards for feeders; and established customer service standards relating to frequency and duration of interruptions.

These conditions were in addition to conditions imposed on licences held by distribution network service providers under the *Electricity Supply Act 1995* and the NER. The introduction of the design, reliability and performance licence conditions, in addition to the existing requirements led to an increase in capital investment by distributors in order to meet the requirements.

Review of reliability standards

In response to concerns about rising electricity bills, and the level of electricity distribution investment in recent years, the NSW Government, through the SCER (formerly MCE) asked the AEMC to review the reliability framework. The SCER has directed the AEMC to undertake two reviews of distribution reliability standards and outcomes.

The first review is to focus on distribution reliability outcomes in NSW. The AEMC is required to analyse the reliability standards and consequent outcomes to date, including

verification that the NSW approach is appropriate, and provide estimation of the willingness-to-pay for reliability. In addition, the AEMC is required to provide a framework and information so the NSW Government can decide whether the existing NSW licence conditions need to be amended to reflect different reliability outcomes.

In June 2012, the AEMC published draft advice on four scenarios for distribution reliability in NSW and examined trade-offs between possible changes in distribution investment and reliability performance for each scenario. The draft advice provides information for the NSW Government should it decide changes should be made to the level of reliability that is provided by electricity distribution networks in NSW. The AEMC's final advice is not expected to be available in time for consideration in this Strategy.

The second review is to have a national focus, and will be a review of frameworks and methodologies for achieving distribution reliability outcomes. As part of the national work-stream, the AEMC will provide an analysis of the different approaches to achieving distribution reliability across the National Electricity Market. As part of this work-stream, the AEMC will also assess the costs and benefits of the different approaches to setting reliability standards. Using this analysis, the AEMC will consider if there is merit in developing a nationally consistent framework for distribution reliability outcomes.

In June 2012, the AEMC published an issues paper for public consultation on the national workstream of the review of distribution reliability outcomes and standards. The AEMC will prepare a draft report that assesses whether there are benefits in developing a nationally consistent reliability framework. The draft report is scheduled to be published in November 2012.

Depending on the findings in the review, the AEMC may make recommendations to the SCER about the way reliability standards are expressed, delivered and reported nationally.

5.3.3 Network planning framework

At the national level, AEMO performs the role of the National Transmission Planner. As part of this role, AEMO is required to prepare a National Transmission Network Development Plan (NTNDP) on an annual basis. The national transmission planner role was recently established following a policy direction by the MCE and a review by the AEMC.

As the market system operator, AEMO prepares the *Electricity Statement of Opportunities for the National Electricity Market* (ESOO) which provides a broad analysis of opportunities for generation and demand side investment in the national electricity market. The ESOO also provides information about demand projections, generation capacities, and supply adequacy for the next 10 years.

The information contained in the ESOO and NTNDP provides information about network development and demand management opportunities. The preparation of this Strategy has drawn on the information prepared by AEMO in the NTNDP and ESOO.

The national framework is supplemented by network management plans prepared by TransGrid and the distribution network service providers.

5.3.4 Transmission planning framework

TransGrid is obliged to ensure that planning and development of the network transmission service meets NSW legislation, NER requirements and contractual arrangements with connected customers. Investment in the transmission network is driven by reliability requirements, growth in demand and maximum demand, renewal of ageing infrastructure and infrastructure standards and safety. Many of these requirements are regulatory obligations.

TransGrid is registered as a Transmission Network Service Provider (TNSP) in the NSW region of the National Electricity Market. Under the NER, TransGrid is responsible for planning and development of networks and as such is required to perform a range of functions. The range of functions includes conducting annual planning reviews with distributors to determine the extent of any emerging constraints (joint planning reviews); analysing the future operation of its transmission network to determine the extent of any future network constraints; economic analysis of the investment options in accordance with the AERs regulatory investment test and prepare and publish an Annual Planning Review by 30 June of each year. TransGrid conducts planning over a short time frame from 1-5 years and also over a longer term period from 5-20 years. TransGrid provides input to AEMO to assist the preparation of the NTNDP and ESOO.

Each year, TransGrid produces an Annual Planning Report which provides advanced information to market participants and interested parties on NSW energy demand projections; emerging constraints in the NSW network; information on completed, committed and planned expansion, and proposed network developments over the next five years. The Annual Planning Report is intended to provide the market with information to identify potential demand management solutions.

TransGrid is required under the *Electricity Supply (Safety and Network Management) Regulation 2008* to prepare a Network Management Plan which outlines its approach to managing existing network assets. The Network Management Plan contains information on the management of network safety and reliability; customer installation safety; public electrical safety awareness; and bush fire risk management.

5.3.5 Distribution planning and reporting requirements

In accordance with the NER, distributors are required to carry out analysis and planning of the future operation of distribution networks. As required of TransGrid, the distributors are also required to prepare and implement a Network Management Plan.

Distributors must produce an annual report covering major issues concerning the operation of their networks network management. These matters include network planning covering demand management; asset management including quality of supply; reliability; public safety; network employee safety; customer installation safety; contestable work scheme; bushfire risk management; and public electrical safety awareness campaigns.

Review of distribution network planning and expansion framework

The AEMC is currently undertaking a review of the distribution network planning framework based on a Rule change request submitted by SCER. The Rule change request follows from recommendations made to the SCER by the AEMC in its *Review of National*

Framework for Electricity Distribution Network Planning and Expansion which was completed in September 2009. In its review, the AEMC recommended amendments to the national planning framework.

In response to SCER's proposal, the AEMC published a draft Rule determination in June 2012. The AEMC proposed a number of new requirements to the distribution planning framework including:

- Establishing a distribution annual planning review process including requirements for a Demand Side Engagement Strategy to be prepared by each distributor.
- Requiring each distributor to publish a Distribution Annual Planning Report. The report is to include information on forecasting; identified system limitations; investments that have been (or will be) assessed under the regulatory investment test for distribution (RIT-D); and significant investment in metering.
- Engaging with non-network providers and considering non-network alternatives.
- Meeting regularly to carry out joint planning with each transmission network service provider whose network is connected to the distributor's network and with other distributors to consider any augmentation (or non-network alternative) that affects more than one network.
- Changes to the regulatory investment test to align with the regulatory investment test for transmission.

The draft Rules proposed by the AEMC reflect, to a some extent, arrangements already in place in NSW. If the Rule proposals outlined above are approved they are not expected to significant impact the planning arrangements faced by NSW distributors.

5.4 Investment in electricity networks

The NSW Government has over \$26 billion of capital invested in the electricity transmission and distribution businesses. This represents around 10.7 per cent of the value of all State owned assets.⁸⁵ The values shown in table 2 represents the 'fair value' of the network assets as at the end of June.⁸⁶

Table 2 Value of electricity network assets

As at 30 June 2011	TransGrid	Ausgrid	Endeavour	Essential	Total
Value assets (\$ billion)	5.4	9.9	4.7	6.3	26.3

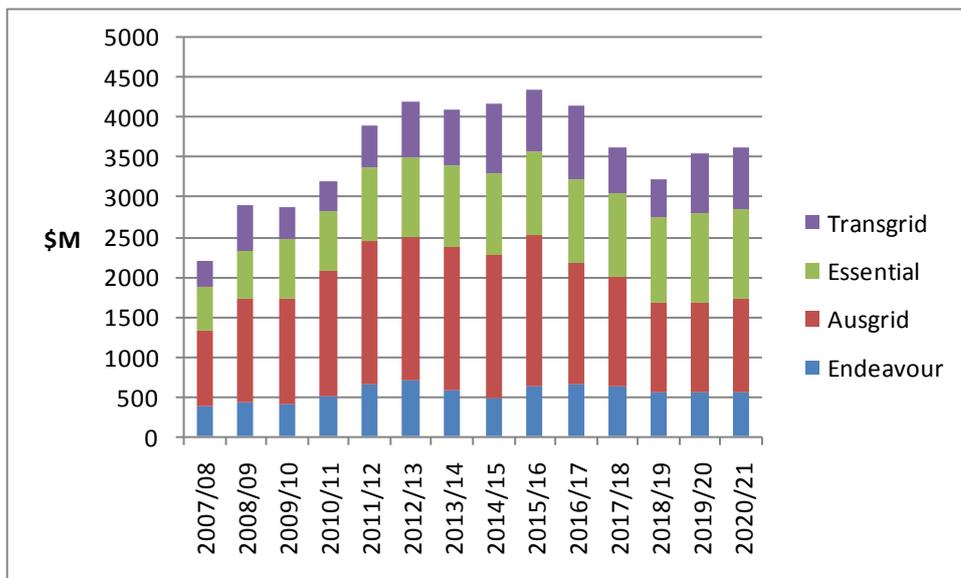
Source: NSW Government, *Budget Paper No.4, 2012-13 Infrastructure Statement*, p.1-17.

⁸⁵ Prepared from information contained in NSW Government 2012, *Budget Paper No.4, 2012-13 Infrastructure Statement*, p.1-14.

⁸⁶ NSW Government 2012, *Budget Paper No.4, 2012-13 Infrastructure Statement*, p.1-17.

In the past ten years, NSW Government investment in the electricity network has more than doubled. In the next 10 years, capital expenditure in the NSW electricity network will average \$3.2 billion a year. The trends actual and forecast capital expenditure by the networks businesses are shown in figure 15.

Figure 15 NSW Government investment in electricity networks 2007/08 to 2020/21



Source: Information provided by to INSW by NSW Treasury.

The increase in capital investment by the networks has been the main contributing factor to increase in electricity prices in recent years.

5.4.1 Transmission capital expenditure

As at 2011, TransGrid’s assets were valued at \$5.4 billion (as shown in table 2). TransGrid’s actual capital expenditure and percentage change is shown in the table 3 below. The trends in actual capital expenditure figures show significant swings from year to year.

Table 3 Trends in capital expenditure by TransGrid 2004/05 to 2010/11

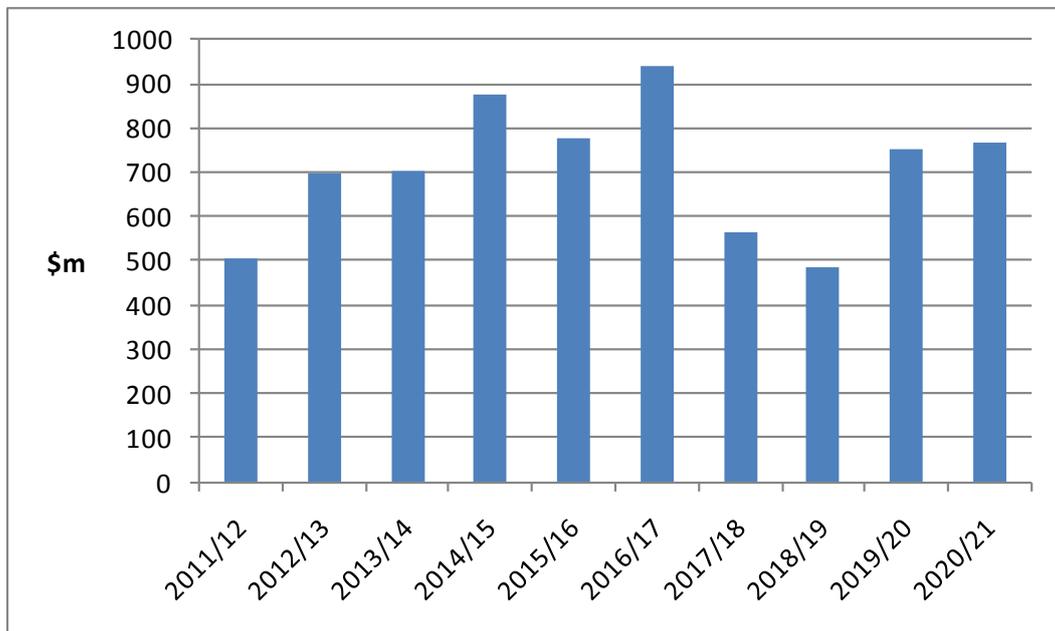
	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Capex	138.3	158.6	218.2	326	582	407	365
%change		15%	38%	49%	79%	-30%	-10%

Source: Information for the years 2004/05 to 2006/07 prepared by GHD for INSW. Information for the years 2007/08 to 2010/11 provided to INSW by NSW Treasury.

The figures show large increases in levels of annual capital expenditure in the period 2004/05 to 2010/11 from \$138.3 to \$365 million. Capital expenditure per annum averaged around \$313 million during this period. From 2005/06, there was a steep incline in capital expenditure especially in 2007/08 and 2008/09 followed by sharp declines the following two years. On average capital expenditure increased by \$38 million (or 23 per cent) per annum over this period.

TransGrid’s future capital expenditure requirements are forecast to continue to increase by a significant amount. The forecast capital expenditure requirements for TransGrid are shown in the following figure.

Figure 16 TransGrid forecast capital expenditure 2011/12 to 2020/21



Source: Information provided to INSW by NSW Treasury.

TransGrid’s capital expenditure is forecast to increase to an average of \$706 million per annum in the period from 2011/12 to 2020/21. This is a significant increase from past levels of capital expenditure (averaging \$313 million during 2004/05 to 2010/11). The committed projects for TransGrid are discussed in section 5.5.1.

5.4.2 Distribution investment

As at June 2011, the combined value of the distribution assets was \$21 billion (as shown in table 2 above). The following table shows the trends in capital investment by distributors. In the period 2004/05 to 2010/11, the levels of annual capital expenditure for each of the three distributors increased significantly. The largest change was experienced by Ausgrid with an increase from \$484 million in 2004/05 to \$1.5 billion in 2010/11. Capital expenditure for Ausgrid averaged just over \$1 billion in this seven year period. Capital expenditure by Essential Energy increased from \$271 million in 2004/05 to \$747 million in 2010/11. Capital expenditure averaged around \$527 million per year.

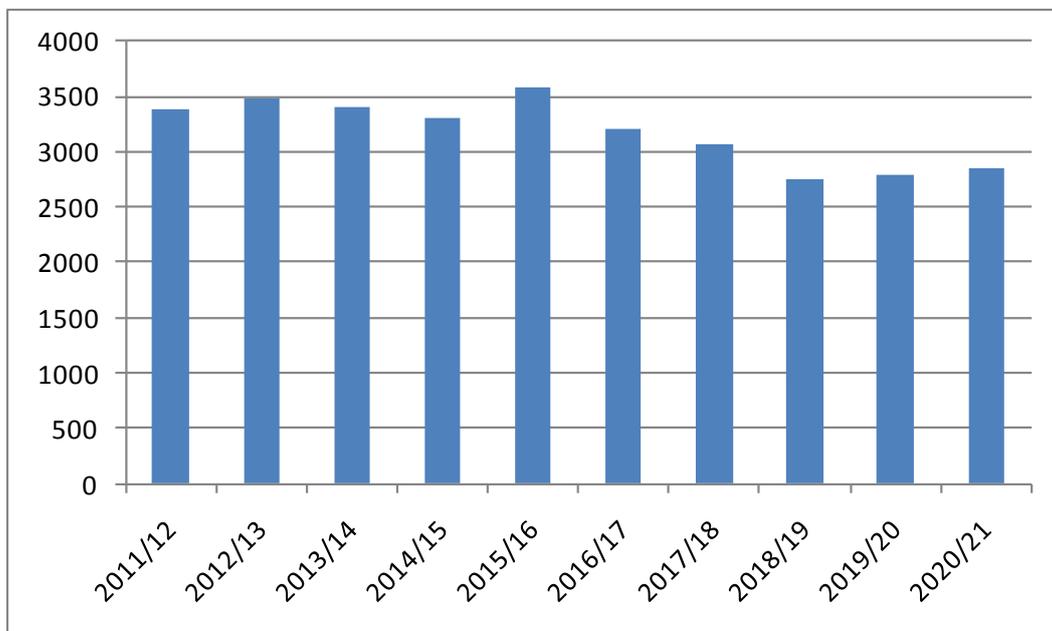
Table 4 Trends in capital expenditure by distribution networks

	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Ausgrid	484	604	784	951	1,291	1,319	1,578
% change	-	25%	30%	21%	36%	2%	20%
Endeavour	257	337	382	374	443	417	499
% change	-	31%	13%	-2%	19%	-6%	20%
Essential	271	347	437	553	593	740	747
% change	-	28%	26%	27%	7%	25%	1%
Total	1,012	1,288	1,603	1,878	2,327	2,476	2,824
% change		27%	24%	17%	24%	6%	14%

Source: Information for the years 2004/05 to 2006/07 prepared by GHD. Information for the years 2007/08 to 2010/11 provided by NSW Treasury.

