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<th>Description</th>
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<tr>
<td>ACCC</td>
<td>Australian Competition and Consumer Commission</td>
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<td>AEMC</td>
<td>Australian Energy Market Commission</td>
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<td>AEMO</td>
<td>Australian Energy Market Operator</td>
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<td>AER</td>
<td>Australian Energy Regulator</td>
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<td>COAG</td>
<td>Council of Australian Governments</td>
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<td>DTS</td>
<td>Declared Transmission System</td>
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<td>ESC</td>
<td>Essential Services Commission</td>
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<td>GPG</td>
<td>Gas Powered Generation</td>
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<td>LNG</td>
<td>Liquid Natural Gas</td>
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<tr>
<td>LRET</td>
<td>Large-scale Renewable Energy Target</td>
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<tr>
<td>MWh</td>
<td>Mega-watt hour</td>
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<td>NEM</td>
<td>National Electricity Market</td>
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<td>STTM</td>
<td>Short Term Trading Market</td>
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<td>Tj</td>
<td>Terrajoules</td>
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<td>VDWGM</td>
<td>Victorian Declared Wholesale Gas Market</td>
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<td>VERT</td>
<td>Victoria’s Emissions Reduction Target</td>
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Executive Summary

Several events, including state-wide blackouts in South Australia and the impending closure of the Hazelwood Power Station in Victoria, have re-ignited debate about energy resources and energy economics. The announcement of the Hazelwood Power Station closure on 4 November 2016 has prompted debate about the current and future state of energy supply in Victoria. French energy company, ENGIE, the majority owner of the power station, announced power supply operations would most likely cease in March 2017 as they are no longer economically viable to run.¹

The closure of Hazelwood will affect Victorian energy markets and will likely have an impact on retail energy prices. Most low-cost electricity in Victoria is generated from brown coal, which brings substantial economic benefits but also contributes to about half of the state’s greenhouse gas emissions.² Victoria relies heavily on brown coal for electricity generation and tends to export surplus electricity to other regions in the NEM. The state is considered a high-emissions jurisdiction; in 2014–15, Victoria’s energy consumption accounted for 23.8 per cent of total Australian energy consumption.³

The transition to renewable energy sources, which includes the gradual phasing out of fossil fuel powered generators, is having an impact on wholesale and retail electricity prices.⁴ Fundamental transformations in wholesale gas markets, notably in the eastern gas market, are presenting substantial challenges to all participants. The change from a domestic to an internationally linked gas market will have an impact not only on prices but also on security of supply. The comparative advantage Victoria has enjoyed through the development and use of high-emissions, low-cost energy may be disappearing.

Introduction

Recent policy and economic developments regarding the Victorian energy sector warrant a focussed explanation of the structure, functioning and issues of energy markets in Victoria. This research paper provides an examination of Victorian electricity and gas energy sources, markets and current issues facing consumers, participants, regulators and governments. The research is undertaken from a policy, economic and structural