Of the three distributors, Endeavour Energy had the lowest level of capital expenditure. Capital expenditure increased from \$257 million to \$499 million or an average of \$387 million per annum.

Figure 17 Distributors’ forecast capital expenditure 2011/12 to 2020/21



Source: Information provided to INSW by NSW Treasury.

In total, the average capital expenditure for the three distributors from 2004/05 to 2010/11 was \$1.9 billion per annum. The level of capital expenditure for the three distributors for the period from 2011/12 to 2020/21 is forecast to average at around \$3 billion per annum. The forecasts are shown in the figure 17 above.

5.5 Investment drivers for transmission networks

Investment in the electricity transmission network is driven by legislative obligations that set out reliability and access requirements and meeting the needs of its large directly connected customers. TransGrid works with the distributors and large customers to plan, develop and manage the network to meet the service standards as set out in the NER, connection agreements with customers, distributor licence obligations and jurisdictional planning criteria.

In its most recent regulatory proposal to the AER, TransGrid described the challenges it faces in maintaining its service performance to its customers. At the time, TransGrid stated that major new infrastructure investment was needed to meet growing demand and to maintain service quality to customers. As a consequence, TransGrid identified the need for a significant increase in its capital program.⁸⁷

One of the challenges raised by TransGrid was the sustained annual increase in energy consumption over the past six decades. This was the combined result of population growth and increase in energy used per person. In addition, both winter and summer demand peaks have grown over recent years, with the winter peaks increasing by an average 250 MW a year and the summer peaks increasing by an average 440 MW a year.⁸⁸ TransGrid forecasts that the summer peaks are expected to consistently exceed the winter peaks from about 2013. A summer peaking system increases the demands placed on the network due to the lower thermal capacity of most transmission equipment at times of higher ambient temperature.

TransGrid cited comments in the *Inquiry into Electricity Supply in NSW* (the “Owen Inquiry”) which highlighted the likely need for additional base load capacity power in the near future (then 2013/14). Base load generation is connected at the transmission level and TransGrid will need to have a network capable of supporting this need. The challenge for TransGrid will be to deliver the potentially significant works required to develop the network to meet the generation developments that eventuate in the lead time available to undertake these works.

TransGrid’s network is one of the largest and one of the oldest in Australia. The majority of system development occurred between the 1960s and the 1980s. Forty per cent of the transmission lines were commissioned in the 1960s or earlier; 35 per cent of the substations and switching stations were commissioned in the 1960s or earlier; and 25 per cent of the

⁸⁷ TransGrid 2008, *Meeting customer needs for transmission services, TransGrid Revenue Proposal, 1 July 2009 - 30 June 2014*.

⁸⁸ TransGrid 2008, *Meeting customer needs for transmission services, TransGrid Revenue Proposal, 1 July 2009 - 30 June 2014*, p.25.

power transformers were commissioned in the 1960s or earlier. Consideration of asset replacements are triggered by asset condition; equipment performance and reliability; supportability of assets; and compliance with safety and environmental obligations. The asset renewal program was another significant challenge for TransGrid.

An important part of TransGrid's planning and development function is to provide connections for proposed new generators. In recent years, the majority of applications to connect to TransGrid's network have been from proponents of gas or wind powered generation. Since 2008, TransGrid has been involved in connecting four new generation projects - Uranquinty gas fired generator; Colongra gas fired generator; Capital Wind Farm; and Woodlawn Wind Farm.

In addition to these new connections, TransGrid worked with the NSW distributors to coordinate and assist with the connection of new generating systems of various technologies and scale. This includes the Tallawarra gas fired station embedded in Endeavour Energy's 132 kV network and the Cullerin Range Wind Farm, the Gunning Wind Farm and the Jounama Hydro Power Station embedded in Essential Energy's distribution network.

TransGrid expects an increased level of connection activity to emerge. The expected activities include:⁸⁹

- Increased level of connection for gas, wind and solar generation as a result of the implementation of the carbon price and renewable energy target scheme. But noting there is a large amount of wind generation resource in NSW near existing transmission lines.
- Reconciling the impact of intending generators technical performance with TransGrid's performance obligations to existing generators and consumers.
- An increase in demand for network services to supply energy to new industrial and mining operations which will predominately be in rural parts of the State. Existing electricity transmission infrastructure is likely to require augmentation and extension to both connect and support the load increase.

TransGrid as the transmission service provider will face a raft of complex challenges which will impact on infrastructure investment and management. The current regulatory framework provides a stable environment for TransGrid to be able to plan and operate its network to meet these challenges.

The range of reviews being conducted by the AEMC is likely to improve the effectiveness and transparency of the existing framework governing transmission planning and economic regulation.

5.5.1 Transmission investment projects

The types of investment challenges identified by TransGrid are driven by the need to meet regulatory requirements. These requirements translate into investment projects.

⁸⁹ TransGrid 2011, *New South Wales Annual Planning Report 2011*, p.78.

Key transmission projects identified in 2011 National Transmission Network Development Plan are presented in the table 5 below.

Table 5 Transmission projects

	Project	Status
1	Series compensation on the Armidale–Dumaresq 330 kV circuits and the Bulli Creek–Dumaresq 330 kV circuits.	TransGrid and Powerlink are actively investigating upgrade impacts.
2	A new 220 kV, 250 MVA phase angle regulator on the Buronga–Red Cliffs 220 kV circuit.	The feasibility of a phase angle regulator installation is under investigation.
3	Upgrade of VIC–NSW interconnector.	Preparatory work done by TransGrid and AEMO.
4	Hunter Valley–Eraring (via Newcastle) 500 kV development.	TransGrid is actively working on this develop.
5	Replacement of the 500/330 kV Eraring Power Station transformer with a 1,500 MVA unit, and add a new parallel 500/330 kV Eraring Power Station transformer.	Second transformer is expected to be required soon.
6	Hunter Valley–Northern NSW zone 500 kV developments.	Dependent on load growth in the Northern NSW zone and interconnector power flow.
7	Upgrade terminal equipment on the Ingleburn–Wallerawang Power Station 330 kV circuit to achieve the full line rating. Address attendant voltage control issues for Sydney’s 330 kV transmission network.	Minor works to be undertaken if economic in advance of any potential limitations.
8	Additional Mt Piper –Wallerawang 330 kV circuit.	Options and needs being investigated.

Source: AEMO 2011, *National Transmission Network Development Plan*.

In June 2012, TransGrid and its counterpart in Queensland, Powerlink, published a report initiating consultation on a possible upgrade of the Queensland/NSW Interconnector (QNI).⁹⁰ The proposal is to upgrade the capacity by approximately 20 per cent. At present,

⁹⁰ TransGrid and Powerlink 2012, *Project Specification Consultation Report – Development of the Queensland - NSW Interconnector*.

the maximum transfer capacity is 700 MW from NSW to Queensland and 1,078 MW from Queensland to NSW. The report states that QNI is constrained on occasions for both northwards and southward flows and the number of hours of constraint in both directions is increasing. The report is the first step of consultation under the regulatory investment test for transmission framework under the NER. A follow up report is expected to be released in mid to late 2013.

The delivery of the listed projects is part of the planning framework that aims to maintain reliability of the transmission network. The proposed QNI upgrade has the potential to provide significant market benefits by allowing each jurisdiction to have access to lower priced generation sources.

5.5.2 Longer term transmission projects

In the 2010 NTNDP, AEMO carried out strategic planning modelling to identify possible options to address observed limitations. The outcome of the strategic planning identified a list of longer term transmission projects. Strategic outcomes specific or relevant to NSW include:

- As part of a longer term vision, AEMO modelled the impact of significantly increasing transmission capacity between the regions. Referred to as NEMLink, AEMO considers that this project has the potential to allow a largely unconstrained and reliable interchange of energy across the entire National Electricity Market.
- Many scenarios underscored the need for augmentation to complete the main 500 kV transmission ring that circles and supports the major load centres of Sydney, Wollongong, and Newcastle.
- Multiple future generation investments, or generation clusters, may develop in areas (zones) with the most cost-effective renewable and non-renewable resources. Areas in NSW identified as subject to significant potential investor interest, based on active connection enquiries included Northern NSW and Central NSW.
- Significant augmentations are required under the majority of scenarios, including extension of the currently incomplete 500 kV transmission ring around Sydney and 500 kV transmission lines to connect major new gas fired generation in Central Northern NSW.⁹¹

A key issue emerging from this strategic analysis is the need to augment the high voltage link to supply the Sydney area and to accommodate gas fired generation and renewable generation.

The question of timing for these projects or whether they will be undertaken will depend on a range of regulatory and market factors. As the investment timeframe approaches, more detailed technical investigations are carried out to ascertain technical issues. Any proposed project will be subject to the planning arrangements under the NER.

⁹¹ AEMO 2010, *National Transmission Network Development Plan*, p.75.

5.5.3 Transmission Frameworks Review

The SCER directed the AEMC to prepare a review into electricity transmission network frameworks. The focus of the *Transmission Frameworks Review* is on network investment; network operations; network charging, access and connection; and management of network congestion.

The purpose of the review is to assess whether the current arrangements for transmission networks remain the most workably efficient and effective for taking the National Electricity Market forward into future decades. The AEMC notes this is an important question now with significant but uncertain changes in generation fuel mix and location and that this is highly likely, in part, as a result of climate change policies.

In November 2011, the AEMC published the First Interim Report for the *Transmission Frameworks Review* report setting out five alternate paths for reforming the role and provision of transmission networks and options for enhancing the planning and connection arrangements.

In the Second Interim Report, released in August 2012, the AEMC made revised proposals for generator access as well as proposals for the planning and connection arrangements. In summary, the proposals set out in the Second Interim Report are:⁹²

- Two options for generator access: including the first option for ‘non-firm’ access which is similar to current arrangements but with the clarification that this was the only access or product that can be offered to generators. The second option is for ‘optional firm’ access. This proposal offers scope for generators to choose whether to have ‘firm’ or ‘non-firm’ access. The difference being that in the event of a constraint on the network that prevented access to the regional wholesale spot price, generators with firm access would receive compensation from generators that did not have firm access.
- Planning: proposals: enhancing national coordination of transmission planning whilst maintaining ownership and operation of transmission at regional levels.
- Connection arrangements: overhaul the current connection arrangements including enhancing the negotiation framework; simplifying the categories of services; and clarifying the responsibilities for provision of extensions and augmentations.

The Second Interim Report sets out the AEMC’s proposals for improving planning, connection and access arrangements. The AEMC is seeking stakeholder submissions to assist in the assessment of the relative benefits of the options. A final report with recommendation will be made to SCER in early 2013.

5.5.4 Investment drivers for electricity distribution

Similarly to transmission, investment in the distribution network is driven by legislative obligations set out in the NER and *NSW Electricity Supply Act 1995* and Regulations. The legislative requirements cover service reliability, planning and access arrangements.

⁹² AEMC 2012, *Transmission Frameworks Review, Second Interim Report*.

The key investment drivers faced by distribution are:⁹³

- meeting the expected demand for network services and in particular peak demand
- maintaining quality, reliability and security of supply of the distribution system and network services. This includes assessing asset condition and meeting modern infrastructure standards
- complying with all applicable regulatory obligations including jurisdictional requirements.

The NSW distributors will be submitting regulatory proposals to the AER in May 2013 for revenue requirements including for capital expenditure for period from 1 July 2014 to end 30 June 2019.

There may be scope for the capital expenditure allowances for NSW distributors to be lower than capital allowances in the current regulatory period. This position is predicated on the latest AEMO forecasting information which show significant falls in actual electricity consumption and maximum demand for NSW and forecasts that are lower than in the previous year. On this basis, a review of the proposed capital expenditure programs for each of the network businesses may be warranted.

5.5.5 Distribution investment projects

In 2012/13 capital expenditure by Networks NSW (includes Ausgrid, Endeavour Energy and Essential Energy) is budgeted to be \$3.4 billion.⁹⁴ A list of key projects for each of the distributors prior to the formation of Networks NSW is shown in tables 6 to 8.

Investment in infrastructure by Ausgrid in 2011/12 was estimated to be around \$1.8 billion. A summary of key projects is set out in the table below.

Table 6 Committed distribution projects for Ausgrid

Major projects	Value	Description
Transmission and zone substations	\$358 m	Substations to provide capacity, meet licence conditions, replace aged assets and meet forecast load growth in the medium to long term including new substations at Belmore Park, Hurstville North, Engadine, Empire Bay, Broadmeadow and Charlestown, and replacement and upgrade of North Sydney zone substation and Canterbury subtransmission substation.
Cables	\$280 m	New and replacement 132kV, 66kV and 33kV cables to maintain network reliability performance, including feeder cables between Peakhurst-Bunnerong, Peakhurst-

⁹³ Derived from information contained in Ausgrid (formerly EnergyAustralia) 2008, *Regulatory Proposal*, p.37.

⁹⁴ NSW Government 2012, *Budget Paper No.4, 2012-13 Infrastructure Statement*, p.1.6.

Major projects	Value	Description
		Beaconsfield West and Mason Park-Rozelle.
Distribution centre renewals	\$177 m	Essential renewal of distribution centres and replacement of distribution mains and services that have reached the end of their useful life across Ausgrid's network.
11kV Network	\$105 m	Development of the Ausgrid 11kV network.
Substation augmentation	\$90 m	Augmentation of distribution substations and the low voltage distribution network across Ausgrid's network to accommodate growth in the demand for electricity.
Substation equipment	\$75 m	Replacement of substation equipment including 132kV and 33kV circuit breakers, 11kV switchgear, replacement and refurbishment of transmission towers and poles, protection equipment and other systems.
New cable tunnel	Over \$30 m	Preliminary work for a new cable tunnel in the Sydney CBD.

Source: NSW Government 2011, *Budget Paper No.4, 2011-12 Infrastructure Statement*.

Capital expenditure by Endeavour Energy in 2011/12 was budgeted for around \$674 million. The table below shows a sample of major projects.

Table 7 Committed distribution projects for Endeavour Energy

Major projects	Value	Description
Zone substation	\$278 m	Works undertaken at Parramatta, Casula, Camden, Schofields, Wilton Park, Granville, Doonside, Cheriton Avenue, Canley Vale and Chipping Norton.
Capital refurbishment	\$134 m	Refurbishment of the distribution network to maintain reliability as network demand grows.
Transmission substations	\$79 m	New transmission substations being established at Liverpool, West Tomerong and Guildford.
High voltage distribution network	\$34 m	Augmentation and development of the high voltage distribution network.

Source: NSW Government 2011, *Budget Paper No.4, 2011-12 Infrastructure Statement*.

Investment by Essential Energy in 2011/12 was estimated to be about \$917 million and the major projects are listed in the following table.

Table 8 Committed distribution projects for Essential Energy

Major projects	Value	Description
Substations	\$60 m	New substations at Halliday's Point, Tea Gardens, Uranquinty, Gundagai, Morven, Suffolk Park and Inverell.
Subtransmission lines	\$53 m	Subtransmission lines including under grounding 2.4 km of 132kV line at Ewingsdale and re-insulating lines between Mullumbimby-Ballina, Yarrandale- Gilgandra and Beryl-Dunedo.
Transmission lines	\$40 m	Transmission lines including a second line between Dubbo-Yarrandale, Deniliquin-Moama, and a new line from Forbes to West Jemalong.

Source: NSW Government 2011, *Budget Paper No.4, 2011-12 Infrastructure Statement*.

5.6 Connection service contestability

Unlike arrangements in other jurisdictions, in NSW the provision of connection services from a customer premises to the shared network is fully contestable. NSW distribution networks do not fund connection assets but are required to maintain the connection assets that are built and gifted back to the network.

The NSW Government introduced contestability for the provision of particular connection services in 1995. The connection contestability arrangements are supported by a scheme to accredit service providers that are qualified to provide these services.

In July 2010, the NSW Government conducted a review of the contestable services framework and sought comments on particular aspects of the scheme. The NSW Government found that since 1995, there had been significant maturing of the market for electricity distribution services with over 1,200 accredited service providers operating in the contestable connections market. The value of contestable works undertaken each year has increased to an estimated \$300 million per year and the complexity of the type of work undertaken had increased.⁹⁵

In December 2011, the Australian Government released the *Draft Energy White Paper Strengthening the Foundations for Australia's Energy Future*. In the *Draft White Paper* the Australian Government notes that there are areas, such as network connections, where the provision of

⁹⁵ NSW Government 2011, *Review of contestable services on the New South Wales electricity network, Final report*.

network services could be contestable and that this would assist in delivering the most efficient outcomes for both the direct users of those services and consumers more generally.

The Government notes that SCER is currently looking into developing a national framework for the provision of contestable distribution connections.⁹⁶

The NSW arrangements offer the most effective approach to facilitating private sector involvement in what is considered to be a monopoly industry. It will provide a model for any future reforms in the provision of contestable distribution connections.

5.7 Strategic priorities for electricity network infrastructure

Infrastructure investment by the NSW Government owned network businesses has been the largest contributor to the electricity price increases. The proposed strategies are aimed at achieving cost effective and reliable networks that enhance market security and better balances service with affordability.

Strategic infrastructure priorities for transmission and distribution

It is proposed that in the short term, the NSW Government:

- Conduct a full review of distribution capital proposals for 2012 to 2014 and for the next regulatory period (2014 to 2019) to identify potential capital savings (from all uncommitted projects).
- Support measures to reduce network capital costs including support for the AEMC reviews into distribution reliability standards and rules governing the economic regulation process and rates of return.

The economic reforms that have taken place in the energy sector have successfully delivered competition in the wholesale and retail gas and electricity markets. The competition reforms are complemented by effective national regulation of the monopoly transmission and distribution sectors.

The electricity transmission and distribution sector is subject to an effective regulatory framework. The recent reviews are evidence that the governance arrangement allow for timely reviews to adjust to changes in circumstances and address concerns.

As the owner of these businesses, the Government has the objective of maximising the financial and regulatory returns from these businesses. In its policy role it has the objective of placing downward pressure on costs to ensure affordability and competitiveness of the NSW economy. Having these two competing objectives creates a conflict of interest for the NSW Government. Divesting ownership of the network businesses would allow the

⁹⁶ Australian Government 2011, *Draft Energy White Paper 2011 Strengthening the Foundations for Australia's Energy Future*, p.145.

Government to focus on a single objective of maintaining pressure to lower costs and the regulatory returns of these businesses.

It is proposed that, in the medium term, the NSW Government:

- Review the appropriateness of owning the transmission and distribution businesses
- Ensure that regulatory arrangements for transmission and distribution reliability standards and economic regulation are appropriate to balance the interests of the network businesses and the electricity consumers.

Strategic infrastructure priorities for transmission

Strengthening the interconnectors between the regions will enhance competition in the national wholesale market. Medium term planning indicates a primary need to develop the high voltage link to supply the Sydney area and to accommodate gas fired generation and renewable generation.

It is proposed that the NSW Government:

- Prioritise transmission projects to strengthen the capacity of interstate flows in the National Electricity Market
- Prioritise transmission projects to strengthen supply to the Sydney metropolitan area.

6. Electricity generation

More so than other sector, electricity generation will see major structural changes over the next twenty years. The NSW Government will divest ownership of its generation assets and future investment in NSW generation will be undertaken by the private sector.

The role of the Government will be to ensure regulatory and policy frameworks do not impede efficient and timely investment in generation. Ultimately, the policy aim is to ensure sufficient generation to maintain reliability of supply to customers and security of the electricity system using the most cost effective technology.

6.1 Issues and challenges

There are three complex and interacting challenges facing the generation sector in NSW and other jurisdictions. These challenges will influence investment in types of generation plant and the levels of investment.

Policy initiatives and uncertainty

The most high profile challenge involves responding to the policies to reduce reliance of the economy on carbon intensive energy sources. The introduction of the Federal Government's carbon price on 1 July 2012 is designed to encourage investment in cleaner generators plant types including gas, wind and other renewable sources. This represents an unprecedented investment challenge in the energy sector.

There is a concern that the changing policy environment has created uncertainty and delayed or discouraged investment in an optimal portfolio of generation plant.

There is also uncertainty about the development of future carbon markets and the difficulty of estimating a forward price of carbon and of future and transitional mechanisms.⁹⁷

The carbon price mechanism is aimed at placing a 'price' on carbon which is a by-product or, in economic terms, a 'negative externality' of electricity produced from fossil fuels. The aim of the carbon price is to signal the cost of carbon to emitters and users to encourage adoption of less carbon intensive generation technology.

The successful introduction of a carbon price warrants a review of the range of other carbon related initiatives so as to prevent duplication of schemes that are intended to encourage cleaner energy. In particular, the Renewable Energy Target (RET) scheme largely duplicates the policy objectives of carbon pricing.

The concern is that the range government cleaner energy schemes are adding costs to the price of electricity on top of the carbon price. Further, the range of schemes may be causing investment in generation technology that is sub-optimal. Sub-optimal investment means

⁹⁷ Pierce, J 2012, *The Australian National Electricity Market: Choosing a new future*, AEMC, Conference Paper, World Energy Forum on Energy Regulation V, 13 - 16 May 2012, Quebec City, Canada.

generation costs will be higher than necessary. In particular, there is a concern that the range of schemes including the RET scheme are hindering investment in cost effective base load generation.

The challenge is to develop a coherent policy framework that encourages investment in cleaner energy sources that is optimal and least cost. The NSW Government is currently engaged in reviewing the complementarity of existing national and jurisdictional schemes.

Demand supply balance – need for base load plant

By 2030, it is estimated that NSW will require up to 7,000 MW of new base load generation capacity. However, there has been a notable slow down of investment in base load generation plant. There are indications that private investment in new generation, particularly base load, may face financial barriers brought on by perceived policy risk about carbon pricing at the national level.

Consumption patterns

A third challenge facing the generation sector is that electricity consumption patterns are changing and becoming more intense in peak times. More and more households are installing and using air conditioning. In the absence of demand management, this change in consumption behaviour is likely to result in the need for more peaking plant to be built.

Future investment by the private sector will be strongly influenced by a number of factors including government policy regarding measures to encourage clean energy and the cost of new entrant generation technology. To encourage new investment in future generation capacity, it is recommended that the Government develop clear policy and regulatory frameworks that will provide more certainty to private investors and encourage cost effective investment.

6.2 Structure of the generation sector

Electricity generation in NSW is provided by both publicly and privately owned power stations. Currently in NSW there are around 21 power stations operating with an aggregate capacity of 16,923 MW.⁹⁸ Non-hydro renewable sources provides a further 366 MW of capacity (excluding rooftop photovoltaics).

Around 82 per cent of electricity in NSW is generated by the four state owned corporations Macquarie Generation, Delta Electricity, Eraring Energy and Snowy Hydro. Around six per cent is generated from renewable sources including hydro, wind, solar and bioenergy. NSW imports around 10 per cent of its electricity from other states.

The major NSW power stations, owners, type of plant and capacity are shown in the table 9.

⁹⁸ ESAA 2011, *Electricity, Gas, Australia*.

Table 9 Main generation entity, power station capacity in NSW

Entity and owner	Power station	Plant type	Capacity (MW)	Technical life
Delta Electricity, NSW Government	Mt Piper	Subcritical -black coal	1,400	2043
	Munmorah*	Subcritical –black coal	600	2015
	Vales Point B	Subcritical – black coal	1,320	2028
	Wallerawang C	Subcritical – black coal	1,000	2028
	Colongra	OCGT	667	2039
Eraring, NSW Government	Eraring	Subcritical -black coal	2,682	2033
Macquarie Generation, NSW Government	Bayswater	Subcritical – black coal	2,640	2036
	Liddell	Subcritical – black coal	2,000	2027
Redbank	Redbank	CFBC	150	2051
Marubeni Australia Power Services	Smithfield Energy Facility	CCGT	160	2027
TRUenergy	Tallawarra	CCGT	460	2039
Origin	Uranquinty	OCGT	640	
Snowy Hydro, NSW Government share	Tumut 1,2,3	Hydro	2,285	
Other	Various	Renewable capacity – non-hydro	366	

Sources: ESAA, *Electricity Gas Australia 2011*, NSW Parliamentary Library Research Service 2011, *Key Issues in Energy Background Paper No 4/2011*. Company websites. *In July 2012, Delta Electricity announced the closure of Munmorah.

The table shows that coal fired generators dominate the type of available plant capacity in NSW. The most significant recent investments have been in gas fired generators. TRUenergy built Tallawarra Power Station located near Wollongong which is a combined cycle gas turbine (CCGT). Tallawarra Power Station generates enough power to supply up to 200,000 homes. It commenced operation in January 2009. Origin Energy built

Uranquinty Power Station which is a 640 MW gas fired peaking power station and one of the largest open cycle gas turbine (OCGT) power stations in Australia.

Non-hydro renewable energy (not including photovoltaic solar rooftop units) makes a small contribution to NSW generation capacity. The renewable capacity consists mostly of wind turbines (just over 50 per cent). Other fuel sources include bioenergy and solar.

In December 2010, the electricity generated by Eraring Power was purchased by Origin Energy and the power generated by Mt Piper and Wallerawang C was purchased by TRUenergy. These arrangements were put in place by the previous government.

In November 2011, the Government announced plans to privatise the State's electricity generators. This reform implements the Government's response to the *Special Commission of Inquiry into Electricity Transactions* conducted by the Hon. Brian Tamberlin, QC.

The Government intends to sell Eraring; Delta West (Mount Piper, and Wallerawang C); Delta Coastal (Munmorah, Vales Point and Colongra); and Macquarie Generation generators, the generation development sites previously identified, and a sale or lease of the Cobbora mine. The sale of these generation assets is estimated to provide around \$3 billion in gross proceeds.

The Government has stated that it is seeking to divest ownership of these assets because it wants to free up funds for infrastructure spending. The net proceeds of the sale will be paid into an infrastructure fund. The Restart NSW Fund has been established by the Government to fund major infrastructure projects that will improve the economic growth and productivity of NSW.

Other objectives of privatising the generation assets are to encourage private sector investment, create a more competitive electricity sector and place downward pressure on electricity prices.

Investment drivers for the generation sector are heavily influenced by activity in the National Electricity Market. The investment environment in the National Electricity Market is discussed in the next section.

6.3 Investment signals in the national electricity market

All electricity generators in the eastern and southern states, with a nameplate capacity of 30 MW or more (scheduled generators), are required to participate in the National Electricity Market.

Under the national market arrangements, scheduled generators trade in the market by competing to be dispatched. Scheduled generators submit their prices and generation quantities for each five minute interval. The generators are dispatched in merit order from lowest to highest bid price. The wholesale 'spot' price is set every half hour and is calculated based on the average of five minute dispatch prices. The dispatch price is influenced by the actual demand for electricity. The electricity is 'pooled' is purchased by electricity. Retailers on-sell the electricity to their customers.

AEMO operates the wholesale market to ensure sufficient generation is dispatched to meet system demand. In general, the trend in daily half hour prices correlates positively to the levels of demand. However, spot prices can fluctuate depending a range of circumstances including unplanned outages and unexpected changes in weather conditions.

The wholesale spot market arrangements are underpinned by financial hedging arrangements to limit exposure by the generators and retailers to the fluctuations of the spot market price. The main types of hedging instruments are ‘over the counter’ contracts and electricity futures. Over the counter contracts are contracts between two parties, usually a generator and retailer. The most common types of hedges are ‘swap’ and ‘cap’ hedges. Other types of hedges involve the parties negotiating a price for electricity that provides a degree of certainty about the price of wholesale electricity.

Electricity futures contracts are bought and sold through a central exchange operated by the Australian Securities Exchange. The types of futures contract include base load and peak futures.

The hedging arrangements operate in a secondary market outside of the National Electricity Market. In addition to financial hedging, some energy retailers have built generation plant as a physical hedge against spot price volatility. The integration of retail and generation - especially peaking plant - provides a natural hedge against price volatility.

Physically, the National Electricity Market is an interconnected power system. Electricity is transported along high voltage transmission lines that interconnect the regions of NSW, Queensland, Victoria, ACT, South Australia and Tasmania. Electricity flows through the interconnectors from the low cost to high cost regions subject to the capacity of the interconnectors.

The establishment of the National Electricity Market replaced jurisdictionally based government planning of the electricity generation with market based approaches that respond to long term pricing signals. Under the National Electricity Market trading arrangements, upward trends in wholesale prices signal the need for new investment. Since the start of the National Electricity Market in December 1998 there has been around \$12 billion invested in new generation plant.⁹⁹

The NSW Government owned generators compete in the National Electricity Market. The privatisation of the generators will reduce the Government’s exposure to these competitive trading arrangements.

In recent years the deliberations about policies for the pricing of greenhouse gas emissions has created an environment of investment uncertainty. There is evidence to suggest that a sustained period of indeterminate government policies has interfered with the workings of efficient price signals in the National Electricity Market.

In a recent report, ACIL Tasman questioned whether a new coal-fired power station in NSW could be financed on reasonable commercial terms. The question was raised in the context

⁹⁹ Investment Reference Group 2011, *A Report to the Commonwealth Minister for Resources and Energy*, p.4.

of the perceived risks in relation to carbon pricing and related policies.¹⁰⁰ The Investment Reference Group (IRG) expressed concern about policy uncertainty manifesting into shorter trading horizons and reduced liquidity in the over the counter contract market. This was in the context of concerns about counterparty risk and the difficulties of forecasting the carbon price. IRG noted that since Millmerran power station was commissioned in 2002, the Tallawarra power station in 2009 was the only merchant or independent thermal base load generation built in the National Electricity Market.¹⁰¹ The IRG stated that energy companies had informed it, that it was difficult if not possible to obtain finance for base load new gas and coal-fired generation plant. This difficulty was largely due to the carbon price risk associated with these types of long lived assets.¹⁰²

The AEMC recently commented on overall investment trends in the National Electricity Market over the previous ten years. The AEMC observed that the most noticeable trend was the relatively low levels of investment in base load coal fired generation relative to gas fired generation and wind generation.¹⁰³

The lack of bipartisan support for the carbon pricing policy at the national level may be continuing to create policy uncertainty for investment, in particular, in new base load plant.

There is a risk that investment uncertainty will continue and that this may hinder planning for future investment in new base load plant. The existence of this type of policy uncertainty, together with the distortions that may be occurring with the range of cleaner energy schemes, warrants some form of policy assistance by the NSW Government for future base load plant. The type of assistance should be non-financial and limited to NSW initiatives such as providing a development consented site for base load plant as part of the generation sale package.

The policies affecting investment signals are discussed in the next section.

6.4 Policies affecting generation investment

The implementation of the Australian Government's *Clean Energy Future* package and other renewable and energy efficiency schemes are likely to encourage investment in cleaner energy technology. The intent of the carbon price is to increase the cost of carbon intensive generation such as coal fired plant relative to cleaner energy.

¹⁰⁰ ACIL Tasman 2012, *Coal Seam Gas in NSW: implications for energy security and economic sustainability A High Level Assessment* Prepared for Santos, p.14.

¹⁰¹ Investment Reference Group 2011, *A Report to the Commonwealth Minister for Resources and Energy*, p.6.

¹⁰² Investment Reference Group 2011, *A Report to the Commonwealth Minister for Resources and Energy*, p.18.

¹⁰³ Pierce, J 2012, *The Australian National Electricity Market: Choosing a new future*, AEMC, Conference Paper, World Energy Forum on Energy Regulation V, 13 - 16 May 2012, Quebec City, Canada, p.20.

6.4.1 Clean energy future package

In July 2011, the Australian Government released the *Securing a Clean Energy Future* package.¹⁰⁴ This package sets out the Australian Government's climate change plan and features the introduction of a carbon price into the Australian economy. The carbon pricing mechanism will apply to around 500 of the largest polluters in the Australia who will pay for each tonne of pollution they release into the atmosphere.

The carbon pricing mechanism commenced on 1 July 2012, with a price that will be fixed at \$23 per tonne and will rise at 2.5 per cent per annum in real terms. On 1 July 2015, the carbon price will transition to a fully flexible price under an emissions trading scheme, with the price determined by the market.

In addition to the carbon price, the clean energy package includes:

- A \$10 billion new commercially oriented Clean Energy Finance Corporation will invest in renewable energy, low pollution and energy efficiency technologies.
- The Government will seek to negotiate the closure of around 2,000 megawatts of highly polluting electricity generation capacity by 2020 to reduce pollution and facilitate a smooth energy market transition.

The carbon price is intended to trigger a transformation of the Australian economy to a low carbon economy. The types of changes envisaged by the Australian Government include the promotion of more gas fired or renewable electricity generation; energy efficiency among households and businesses; and innovation in technology to reduce pollution.

The Australian Government's policies will impact on NSW economy and infrastructure requirements. The main impact will be to increase the cost of coal fired generation. Increasing the cost of coal fired generation relative to other types of generation is likely to influence the types of generation to meet future energy requirements.

In the in medium-to-high carbon price scenarios modelling prepared by AEMO in the 2011 *Gas Statement of Opportunities* (GSOO) substantial brown coal generation is projected to be replaced by gas fired generation and renewable technologies. This situation will be more pronounced given the proposal under the *Clean Energy Future* package for the closure of around 2,000 MW of high emission coal-fired generation by 2020. (This plan was not specifically modelled in the scenarios considered in the GSOO).

This has already started to occur with the majority of new committed generation capacity coming from wind projects.

6.4.2 Renewable Energy Target

In August 2009, the Australian Government introduced the Renewable Energy Target (RET) scheme which is designed to achieve a target of 20 per cent of Australia's electricity supply to come from renewable sources by 2020. On 1 January 2011, the RET was separated into two

¹⁰⁴ Australian Government 2011, *Securing a Clean Energy Future*, <http://www.cleanenergyfuture.gov.au/clean-energy-future/securing-a-clean-energy-future/>

parts—the Large scale Renewable Energy Target (LRET) and the Small scale Renewable Energy Scheme (SRES). The basic principle of these schemes is the creation of certificates from renewable energy sources which are bought by liable entities.¹⁰⁵

Large-scale generation certificates (LGCs) are created by accredited renewable energy power stations based on the amount of renewable electricity they produce above their ‘baseline’. The types of power plant that can be accredited under the scheme include wind, solar, ocean and tidal, wood waste, agricultural waste, bagasse (sugar cane waste), black liquor (a by-product of the paper-making process), or landfill gas.

Small-scale technology certificates (STCs) are created for correctly installed eligible solar water heaters, heat pumps, and small-scale solar panels, wind, and hydro systems.

The certificates are created and traded through the online Renewable Energy Certificate Registry which is managed by the Clean Energy Regulator.

The scheme places a legal obligation on liable entities (usually electricity retailers) to purchase a certain amount of these certificates each year and surrender them to the Clean Energy Regulator.

LGCs are sold through the open LGC market, where the price will vary according to supply and demand.

The RET is intended to facilitate the take up of renewable energy technologies and help smooth the transition to a clean energy future. It is estimated that the RET scheme combined with other elements such as the carbon price, will drive \$20 billion of investment in large-scale renewable energy by 2020.

6.4.3 Impact of the carbon price and RET

The Australian Government policies aimed at encouraging cleaner energy technology such as the carbon price and the RET are intended to encourage more investment in less carbon intensive and renewable energy. The carbon price, places a cost on the carbon emissions – which are a detrimental by-product or negative externality of electricity produced from fossil fuels. Placing a price on carbon emissions as a proxy cost for the negative externality increases the cost of carbon intensive technologies such as coal fired generation. Thus, making renewable energy sources more competitive compared to coal fired generation.

With the introduction of the carbon price, the NSW Government has expressed concern about duplication of government cleaner energy initiatives. To help improve the complementarity of cleaner energy schemes, the NSW Government has taken action to improve co-ordination with the Australian Government as well as close down duplicative and inefficient renewable energy programs.

Further, the NSW Government has called on the Australian Government to dismantle the RET scheme after commencement of the carbon price. The NSW Government is concerned about the cost pressures on consumers of duplicative schemes.¹⁰⁶

¹⁰⁵ Clean Energy Regulator 2012, *About the Renewable Energy Target, The Large-scale Renewable Energy Target (LRET); The Small-scale Renewable Energy Scheme (SRES)*.

The focus on encouraging low carbon energy sources needs to be achieved within a framework that encourages investments that are least cost. The RET scheme largely duplicates the policy objective of the carbon price. This duplication adds costs to the price of electricity being paid for by energy customers. The extent of the benefits of having duplicative schemes is not clear. In this context, the carbon price should be the primary instrument for encouraging cleaner energy technology.

The economy will benefit from a portfolio of energy sources that meets the policy objective of low carbon emissions at the least cost possible.

The implementation of policies to transition to a low carbon economy requires a co-ordinated policy response across all levels of government to promote investment in the most cost effective and optimal portfolio of clean energy technology. Greater co-ordination between governments is required to create a framework of complementary policies and programs to transition to a least cost and low carbon economy.

6.5 Cost of new entrant generation

The ability of new generation technologies to enter and compete in the electricity sector against incumbent generators will depend on their long run marginal costs. The long run marginal cost reflects the total project management, capital and fuel costs over the life of the asset.

Table 10 Cost of new entrant fossil fuel generators (including carbon price estimate)

Technology	Total cost \$/MWh (real \$2009/10)
Black coal - ultra super critical	69.23
Black coal - super critical	69.79
CCGT -water cooled	70.58
Geothermal	86.64
IGCC	88.25

Source: ACIL Tasman 2009, *Fuel Resource, New Entry and Generation Costs in the NEM*, Prepared for the Inter-Regional Planning Committee.

A report prepared for AEMO assessed the long run marginal cost for a range of technologies for each of the regions in the National Electricity Market.¹⁰⁷ The analysis included an estimate of the carbon price. The table below summarises the long run marginal

¹⁰⁶ NSW Government 2012, *Submission to Draft Energy White Paper*.

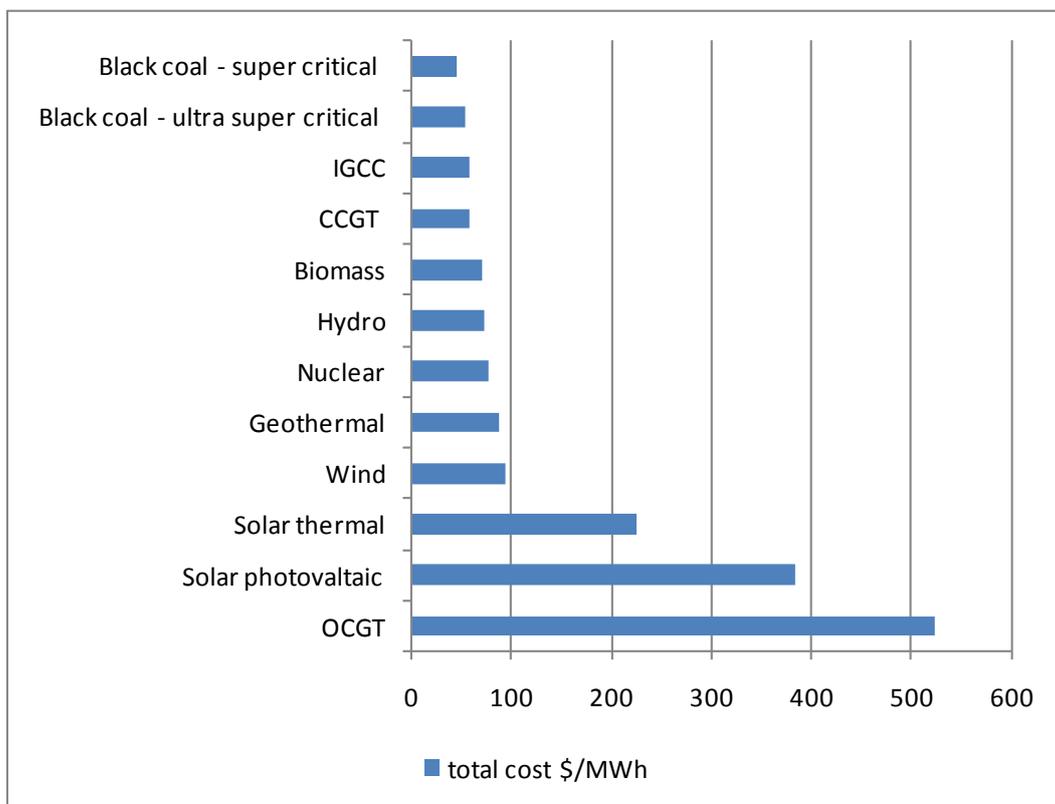
¹⁰⁷ ACIL Tasman 2009, *Fuel Resource, New Entry and Generation Costs in the NEM*, Prepared for the Inter-Regional Planning Committee.

costs of a range of generation technologies results for central region in NSW (apart from the result for geothermal technology which is based on region of northern NSW).

The analysis shows that the long run marginal cost of black coal technology even with a carbon price is likely to be competitive against gas plant technology. Black coal supercritical and black coal ultra critical have the lowest long run marginal costs. This is closely followed by Combined Cycle Gas Turbine (CCGT).

Figure 18 below presents a comparison of the long run marginal cost of a larger range of generation technologies including fossil fuel based and renewable technologies.

Figure 18 Comparative costs of generation (excluding carbon price)



Source: ACIL Tasman 2008, *Projected energy prices in selected world regions* cited in NSW Government, *Submission to Coal Seam Gas Inquiry*, 2011.

This data was prepared in 2008 and does not include a carbon price estimate. Even though the data does not include a carbon price, it does show the relative differences in the costs between renewable technology and more conventional technologies. In particular, the analysis shows there is a large disparity between the cost of solar technologies and fossil fuel based technologies.

This assessment of the cost of energy technologies is supported by analysis by the Electric Power Research Institute (EPRI) which has assessed and compared the status of different electricity technologies in 2015 and 2030. The analysis by EPRI shows that, in the medium term, coal and gas (without carbon capture and storage) will remain among the lowest technology cost options. Of the renewable energy technologies, wind is one of the lowest

cost options. Despite a significant decline in the cost of solar technologies expected in the future, the cost of these technologies is expected to remain relatively high over the coming years. The cost of geothermal electricity is shown to be competitive with those of other base load technologies, although this technology is still at a demonstration stage.¹⁰⁸

For other technologies such as ocean energy, bioenergy and the retrofitting of existing fossil-fuel plants with carbon capture and storage technology there is considerable uncertainty regarding the absolute cost of these technologies.

The assessment of costs of generation technologies summarised in this section indicate that wind technology is likely to be the most cost effective and proven renewable generation option in Australia. However, generation technology that uses gas and coal is likely to continue to be a source of low cost energy even with the introduction of the carbon price.

6.6 Meeting base load requirements

AEMO modelling based on long term maximum demand projections indicates that around 7,000 MW of generation capacity is likely to be required by 2029/30 to meet energy requirements.¹⁰⁹ The modelling has a number of parameters that need to be explained to better understand the outcomes. The model is designed to provide for a least cost approach to generation investment. The model provides for investment and retirement of generation or upgrade inter-regional network capability with the aim of minimising capital and operating cost expenses across the National Electricity Market.

The model is subject to satisfying a number of conditions including the electricity supply-demand balance throughout the year across the National Electricity Market; meeting a specified reliability target; and meeting the LRET mandate for an annual level of generation to be sourced from renewables. A summary of the projected generation requirements for NSW from 2010/11 to 2029/30 is presented in table 11 below.

Table 11 Generation capacity requirements for NSW to 2030*

Generation type	Likely scenario
Base load	7,000 MW
Renewable	1,000 MW
Total	8,000 MW

Source: AEMO 2011, *National Transmission Network Development Plan*. *Includes Canberra region.

¹⁰⁸ Electric Power Research Institute (EPRI) 2010, *EPRI technology status data*. Cited in Syed, A. Melanie, J. Thorpe, S. & Penney, K, 2010, *Australian energy projections to 2029-30*, ABARE research report 10.02, Prepared for the Department of Resources, Energy and Tourism.

¹⁰⁹ AEMO 2011, *National Transmission Network Development Plan*, data for figure 7-6.

The information shown in table 11 is the result of one of five core modelled scenarios. The result of the most likely scenario, the ‘decentralised world with medium carbon price’ shows, that under the modelled parameters, NSW will require around 7,000 MW of base load capacity and 1,000 MW of renewable capacity by 2030.

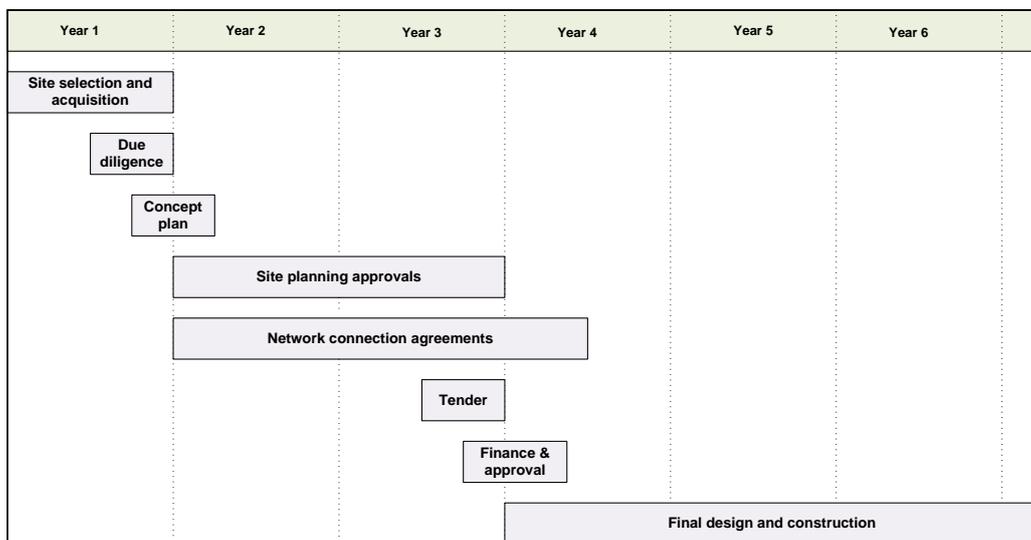
The results are sensitive to a number of factors including price of gas and cost of generation technology. However, the outcomes of the analysis indicate that in NSW there is likely to be a need for significant investment in base load generation capacity within the next 20 years.

The benefit of base load gas or coal generation is that it provides the lowest cost source of electricity. As discussed earlier, in the current environment there appears to be a number of investment hurdles facing base load generation. Consequently, investors appear to be more inclined to invest in smaller gas plant.

There is a concern that in this environment base load plant will not be built and if plant is built it may not be in time to meet the energy requirements in NSW. The planning and construction of base load plant generation plant has a very long lead time. Building of new generation plant takes years of design, planning, obtaining planning and environment approvals, and construction.

The main stages in developing a base load plant can be summarised into a number of key stages as shown in figure 19.¹¹⁰

Figure 19 Indicative timeframe for developing base load plant



¹¹⁰ This information was adapted from material prepared by Investment Reference Group, 2011, *A Report to the Commonwealth Minister for Resources and Energy, Annex 4*.

The key stages are:

- Selection and acquisition of suitable site
- Due diligence of the site
- Development of preliminary concept design plans and configurations
- Project planning and environmental approvals. In NSW projects are assessed under the *Environmental Planning and Assessment Act 1979*.
- Tender process for construction works.
- Investigate project financing and obtaining board approval for project to proceed.
- Final design, construction and commissioning of the generation plant.

In addition to the time needed to design and build the generation plant, the transmission operator, TransGrids needs to forward plan for the connection of the base load plant to the high voltage network. AEMO notes that in relation to development of renewable generation development in Australia:¹¹¹

- a minimum of one to two years are required to conduct a grid integration study
- grid augmentations (if required) typically take five to seven years to complete once plans are finalised.

The same would be true for other types of generation and possibly longer for large base load plant. In the case of base load gas fired generation, an additional step is that the owners of the plant will need to negotiate access to the gas pipeline infrastructure and secure gas to supply the generator.

Therefore the planning and construction of any new base load plant will need to start many years ahead of the time generation capacity is needed. This includes transmission planning (two years), network augmentation (up to seven years) and construction of the generator at the same time.

To help address some of the uncertainties surrounding the investment environment, it may be beneficial for the NSW Government to consider including a pre-approved site for the construction of base load plant as part of the sale of its generation assets. The benefit of this option is that it may help overcome some of the investment hurdles faced by potential investors in base load plant and bring forward the building of plant by several years.

6.7 New investment in generation

In NSW, proposals to build new power stations are assessed under the *Environmental Planning and Assessment Act 1979*. On 1 October 2011 a new assessment system for projects of State significance commenced in accordance with the *Environmental Planning and Assessment Amendment (Part 3A Repeal) Act 2011* and the *State and Regional Development - State Environmental Planning Policy* (1.4 b).

¹¹¹ AEMO 2011, *National Transmission Network Development Plan*, p.4-18.

New power stations are subject to a transparent and public assessment process to ensure protection of the environment and the health and amenity of local communities. The environmental assessment process for electricity generation projects is the same as for any other major project. This process requires a full and thorough environmental assessment by the Director-General of the Department of Planning with particular emphasis given to ensuring approved proposals proceed in an environmentally appropriate and sustainable manner.

Further, to assist with the processing of applications for renewable energy, the NSW Government has introduced streamlined planning approvals for renewable energy covering both small scale and large scale systems. Renewable energy proposals are considered under different parts of the *Environmental Planning and Assessment Act 1979*. Electricity generation projects with a capital cost of more than \$30 million (or \$10 million in an environmentally sensitive area) are considered as State Significant Developments and are assessed under Part 4 of the *Environmental Planning and Assessment Act 1979*.

Currently in NSW, there is 20,000 MW of electricity generation proposals at various stages of development – from projects in the planning system to those with development approval. Just under half of these projects are for renewable energy sources.

According to AEMO, there are about 46 generation projects that have been listed as committed.¹¹² Of these committed projects 25 are wind; eight are gas fired and five involve solar technology. The remainder include upgrading of existing coal fired plant or landfill methane.

In total these projects represent billions of dollars of investment in NSW and in particular for regional areas. The majority of the committed gas, solar and wind generation projects are in regional areas.

6.7.1 Coal and gas fired generators

NSW has vast reserves of coal and it is the primary fuel used in electricity generation. Coal has been a low cost fuel that this has underpinned the strength of the NSW economy for decades. NSW's economic demonstrated resources of black coal are estimated to be around 375,084 PJ. The impact of the carbon price and RET is to make carbon intensive generation less competitive. As previously discussed, uncertainty surrounding carbon pricing policies has slowed down the commissioning of base load plant relative to other types of generation plant.

The policy intent to transition the economy to cleaner generation will see gas fired generation become increasingly important source of electricity. The two types of gas technology include:

- combined cycle gas turbine (CCGT) which can be used for base load generation; and
- open cycle gas turbine (OCGT) which can be used for meeting peak demand (peaking plant) and for supplementing intermittent renewable generation such as wind.

¹¹² AEMO commented that 'committed' projects represents generation that is considered to be proceeding. Refer to AEMO 2011, *Electricity Statement of Opportunity*, p.xxix.

As a sign of the impact of the recent carbon price policy, Macquarie Generation has received development approval for 2,000 MW Combined Cycle Gas Turbine (CCGT) or Ultra-supercritical coal plant at its Bayswater site.¹¹³

In NSW, the committed investment in gas plant represents around 3,800 MW of new capacity and billions of dollars of investment. For example, AGL will be investing \$1.5 billion in the Dalton Power Project in the NSW Southern Tablelands.¹¹⁴

A list of committed projects and the latest status are presented in table 12 below.

Table 12 Committed gas fired generation

Project and owner	Generation type	Nameplate capacity MW	Status
Bamarang (Stage 1 and 2), Infratil	CCGT or OCGT	300 or 400	Project approved. Approval lapse date extended to February 2014.
Dalton Power Station, AGL	OCGT	500	Commissioning start date October 2012.
Kerrawary Power Station, Origin Energy	OCGT	1000	Commissioning start date, January 2017.
Leafs Gully, AGL Energy	OCGT	360	Project approved. No information on start date.
Marulan, TRUenergy	OCGT or CCGT	700	Project approved. No information on start date.
Parkes Peaking, International Power Pty. Ltd.	OCGT	150	Project approved. No information on start date.
Tallawarra Stage B, TRUenergy	OCGT	450	Project approved. No information on start date.
Wellington -ERM Power Ltd	OCGT	510	Commissioning start date, September 2014

Source: AEMO 2011, *Electricity Statement of Opportunity for the National Electricity Market*, Department of Planning and Infrastructure and company websites.

¹¹³ Refer to NSW Planning and Infrastructure website: www.planning.nsw.gov.au

¹¹⁴ AGL website: www.agl.com

The majority of these projects are for open cycle gas turbines which provide plant to meet peak demand. This type of gas generation helps to compensate for the intermittent nature of wind and solar generation and as a way to manage wholesale spot market risk.

Peaking plant is significantly more expensive than electricity produced from combined cycle gas turbine technology. Therefore the future mix of generation with increasing capacity from peaking gas plant and renewable sources is likely to result in more expensive wholesale electricity.

Gas projects are contingent on the future availability of gas at prices that can compete with coal fired generation. Concerns have recently been raised that rising gas prices will delay the switch from coal fired power to gas.¹¹⁵ The increasing importance of gas fired generation in NSW highlights the importance of developing NSW gas sources. Further, it will be important to plan for upgrading transmission pipelines between NSW and Queensland to increase options for access to gas at cost effective prices.

6.7.2 Wind turbines

The proportion of installed wind capacity in NSW is minor compared to other forms of generation sources. As at November 2011, there was around 266 MW of installed wind capacity (less than 2 per cent of the total generation capacity).

Within Australian, NSW may become the region with the most wind generation capacity in the next 10 to 20 years.¹¹⁶ There are currently 25 committed wind projects underway in NSW. NSW has around 2,000 MW of new wind generation proposals with development consent and an additional 5,000 MW under assessment through the NSW planning system.

One of the largest projects is the Silverton Wind Farm, north west of Broken Hill, with a potential operational capacity in excess of 1,000 MW. The project was purchased from the original proponent by AGL in 2012. If both stage 1 and stage 2 of the project go ahead, the wind farm will have capacity to generate up to approximately 4.5 per cent of NSW current total power consumption. In a typical year, the electricity generated from the site will be equivalent to the consumption of over 430,000 NSW homes.¹¹⁷ The original project proponent indicated that the Silverton Wind Farm will contribute more than \$700 million to the regional economy, providing jobs and other economic benefits.

Table 13 Committed wind generation (>100 MW nameplate)

Project and owner	Generation Type	Nameplate capacity MW	Status
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¹¹⁵ Australian Financial Review, 4 April 2012, *Power plant builders face catch 22*.

¹¹⁶ AEMO 2011, *National Transmission Network Development Plan*, p.xxiii.

¹¹⁷ AGL website. www.agl.com.au

Project and owner	Generation Type	Nameplate capacity MW	Status
Bango Wind Farm, Wind Prospect CWP Pty. Ltd.	Wind	150-300	Bango Wind Farm layout is currently being designed and will include detailed consultation work into 2012 prior to the submission of the Planning Application.
Ben Lomond Wind Farm, AGL Energy	Wind	200	Project revoked October 2011. Direct General requirements issued over 2 years.
Birrema Wind Farm, Epuron Pty. Ltd.	Wind	140	Director General's Requirements for the environmental assessment (to be prepared by the proponent) have been issued for the project.
Boco Rock, Wind Prospect CWP Pty. Ltd.	Wind	270	Project withdrawn.
Bodangora Wind Farm, Infigen Energy	Wind	100	Project is currently on public exhibition.
Capital II Wind Farm, Infigen Energy	Wind	100	Commissioning start date April 2013.
Collector Wind Farm, Transfield Services	Wind	120-235	Director General's Requirements for the environmental assessment have been issued.
Crudine Ridge Wind Farm, Wind Prospect CWP Pty. Ltd.	Wind	165	Director General's Requirements for the environmental assessment have been issued.
Flyers Creek Wind Farm, - Infigen Energy	Wind	108	Undergoing planning assessment. Proposed commissioning start date November 2014.
Golspie Wind Farm, Wind Prospect CWP Pty. Ltd.	Wind	150-300	Director General's Requirements for the environmental assessment have been issued.
Gullen Range Wind Farm- Gullen Range Wind Farm Pty. Ltd.	Wind	182.5	Project has planning approval. Scheduled to begin construction

Project and owner	Generation Type	Nameplate capacity MW	Status
			work at site in 2012.
Liverpool Range Wind Farm, Epuron Pty Ltd	Wind	1,100	Director General's Requirements for the environmental assessment have been issued.
Paling Yards Wind Farm, Union Fenosa Wind Australia	Wind	150	Director General's requirements for the environmental assessment have been issued.
Rye Park Wind Farm, Epuron Pty. Ltd.	Wind	200	Director General's requirements for the environmental assessment have been issued.
Sapphire Wind Farm, Wind Prospect CWP Pty. Ltd.	Wind	425	Proponent reviewing submissions to environmental assessment.
Silverton Wind Farm, AGL	Wind	1,000 (300 MW for stage 1)	Concept plan and Stage 1 of the project approved. Acquired by AGL in March 2012. Construction on Stage 1 commencing in 2013, subject to market conditions.
Taralga, AusChina	Wind	122	Project acquired from RES Southern Cross in 2011. Project expected to be completed in 2013.
Uungula Wind Farm, Wind Prospect CWP Pty. Ltd.	Wind	500-800	Director General's Requirements for the environmental assessment have been issued.
White Rock Wind Farm, Epuron Pty. Ltd.	Wind	238	Proponent's environmental assessment report is being assessed.
Yass Valley Wind Farm, Epuron Pty. Ltd.	Wind	222	Proponent reviewing submissions to its environmental assessment report.

Source: AEMO 2011, *Electricity Statement of Opportunity for the National Electricity Market*, NSW Department of Planning and Infrastructure website, company websites.

The intermittent nature of wind, means that wind generation typically has a capacity factor of between 25 to 40 per cent. This substantially reduces wind generation’s likely contribution to meeting regional maximum demand. Wind generation may be used effectively to meet regional energy requirements but it cannot be relied upon for meeting capacity (maximum demand) requirements.¹¹⁸

6.7.3 Solar technology

Electricity produced from solar technology makes only a minor contribution to meeting NSW energy needs. In recent years, this contribution has increased due to government schemes that have provided financial incentives for households to install solar photovoltaic (PV) units.¹¹⁹

According to IPART, more than 160,000 household and small business customers have installed solar PV units in NSW. This has created an additional generation capacity of over 358 MW.¹²⁰ The electricity produced by the solar rooftop represents energy that does not need to be supplied by the National Electricity Market.

The capacity of solar generation, excluding solar hot water installations and rooftop PV units, in 2010 was 4.6 MW. The financial cost of producing electricity from solar technology is high compared to more conventional technology. This makes the commercial viability of solar projects difficult without some form of government support.

In addition to the RET scheme, the Federal Government has other initiatives to encourage investment in solar technology. The Solar Flagship program and funding from the Australian Renewable Energy Agency are two such initiatives.

A list of the committed solar generation projects in NSW is shown in table 14.

Table 14 Committed solar generation

Project and owner	Generation type	Nameplate capacity	Status
Capital Solar Farm, Infigen and Suntech Australia Pty. Ltd.	Solar PV Panels	50	Project planning approval received December 2010.
Manildra Solar Farm, Infigen Suntech Australia	Solar PV Panels	50	Project planning approval received March 2011.
Moree Photovoltaic Solar	Solar PV panels	50	Project planning approval

¹¹⁸ AEMO 2011, *Electricity Statement of Opportunities for the National Electricity Market*, p. Xxviii.

¹¹⁹ The Federal Government’s Renewable Energy Target scheme provides an up-front subsidy on PV units, while the NSW Government’s Solar Bonus Scheme provided subsidised feed-in tariffs for the electricity produced by PV units.

¹²⁰ IPART 2102, *Solar feed-in tariffs Setting a fair and reasonable value for electricity generated by small-scale solar PV units in NSW Energy — Final Report*, p.1.

Project and owner	Generation type	Nameplate capacity	Status
Farm, Infigen Energy			received March 2011.
Moree Solar Farm, Fotowatio Renewable Ventures / Pacific Hydro	Solar PV panels	150	Project planning approval received July 2011 Project failed to meet Solar Flagship Program December deadline to secure financial backing.
Nyngan Photovoltaic Solar Farm, Infigen Energy	Solar PV panels	80	Project planning approval received December 2010.
Nyngan and Broken Hill solar projects, AGL	Solar PV panels	159	Publicly announced. Proposed to be developed in 2012/13 with construction complete in 2015.

Source: AEMO, 2011, *Electricity Statement of Opportunity for the National Electricity Market*, Department of Planning and Infrastructure website, company websites.

One of Australia's largest solar projects is to be built in NSW after AGL Energy and PV manufacturer First Solar were selected by the Federal Government as the successful proponent in the solar photovoltaic category of the Solar Flagships Program.¹²¹

AGL will develop two large-scale solar PV power projects totalling 159 MW at two locations in NSW. The project consists of a 106 MW project at Nyngan and a 53 MW project at Broken Hill. First Solar will provide engineering, procurement and construction services for both projects using its advanced thin-film PV modules.

The \$450 million project will generate enough electricity to power 30,000 homes when completed by the end of 2015. The Commonwealth and NSW Governments will provide grant funding to support delivery of the projects under two funding agreements. The Australian Government will provide \$129.7 million to support project implementation, and the NSW Government will provide \$64.9 million in funding.

The project is estimated to create 150 jobs in Broken Hill during construction and up to 300 in Nyngan.

¹²¹ AGL website www.agl.com.au

6.8 Strategic priorities for electricity generation infrastructure

The NSW Government will sell its electricity generation assets during 2013 and future investment in NSW generation will be made by the private sector. The Government has a role to remove any barriers to investment and to encourage the private sector to invest in the lowest cost generation available.

Significant private investment is needed in the next twenty years in electricity generation for both base load and renewable energy.

In the short to medium term, the market is likely to invest in higher cost, smaller plant units to manage supply and peak price risks. The emerging mix of generation technology is likely to result in higher electricity prices. This will disadvantage the NSW economy. Potential investors in base load generation may face difficulties in obtaining investment finance due to flat demand and the uncertainty surrounding the impact of carbon pricing and renewable energy policies.

One way for the Government to alleviate some of the investment uncertainty is to provide consented development sites in the generation sale packages which are fuel and technology neutral. This would enable the investors to choose the most cost effective investment and accelerate the development of the project by several years.

Further, it will be important to upgrade transmission pipelines between NSW and Queensland to increase options for access by gas fired generators to gas at cost effective prices.

It is proposed that the NSW Government encourage investment in the lowest cost generation technology. The proposed strategies to achieve this are:

- Providing a development consented site for base load technology in the generation sale package. This is to provide an incentive for private investment in low cost base load plant.
- Facilitating the planning for the upgraded transmission connections and augmentations that may be required to ensure unconstrained market access by generators.
- Supporting the upgrading of gas transmission interconnections with the Queensland market to ensure availability of cost effective gas for supply to gas powered generators.

A review of the schemes aimed at encouraging cleaner energy including the RET scheme is required to remove duplication of schemes that have the same objective. Removing the RET scheme would reduce generation costs and electricity prices.

It is proposed that NSW Government conduct a review of the impact of the renewable energy target scheme and other schemes with a view to removing duplication of schemes that have the same objective as the carbon price.

7. Gas sector

This chapter identifies key issues and challenges facing the NSW gas sector. A number of strategically important issues and opportunities are emerging that will affect the infrastructure requirements in the gas sector in the next twenty years.

The main objective is to facilitate private sector investment in key gas infrastructure projects to meet emerging requirements in a timely manner.

7.1 Issues and challenges

The gas sector in NSW is on the cusp of significant change. The most significant development is the potential for coal seam gas reserves located in this State to provide a new and important source of energy.

Opportunities

The size of these coal seam gas reserves has the potential to replace the declining reserves of natural gas from traditional interstate sources. NSW has the potential to become self sufficient in meeting its gas requirements. Further, the size of the reserves has the potential for NSW to provide gas to other Australian States and for export to overseas markets.

In 2010/11, Australia in total produced 2,091 PJ of gas.¹²² Gas production in the eastern market is projected to grow at rate of 5 per cent a year to 2,492 petajoules (PJ) in 2034/35.¹²³ This is greater than the total amount of gas currently produced in Australia.

The emergence of a NSW coal seam gas industry is a significant opportunity that will provide employment and economic growth to regional areas in NSW. NSW coal seam gas offers a number of other strategic advantages.

Security of gas supplies

The carbon price introduced on 1 July 2012, is likely to be a significant investment driver in the gas sector. The carbon price will encourage investment in cleaner technologies such as gas fired generation which will increase the demand for gas in NSW. As identified in chapter 3, projections indicate that the demand for gas in NSW will grow, on average, at a greater rate in the next twenty years than in the past. The most significant driver of this increased demand is due to the commissioning of new gas fired generation. As discussed in the previous chapter, there are eight 'committed' gas fired generators in various stages of development in NSW.

Security of gas supply is an emerging issue due to NSW reliance on traditional interstate source basins which have dwindling reserves. As well as the issue of declining gas reserves,

¹²² Bureau of Resources and Energy Economics 2012, *Energy in Australia 2012*, table 20, p. 69.

¹²³ Syed, A and Penney, K 2011, *Australian Energy Projections to 2034-35*, Bureau of Resources and Energy Economics, December, p.52.

major gas producers appear, increasingly, to be earmarking gas reserves for the export market.

The development of the LNG production and export facilities in Queensland is likely to divert local gas for supply to the burgeoning export market. Recently, there have been signs of competing gas producers entering into commercial arrangements to sell gas to each other to supply the export market.¹²⁴ The diversion of Australian gas for LNG production and export is likely to impact on wholesale gas prices domestically with gas prices predicted to reach international price parity.

New sources of gas, such as NSW coal seam gas, will enhance competition among gas producers. Encouraging more competition in the gas sector will be important to counter the risk of higher wholesale gas prices that are emerging.

Increasing gas exports, together, with the declining reserves of natural gas in the traditional basins supplying NSW has two implications. Firstly, it creates uncertainty about the availability of gas to supply NSW. Secondly, it creates uncertainty about gas prices in the future. These are real and significant risks that could have detrimental impacts for the security of gas supplies to NSW. These security and price risks can be alleviated by developing the coal seam gas sector in NSW.

The NSW Government, in its submission to the Coal Seam Gas Inquiry, presented the position that ensuring security of gas supply for NSW electricity generation will require bringing the State's coal seam gas reserves into production and/or the expansion of transmission pipeline capacity from interstate.¹²⁵ Without bringing reserves into production or expanding interstate capacity, potentially significant price rises could be expected to flow on to large gas consuming industrial customers well as smaller commercial and residential customers. In addition, these price rises will flow into electricity prices as the proportion of electricity supplied by gas fired electricity generation increases in NSW.

Infrastructure requirements

Significant investment in infrastructure will be required to support transportation of gas to support the development of the NSW gas supply sector. Investment in gas infrastructure will be undertaken by private interests with regulatory oversight by the Government. The priority is to ensure that infrastructure investment in the gas sector occurs in a timely manner. The planning and approval processes need to be streamlined, proportionate and timely.

A safe gas sector

The Government is putting in place a series of measures to ensure that the NSW gas industry meets the safety, health and environmental requirements expected from the community. Meeting community expectations will be important for maximising the future contribution of coal seam gas to meeting NSW energy requirements.

¹²⁴ Santos 2012, *GLNG to purchase 365PJ of gas from Origin Energy*, ASX Media Release, 2 May 2012. Origin Energy 2012, *Origin Announces major gas sales agreement with GLNG*, ASX Media Release, 2 May 2012

¹²⁵ NSW Government 2011, *Submission to NSW Legislative Council General Purpose Standing Committee No.5, Inquiry into Coal Seam Gas*.

The development of NSW coal seam gas will provide important strategic benefits to the State. It will help to address the security risk of declining reserves of conventional natural gas; meet the increasing demand to meet the increase in gas fired generation; and help to contain upward pressures on wholesale gas prices because of declining reserves and increased demand and exports.

Securing low cost sources of gas will be essential to fuel economic growth and prosperity in NSW.

7.2 Structure of the gas sector

NSW consumes around 164 PJ of gas per annum and this is projected to increase to 505 PJ over the next 20 years.¹²⁶

The gas system in NSW consists of distribution networks, transmission pipelines and gas processing and storage facilities. Only a small amount of gas is currently produced in NSW. Gas consumed in NSW is sourced from the Cooper Basin in South Australia and Gippsland, Otway and Bass Basins off the coast of Victoria. Gas transmission pipelines deliver gas from gas production facilities under high pressure to either city gates that are the entry point to the gas distribution network or large industrial users connected to the transmission pipeline.

From the city gates, gas is transported at lower pressures through the gas distribution network to end use customers. The NSW gas system consists of around 4,000 km of high pressure transmission pipeline and around 30,560 km of distribution and lower pressure lines.¹²⁷

Gas producers sell gas to energy retailers, large industrial, power generators and mining companies. Energy retailers sell gas to residential and business customers. Currently, in NSW there are seven licensed gas retailers selling to residential and the small business customers.

7.3 Gas market reforms

A major reform agenda initiated by the MCE was the establishment of the Short Term Trading Market (STTM) for gas. The STTM, established in September 2010, is a market-based wholesale gas balancing mechanism. It operates at gas hubs in Sydney, Adelaide and Brisbane. There is potential to link all state based hubs in the longer term. AEMO operates the STTM. The STTM operates alongside Victoria's Wholesale Gas market.

The objective of the STTM is to facilitate the short term trading of gas between pipelines, participants and production centres. The STTM operates once a day, on the day ahead, for each hub. Participants submit bids, offers, forecasts and pipeline capacities to determine schedules for deliveries from the pipelines which ship gas from producers to transmission users and the hubs.

¹²⁶ As discussed in chapter 3. Actual consumption data sourced from Bureau of Resource Economics and Projected data sourced from AEMO GSOO.

¹²⁷ ESAA 2011, *Electricity Gas Australia*, table 5.4.

The market sets a daily market price at each hub and settles each hub based on the schedules and deviations from schedules. The daily transaction of participants (scheduled trades and unscheduled deviations or variations) are settled at market prices and billed regularly (monthly). The market price reflects the supply-and-demand situation, which in turn provides a price indicator for future investment in production, transmission, and distribution infrastructure.

The STTM operates in conjunction with existing underlying gas supply, transportation and network contracts. The physical operation of pipeline and network assets is maintained by owners of the infrastructure. In addition, AEMO operates the National Gas Market Bulletin Board which provides information about the real world cost of production and transport of gas, and the cost and nature of augmentations to the network, is not necessarily available.

The retail gas markets in NSW, South Australia and Queensland operate in conjunction with the STTM wholesale gas market in each state. Retailers are able to buy gas through the STTM to deliver to customers.

7.4 Sources of gas for NSW

7.4.1 Current energy sources

The two main types of natural resource gases extracted in Australia are conventional gas and coal seam gas. Conventional gas is sourced from underground reserves and coal seam gas is found in coal seam beds. NSW has no known reserves of conventional gas but does have coal seam gas located in a number of basins.

Currently, NSW produces only a small fraction of the gas that it consumes. Around 97 per cent of the gas consumed in NSW is sourced from established gas basins in South Australia and Victoria. The remainder (around 4-6 PJ per year) is sourced from gas produced in Camden in the south west of Sydney. NSW gas production is currently valued at around \$34.5 million per annum.¹²⁸

NSW is a minor gas producer compared to other jurisdictions. A comparison of gas produced in Australia is shown in the table 15.

Table 15 Gas production in Australia (PJs)

¹²⁸ NSW Government 2011, *Submission to NSW Legislative Council General Purpose Standing Committee No.5, Inquiry into Coal Seam Gas*. p.7.

	2006/07	2007/08	2008/09	2009/10	2010/11
Qld Conv.	28	28	27	21	10
Qld CSG	88	129	150	195	233
NSW CSG	11	5	5	6	6
Victoria	300	313	274	270	342
South Australia	50	78	134	107	41
Western Australia	1,130	1,143	1,235	1,371	1,439
Northern Territory	22	22	22	27	20
Total	1,629	1,718	1,847	1,997	2,091

Source: Bureau of Resources and Energy Economics 2012, *Energy in Australia*, p.69.

The table shows that, of all the jurisdictions, NSW currently produces the least amount of gas (apart from Tasmania and the ACT where gas is not produced). The table also shows that Queensland has experienced a near tripling in the production of coal seam gas from 2006/07 to 2010/11.

Reserves of gas in Victoria and South Australia are reported to be in decline. Victorian gas reserves are expected to fall by more than 50 per cent over the next 20 years to approximately 4,300 PJ in 2029. South Australian reserves are expected to decline by 25 per cent between 2014 and 2029.¹²⁹

Because of the declining gas reserves in the Victorian and South Australian gas basins, there is a risk that less gas will be available for export to NSW. This is a serious concern as NSW demand for gas is expected to increase by around 7 per cent per annum in the next twenty years. This is much higher than the average rate of increase of 3.5 per cent per annum in the past. Much of the increase in demand will come from gas fired generation.

7.4.2 Coal seam gas

In recent years, coal seam gas has emerged as a commercially viable source of energy for NSW. After Queensland, NSW has the second largest known reserves of coal seam gas. Currently, however, only 2 per cent of known coal seam gas reserves in NSW are classified as proved and probable (2P). The term proved and probable refers to gas reserves that are commercially recoverable. The remaining 98 per cent is classified as proved, probable and possible (3P) which is less commercially recoverable than the 2P classification.

The reserves of coal seam gas in NSW and Queensland are shown in table 16. Eight per cent of the proved and probable gas reserves are located in NSW while 92 per cent are

¹²⁹ AEMO 2009, *Gas Statement of Opportunities for Eastern and South Eastern Australia, Executive Briefing*.

located in Queensland. NSW and Queensland combined have around 78 per cent of proved and probable gas reserves in the eastern states.¹³⁰

Total coal seam gas reserves (proved, possible and prospective) are estimated to be over 327,000 PJ, of which 150,000 PJ (or 46 per cent) are located in NSW. Table 16 shows that the size of known coal seam gas reserves are significantly larger than natural gas reserves across the eastern and south eastern regions of Australia.

Table 16 Coal seam gas and natural gas reserves in Australia

	Proved & probable (2P)	Proved, probable and possible (3P)
CSG - Qld	34,222	175,375
CSG - NSW	2,983	152,290
Total CSG reserve only	37,205	327 665
Natural gas – NEM regions	10,410	24,691
Total gas reserves	47,615	352,356

Source: NSW Government 2012, *Submission to the Coal Seam Gas Inquiry*.

According to modelling prepared by AEMO, gas reserves in the eastern and south eastern Australian regions are sufficient to meet domestic demand and gas demand for LNG export over the next 20 year period. Gas to NSW that is currently supplied from southern basins is projected to be sourced from Queensland and NSW.¹³¹ AEMO estimates that reserve growth in Queensland and NSW will compensate for the depleting reserves in South Australia and Victoria.

In NSW, exploration for coal seam gas is focused on a number of key basins located in the Hunter Region, the Gloucester Basin, the Gunnedah Basin, Southern Coalfield near Camden and the Clarence –Moreton Basin in north eastern NSW. Supply from the Gunnedah Basin is expected to begin in 2014/15. The Gunnedah Basin might contain sufficient resources to present opportunities for LNG export.¹³²

Three major coal seam gas projects have been approved for production. The projects are:¹³³

¹³⁰ This analysis does not include the considerable gas reserves in Western Australia.

¹³¹ AEMO 2011, *Gas Statement of Opportunities for Eastern and South Eastern Australia*, p. Xxxi.

¹³² AEMO 2011, *Gas Statement of Opportunities for Eastern and South Eastern Australia*, p.7-34.

¹³³ NSW Government 2011, *Submission to the NSW Legislative Council General Purpose Standing Committee No.5 Inquiry into Coal Seam Gas*, September, pp. 5-7.

- Camden gas project (stages 1 and 2) currently is owned and operated by AGL and is currently producing a small amount of gas. AGL is proposing to expand the Camden gas project to produce 38 PJ per day (stage 3).
- Casino gas project owned by Metasgo includes approval for the Richmond Valley Power Station a 30 MW gas powered station and development of local coal seam gas production wells to supply the power station.
- Gloucester gas project which comprises several elements including development of gas extraction wells and associated infrastructure; construction and operation of a central processing facility to compress and process gas ready for transportation; construction of a gas transmission pipeline from the processing facility to the gas network at Hexham (near Newcastle); and construction of a gas delivery station at Hexham to deliver the gas to the existing Sydney-Newcastle gas pipeline. AGL is the project owner.

Other committed projects are shown further on in this chapter.

The NSW Government considers that, based on the current estimates of the size of reserves, there is potential for coal seam gas production to exceed \$1 billion per annum by 2025.¹³⁴ This compares to the currently value of coal seam gas sectors at around \$34.5 million per year. The Government notes that in Queensland the coal seam gas industry has the potential to create 18,000 direct and indirect jobs and to increase gross state product by over \$3 billion and provide royalty returns of over \$850 million per annum.

The potential economic benefits of coal seam gas are particularly significant for regional areas in NSW. Investment in coal seam gas activity in Gunnedah and Narrabri, has created new jobs and boosted the local economy. The growth of the coal seam gas sector will provide new sources of supply which may have competitive benefits by making more energy available to the market.

Coal seam gas production has the potential to ease the possible price pressures that may occur in the future as more gas is diverted to LNG exports. The AER has observed that rising production of coal seam gas in Queensland, together with improved pipeline interconnection has enhanced the “*flexibility of the market to respond to customer demand*”.¹³⁵

Taking into consideration the extent of the NSW reserves it seems likely that the production of coal seam gas will be essential to providing a more secure and affordable source of energy and to meeting the growing requirements of NSW.

The development of coal seam gas in NSW is contingent on a number of factors including sufficient production capacity and transmission infrastructure and connections. The planning and provision of adequate infrastructure to support the coal seam gas sector is a key infrastructure priority for NSW.

¹³⁴ NSW Government 2011, *Submission to NSW Legislative Council General Purpose Standing Committee No.5, Inquiry into Coal Seam Gas*, p.7.

¹³⁵ Australian Energy Regulator 2011, *State of the Market Report*, p.87.

Regulatory framework for coal seam gas

The Government has responsibility for the approval and licensing of coal seam gas activities under the *NSW Petroleum (Onshore) Act, 1991* and the *Environment Assessment and Planning Act, 1979* and other State planning legislation.

The recent rapid development of the coal seam gas industry has given rise to community concerns about impact of the production processes on the environment, agricultural production, water resources and human health.

Community concerns have been acknowledged and acted upon by the NSW Government through a number of initiatives. The NSW Government is developing a Gas Industry Development Plan to ensure necessary policy frameworks are in place to support the appropriate development of all aspects of the gas industry. Further, the NSW Government is developing Strategic Regional Land Use Plans (SRLUPS) for the whole State which are being developed on the premise that mineral and petroleum resource industries can co-exist with agricultural production and environmental protection. These SRLUPS will set the framework for assessing future development including coal seam gas extraction. The Government has released draft plans Regional Land Use Plans for the North East North West and the Upper Hunter.

In addition, the Government has implemented a ban on the use of BTEX chemicals in fracturing fluid additives and announced a moratorium on all new hydraulic fracturing approvals while a detailed review of the approach is underway. The Government is working on an Aquifer Interference Policy to ensure impacts on ground water and surface water are minimised.

The Government has released a draft code of practice for coal seam gas exploration and supports the development of a safe and environmentally responsible coal seam gas industry. This will be enhanced with initiatives such as the establishment of a scientific panel to assess coal seam gas proposals; and the development of a harmonised national framework to address environmental and safety concerns of the community and to enhance community engagement.

In May 2012, the Inquiry into Coal Seam Gas made 35 recommendations to the NSW Government.¹³⁶ Among the recommendations made by the Inquiry was that no further production licences be issued until a comprehensive framework for the regulation of the coal seam gas industry is implemented. These and other initiatives are aimed at addressing community and environmental concerns. Appendix 2 contains a summary of the key initiatives aimed at strengthening the regulation of the coal seam gas industry.

It is important for the NSW Government to work towards establishing a regulatory framework that ensures the development of a safe and environmentally responsible coal seam gas industry that co-exists with agricultural production and other activities. Addressing community concerns will be important to securing the future contribution of coal seam gas to meeting NSW energy requirements.

¹³⁶ NSW Parliament 2012, Legislative Council, General Purpose Standing Committee No. 5 *Inquiry into coal seam gas* (Report No. 35).

7.5 Gas transmission pipelines and distribution networks

7.5.1 Structure and ownership

The jurisdictions of NSW, Queensland, ACT, Victoria, South Australia and Tasmania are part of an interconnected transmission pipeline system. The interconnected system enables gas produced in the basins across the southern and eastern regions to be transported to customers across these jurisdictions. There are 16 transmission pipelines operating in NSW and all but two are owned by either APA Group or Jemena.¹³⁷

Gas is transported from gas basins into NSW from the following transmission pipelines:

- Moomba to Sydney Pipeline which extends from Moomba in South Australia to Sydney (Wilton gate), Canberra and Culcairn on the Victorian border which is the entry point into the Interconnect.
- Eastern Gas Pipeline from Longford in Victoria to Sydney (Horsely Park gate).
- The NSW –Victoria Interconnect is a bi-directional pipeline linking the Moomba to Sydney Pipeline with Victoria.

Other transmission pipelines connect the above pipelines to major population centres such as from Wilton to Sydney and Wollongong; and Horsely Park to Central Coast/Wollongong. Other transmission pipelines include Central West Pipeline from Marsden to Dubbo; and Central Ranges Pipeline from Dubbo to Tamworth.

All of the gas transmission pipelines are owned by private interests. The Moomba to Sydney Pipeline and the Interconnect is owned by Australian Pipeline Trust. The Eastern Gas Pipeline is owned by Jemena.

The gas distribution network in NSW consists of a total of over 34,000 km of lines. There are 12 licensed gas network operators within NSW. Seven of these operators are authorised to reticulate natural gas, and five are authorised to reticulate liquefied petroleum gas (LPG) or a variant of LPG.¹³⁸ The gas distribution sector is privately owned. Jemena is the owner and operator of the majority gas distribution network in NSW. Envestra owns and operates 1,790 km of distribution mains with a customer base of 51,119.

Gas produced at Camden is transported along the distribution network.

7.5.2 Regulatory framework

Gas transmission pipelines and distribution networks are subject to regulatory frameworks that govern technical, safety and economic matters. The Governments and independent regulators have oversight for different aspects of the regulatory arrangements.

¹³⁷ ESAA 2011, *Electricity Gas Australia*, table 5.7.

¹³⁸ A list of licensed gas network operators is available from the licensing authority, the Independent Pricing and Regulatory Tribunal (IPART).

The Government is responsible for licensing cross-country transmission pipelines within the State under the *Pipelines Act 1967*. The Government oversees the safety and integrity of the pipelines once they are licensed. The Government regulates the safety and integrity of gas distribution networks licensed in NSW under the *Gas Supply Act 1996*.

To construct and operate a gas distribution network requires a licence which is granted under the *Gas Supply Act 1996*. An application to obtain a licence is processed by the Independent Pricing and Regulatory Tribunal (IPART). Requirements of the Act and the associated Regulations must then be met in all respects.

All gases reticulated through gas networks are required to conform to an Australian Standard or a specification to ensure that the gas is safe to use in approved products.

Under the *Gas Supply (Safety and Network Management) Regulation 2008*, network operators must develop and implement a Safety and Operating Plan, which is then used to monitor the ongoing performance of the network operator.

Under the National Gas Law ('NGL') and National Gas Rules ('NGR') natural gas pipelines are classified as either transmission pipelines or distribution pipelines. The NGL and NGR set out the framework for the economic regulation of 'covered' gas transmission and pipelines and distribution (pipelines) networks. Coverage means that the transmission pipeline or distribution network will be subject to the NGL and NGR. Pipelines that are not covered have been deemed to be subject to sufficient competition and therefore economic regulation of the access to the pipeline is not required. In this case, pipeline owners are free to enter into negotiated arrangements.

The Moomba to Sydney pipeline is partially covered. The Marsden to Wilton portion of the pipeline line is covered with light regulation applying from 2008. The Eastern Gas Pipeline is uncovered and the NSW – Victorian Interconnect is covered. The majority of distribution networks located in NSW are covered.

The AER regulates the economic access arrangements for covered pipelines.

Covered pipelines and networks are required to submit an access arrangement to the AER for approval every five years. The access arrangements sets out the terms and conditions for third party access to the network

In September 2011, the AER submitted a Rule change proposal to the AEMC proposing changes to the method for determining the rate of return (weighted average cost of capital) for gas transmission pipelines. The AEMC draft determination is discussed in section 5.3.1.

7.5.3 Pipeline and network planning and performance

There is a national approach to gas infrastructure planning which is supplemented by network operator planning.

AEMO prepares and publishes the Gas Statement of Opportunities for Eastern and South Eastern Australia (GSOO). The GSOO focuses on gas reserves, processing and storage, transmission pipelines and demand forecasting. It contains information about potential gas

system constraints; future developments, and opportunities for investment. The GSOO is intended to help inform energy stakeholders and potential gas industry investors about the current state of the gas industry in eastern and south eastern Australia.¹³⁹

In accordance with their operating licences, transmission pipeline and distribution infrastructure owners are required to survey 100 per cent of their networks every five years. The survey regime provides owners with a good understanding of the condition of the network. Distribution network leaks have been declining since 2006/07. Data implies that the condition of the transmission pipelines has been declining. This, however, may be explained by the increase in the coverage of the inspection regime.¹⁴⁰

The regulatory arrangements provide a robust framework for the oversight of the technical, safety and (in the case of regulated entities) economic regulation of the gas system in NSW.

7.6 Gas infrastructure development

Since 2011, more than 500 km of new gas pipeline projects have been approved or planned. This is a small sample of the proposed transmission, storage and processing facilities that are proposed to be developed in the next few years.

Many of the committed projects are directly related to the emerging coal seam gas industry in NSW. Other types of projects include supplying gas for gas fired generation.

The value of these projects represents hundreds of millions of dollars worth of investment and will create thousands of jobs in regional areas.

The developments are at various stages of approval and construction. The type of project, description and status of the project is set out in the table 17 below.

Table 17 Gas infrastructure projects

Project	Description	Status
Proposed gas transmission and storage projects		
Queensland–Hunter Gas Pipeline	Hunter Gas Pipeline Pty Ltd proposes to construct and operate a \$700 million 850 km long underground high pressure gas transmission pipeline from the Wallumbilla Gas Hub in South Central Queensland to the existing Sydney-Newcastle pipeline at Hexham in NSW.	Approved February 2009 The project is expected to be completed in 2015.*
Young to Wellington	ERM Power Pty Ltd constructing a 219km high pressure gas pipeline to connect Wellington Gas Powered Generator to	Approved March 2011.

¹³⁹ The GSOO covers NSW, South Australia, Victoria, Tasmania, and Queensland, and the Australian Capital Territory.

¹⁴⁰ This analysis was prepared by GHD for INSW.

Project	Description	Status
Gas Pipeline	Moomba to Sydney Pipeline.	Final decision by ERM expected in 2012.
Lions Way Pipeline (Casino, NSW to Ipswich, QLD)	Metasgo is proposing a new 145 km pipeline to transport coal seam gas from the Clarence-Moreton to customers based in south east Queensland.	Environmental impact assessments is being prepared.
Liddell Pipelines (East West and North South)	Macquarie Generation has proposed a two gas pipeline projects to supply mine waste methane gas as supplementary fuel to Liddell Power Station. In total the pipelines are approximately 76k km in length. The pipeline will transport either gas from the Hunter Valley.	Planning approval given July 2009.
Newcastle Liquefied Gas Storage Facility	AGL is proposing to construct and operate a gas storage facility with associated pipeline and access road located at Tomago. Facility will have capacity to store two weeks supply of gas for greater Newcastle region. Final investment decision planned for the second half of 2012.	Planning project approval given May 2012.
Young to Wagga Looping Pipeline	<p>APA Group is proposing to construct and operate a gas pipeline and associated infrastructure that loops the existing 131km gas pipeline between Young to Wagga Wagga:</p> <ul style="list-style-type: none"> • Stage 1 – loops 61km of the 131km between Bomen to Bethungra • Stage 2 – loops 71km of the 131km from just north of Bethungra to Young 	<p>Stage 1 Approved May 2010.</p> <p>Stage 2 requirements for environmental impacts issued by Planning in September 2010.</p>

Developments related to gas production facilities

Casino Gas Project	Metasgo is proposing to produce coal seam gas from the Clarence-Moreton Basin. This is the first production from this Basin.	Expect to supply gas by late 2012. (Metasgo Annual report)
Gloucester Gas Project	AGL is proposing to construct and operate a coal seam gas extraction, processing and transportation system. The project is	Concept Plan and

Project	Description	Status
	consist of: <ul style="list-style-type: none"> 60-90 gas wells and gathering lines within the total concept plan field area a central processing facility an approximately 100 metre wide pipeline corridor within the overall concept plan pipeline corridor between Stratford and Hexham 	determination of project application for first stage of gas extraction was approved (with conditions) February 2011.
Narrabri Coal Seam Gas Project	Coal seam gas production from the Gunnedah Basin near Narrabri, NSW. Small volumes of gas are already provided to the Wilga Park Power Station via a 32 km, 250 mm diameter pipeline. Additional gas might be produced to support existing or future large-scale power generation or LNG export. In November 2011, Santos acquired the project after it bought Eastern Star Gas. Santos. Santos announced it will seek project to be assessed under new part 4 planning provisions.**	Further exploration is underway.
Hunter Gas Project	Coal seam gas to be produced from the Sydney Basin near Newcastle, NSW. In April 2009, AGL assumed 100 per cent ownership and operatorship of the exploration licence after the acquisition of Sydney Gas Limited.	Proposed. Gas exploration continuing.
Camden expansion	In 2009, AGL acquired Sydney Gas Limited, and became 100% owner and operator of the Project. A proposed expansion of the existing gas facilities at the Camden site which is located south-west of Sydney, NSW. AGL is proposing to expand the Camden gas project to produce 38 PJ per day (stage 3).	Proponent is reviewing submissions to the environmental assessment.

Development related to LNG processing

LNG Newcastle project	Proposal by Eastern Star to develop up to two LNG trains at Newcastle, that would produce up to three million tonnes of LNG per year. Gas supply arrangements are being finalised. A 400 km pipeline with a capacity of over 400 TJ per day (150 PJ per year) would be required to transport gas from the Gunnedah Basin near Narrabri, to Newcastle. Company acquired by Santos in November 2011.	Company acquired by Santos in November 2011. Status not clear.
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Sources: AEMO 2011, *Gas Statement of Opportunities for Eastern and South Eastern Australia*, company annual reports and websites. * Verbal update provided by representative from Hunter Gas Pipeline Pty Ltd. ** Transcript from Legislative Council, General Purpose Standing Committee No. 5 Inquiry into coal seam gas, Corrected proof, 17 November 2011.

These projects represent a huge economic boon to NSW and provide greater supply security to NSW. The AGL gas storage facility at Tomaga will help to alleviate the risk of gas supply outages.

7.7 Gas infrastructure requirements

Infrastructure requirements in the gas sector over the next twenty years will be influenced by economic growth, the carbon price and the direction of wholesale gas prices. The projected increases in demand for gas will drive up transmission capacity utilisation rates which may require infrastructure augmentation.

In NSW, more specifically, infrastructure will be driven by developments in the NSW and Queensland coal seam gas industries. In addition, the declining southern gas reserves present opportunities for augmentation of the gas infrastructure in NSW.

The Queensland Government's *Gas Market Review* also recommended that the Queensland Government consider opportunities to work with the NSW Government and industry to facilitate the development of improved gas infrastructure interconnections and to leverage the market benefits of a supply-based trading market.¹⁴¹

7.7.1 Infrastructure capacity and utilisation

As the demand for gas increases, the utilisation of capacity on the transmission and distribution lines increases. In situations where gas transmission and distribution reach capacity, supply must either be curtailed or the infrastructure needs to be augmented.

Table 18 shows the utilisation rates of major pipelines. A look at the utilisation information available for two of the three transmission pipelines serving NSW shows they are at varying levels of utilisation. The annual utilisation rate of Eastern Gas Pipeline at 79 per cent is the highest when compared to all the eastern seaboard transmission pipelines.

¹⁴¹ Queensland Government 2011, *Gas Market Review*, p.xiii

Table 18 Major pipeline utilisation

Pipeline	Length(km)	Capacity end 2010 (TJ/day)	Summer utilisation	Winter utilisation	Annual utilisation
Eastern Gas Pipeline, Longford to Sydney	797	268	74	84	79
Moomba to Sydney Pipeline	2029	439	29		59
NSW – Victoria interconnect	150	71 (to NSW)	n/a	n/a	n/a
		92 (to Victoria)			

Source AEMO 2011, *Gas Statement of Opportunities for Eastern and South Eastern Australia*, and GHD analysis prepared for INSW.

AEMO has identified opportunities for infrastructure development at the Sydney-Newcastle node. Gas demand at the Sydney–Newcastle node is mostly supplied by the Eastern Gas Pipeline and the Moomba to Sydney Pipeline.

The combined capacity of these two pipelines of 707 TJ per day is well above both the summer or winter peak day requirements in all modelled scenarios. However, Sydney–Newcastle demand lies at the end of these pipelines and competes for gas supply with demands in other locations in NSW and the Victorian segment of the NSW – Victoria Interconnect pipeline. While the modelling indicates that supply to Sydney-Newcastle is sufficient to meet demand growth, the development of NSW gas adds a new dimension to potential developments.

Save for demand for LNG export, gas demand in Sydney–Newcastle could be the largest in the network – even exceeding Melbourne demand in later years. AEMO has identified that establishment of another supply to Sydney–Newcastle may provide benefits in the form of enhanced reliability of supply. This enhancement would reduce risks in the event of loss of supply from a pipeline. Importantly, it would increase supply options for the retailing of gas to consumers.

Augmentation of gas transmission to the Sydney-Newcastle node has the potential to provide better security of supply. In addition, this option has the potential to provide a more competitive market for NSW gas consumers. As part of the Gloucester Gas Project, AGL currently has a proposal for a pipeline between Stratford and Hexham in Newcastle. This would help to improve supply security to Sydney.

Bringing NSW gas reserves into the eastern markets could improve stability of wholesale prices. This would contribute to price stability for the residential, commercial and industrial sectors. Containing wholesale gas prices will be important for the competitiveness of NSW businesses.

7.7.2 Infrastructure to support NSW gas development

As previously discussed, development of coal seam gas in NSW is projected to occur mainly in the Bowen-Surat and Gunnedah basins. The types of infrastructure opportunities as a result of this emerging sector include processing facilities and augmentation of the existing transmission system. Prior to the takeover of Eastern Star by Santos a pre-feasibility study was underway for an LNG project at Newcastle to supply the export market.

Establishing a link between Sydney and the Bowen-Surat Basin, passing through areas of potential development in the Gunnedah Basin could potentially supply Sydney and Newcastle. This could also reduce reliance on supply from southern basins and relieving peak day flow constraints elsewhere in the network.

Additional transmission pipeline infrastructure such as the projects proposed between Queensland Newcastle (the Queensland – Hunter Gas Pipeline project and the Lions Way Pipeline as shown in table 17 above) have the potential to supply gas from the new coal seam gas reserves to eastern NSW. Building of this type of infrastructure will increase security of supply for NSW consumers.

7.7.3 Measures to address risk of depleting southern gas reserves

AEMO modelling indicates that the transition from coal-fired generation to gas fired generation under carbon pricing, leads to a depletion of southern conventional gas reserves within the 20-year outlook period. As southern conventional reserves decline, NSW, Victoria, South Australia, and Tasmania rely almost exclusively on reserves development in either NSW or Queensland.

If the projections of declining southern gas reserves transpire it is likely to provide opportunities for meeting demand requirements in the southern regions. Under various modelling scenarios prepared by AEMO, when demand grows in southern regions, flow from Queensland to the southern states becomes constrained by the capacity of one or more of the South West Queensland Pipeline, Moomba to Adelaide Pipeline System, and Moomba to Sydney Pipeline.

Opportunities are presented to either increase flow on these pipelines or to develop new links between Queensland and the southern states. This may provide opportunities to increase gas transmission capacity connecting Queensland and/or northern NSW to the southern demand centres.

Some the options for transmission augmentation include:

- the reversal of flow on the Eastern Gas Pipeline (from north to south)
- the reversal of flow on the NSW- Victoria Interconnect pipeline (from north to south).

The scale of investment in the gas sector over the next twenty years is significant. The scale of investment can be gauged by developments in Queensland where, in November 2010,

about \$50 billion of investment has been sanctioned for the development of five liquefied natural gas (LNG) trains to be sited at Gladstone, Queensland.¹⁴²

7.8 Strategic priorities for gas infrastructure

The economic potential of the coal seam gas sector is game changing for NSW. Over the next twenty years the production of local coal seam gas will boost economic activity in NSW. The capital investment required in the coal seam gas industry will provide opportunity for regional job development.

Coal seam gas is a low greenhouse emitter and will assist in containing electricity prices in a carbon constrained economy. Development of the coal seam gas industry will enhance the security of gas supplies to NSW which is critical in light of the declining gas reserves in the southern basins.

It is important that the NSW Government establish a regulatory framework that supports the co-existence of coal seam gas extraction with agricultural production and environmental protection. This needs to occur as a matter of priority to give to businesses and the community increased certainty and assurance about the future.

Fulfilling the potential economic contribution of the coal seam gas sector will require substantial new investment in infrastructure. The private investment in infrastructure in new gas production and transmission pipelines over the next twenty years will be significant. The investments in gas infrastructure will be funded by private interests.

The infrastructure strategies to support the development of the coal seam gas industry are presented below.

It is proposed that the NSW Government support private sector investment in developing gas resources by:

- Strengthening the regulatory framework that ensures the development of a safe and environmentally responsible coal seam gas industry that co-exists with agricultural production.
- Facilitating development of new industries, and in particular, investigating options for LNG export infrastructure jointly with the Queensland Government.

The NSW Government can provide support the development of coal seam gas industry in a number of ways.

It is proposed that the NSW Government support a more integrated inter-jurisdictional gas

¹⁴² AEMO 2011, *Gas Statement of Opportunities for Eastern and South Eastern Australia* for the p.6.1.

system. This will include support for:

- Augmenting gas transmission between Queensland and NSW jointly with the Queensland Government. And in particular, supporting a new north-south gas transmission pipeline from Bowen and Surat Basin and Gunnedah Basins to Newcastle.
- Investigating the potential for investment in reverse-flow capabilities for gas transmission facilities that currently supply NSW from Victoria.

Appendix 1 Findings from the Inquiry into NSW Electricity Network and Prices

On 27 October 2010, the NSW Premier announced an inquiry to investigate options to reduce or defer electricity network charges in order to place downward pressure on electricity price increases.

At the time, the *NSW Electricity Network and Prices Inquiry* reported that electricity prices increased by about 43 per cent in NSW over the last three years and were expected to rise by about this much again over the next three years.

The price increases were the result of two main drivers - network costs and introduction and expansion of State and National government schemes to encourage the development of renewable energy sources and the reduction of greenhouse gas emissions from electricity generation.

Since 2004, transmission and distribution businesses have doubled their annual capital expenditure and increased operating expenditure. At least 80 per cent of the percentage increases in the IPART 2010 determination of regulated retail tariffs were the result of increased network charges. The Inquiry found that these increases were mostly driven by growth in the demand for electricity, replacement of ageing network assets, enhanced reliability and performance standards and the escalation of operating costs. Notably, the rapid rate of growth would continue for the remainder of the current price period for the network businesses to 2013/14.

Further, the costs of 'cleaner energy schemes' such as Renewable Energy Target would add electricity costs as these schemes are recovered from customers through their electricity prices (and are not funded by taxpayers). The Inquiry expected these costs to jump sharply in 2011 because the network businesses will start to recover the costs of the NSW Government's Solar Bonus Scheme (SBS).

Other factors that would contribute to future increases in electricity prices included: anomalies that have arisen because of the regulatory framework; aspects of the government's ownership of the network businesses and the way it derives its return on its investment; and overspending of \$1.4 billion by the NSW network businesses in the last regulatory period.¹⁴³

There were also likely to be future price increases due to less predictable factors. Namely, the introduction of a carbon tax or emissions trading scheme (ETS) would almost certainly result in increased wholesale energy costs and electricity prices. Other uncertainties referred to in the Inquiry were the direction of in gas prices while coal prices were predicted to decline in real terms over the long term. The trend in gas prices was considered by the Inquiry to be uncertain given the large scale expansion of coal seam methane production.

¹⁴³ NSW Industry and Investment 2010, *NSW Electricity Network and Prices Inquiry*, p.4.

The impact on electricity prices in NSW would depend on the timing of a shift in the mix of fuels that supply generators in the National Electricity Market.

New technologies such as smart meters and smart grids were mentioned as having the potential to influence costs and prices in the longer term. Funding the large scale investment in the infrastructure to enable these technologies would add to pressure on retail prices notwithstanding any benefits that these technologies may bring to customers.

In light of these findings, the Inquiry concluded that *‘It is hard to avoid the conclusion that all these factors create a “perfect storm”’*.¹⁴⁴

The Inquiry developed and examined a number of possible options to ease the upward pressure on prices for NSW customers. These included:

- Options aimed at reducing the impact on customers of expected increases in network charges over the current price period to 2013/14.
- Options that address the impacts on electricity customers of the Solar Bonus Scheme.
- Options that address the drivers of increased network charges over the medium and longer term so that these costs are better contained in future.

¹⁴⁴ NSW Industry and Investment 2010, *NSW Electricity Network and Prices Inquiry*, p.4

Appendix 2 Regulatory initiatives for coal seam gas sector

There are a number of other state and national initiatives underway to address community concerns. A summary of these initiatives is presented below.

Code of Practice for Coal Seam Gas Exploration

In March 2012, the Government released for consultation a draft code of practice for coal seam gas exploration. The code is intended to establish a best practice framework for exploration companies in dealing with NSW land owners and the community. The draft guideline sets out an access regime for explorers that aims to balance the rights and concerns of private holders.

NSW Strategic Land Use Plans

The NSW Government is developing Strategic Regional Land Use Plans (SRLUPS) for the whole State which are being developed on the premise that mineral and petroleum resource industries can co-exist with agricultural production and environmental protection. The Regional Plan will be used to define land use priorities for different areas of land within a region. The Regional Plans will identify strategic agricultural land and associated water and ensure it is protected from the impacts of over development. The SRLUPS will set the framework for assessing future development including coal seam gas extraction. The Government has released draft plans Regional Land Use Plans for the North East North West and the Upper Hunter.

NSW Parliamentary enquiry

The *NSW Legislative Council General Purpose Standing Committee No.5, Inquiry into Coal Seam Gas*. was established in August 2011, to inquire into and report on the environmental, health, economic and social impacts of coal seam gas activities. The Inquiry was set up to examine the role of coal seam gas in meeting the future energy needs of NSW. The NSW Government made a submission to the Inquiry.

In May 2012, the Inquiry into Coal Seam Gas made 35 recommendations to the NSW Government.¹⁴⁵ Among the recommendations made by the Inquiry was that no further production licences be issued until a comprehensive framework for the regulation of the coal seam gas industry is implemented. These and other initiatives are aimed at addressing community and environmental concerns.

¹⁴⁵ NSW Parliament 2012, Legislative Council, General Purpose Standing Committee No. 5 *Inquiry into coal seam gas* (Report No. 35).

National framework for coal seam gas industry

SCER has identified coal seam gas as a key strategic issue and in December 2011 agreed to develop a national harmonised regulatory framework for the coal seam gas industry.¹⁴⁶ The national harmonised framework will incorporate a combination of leading practice guidelines, protocols, standards, regulations and legislation. The framework will enhance existing work a by state and territory governments. The work program is designed to build community confidence in the effectiveness of regulatory regimes governing the industry's development.

A final paper and recommendation to SCER for publication of a national harmonised framework is scheduled to be completed by September 2012.

Scientific panel

The Australian Government will be establishing an Independent Expert Scientific Committee on Coal Seam Gas and Coal Mining to provide scientific advice to governments about coal seam gas and large mining approvals where they have significant impacts on water. The Committee will oversee research on impacts on water resources. Pending establishment of the Committee under legislation an Interim Committee has been appointed.

In November 2011, the Prime Minister announced the establishment of a new National Partnership Agreement with the states through COAG agreeing that the states and the Commonwealth must take into account the advice of the Committee in their assessment and approval decisions.

In March 2012, the NSW Government signed the National Partnership Agreement on Coal Seam Gas and Large Mining Development. Queensland and South Australia have also signed the Agreement. Under this agreement the NSW Government will remain the primary regulator of the coal seam gas sector in NSW.

¹⁴⁶ Standing Council on Energy and Resources 2011, Meeting Communiqué, 9 December 2011

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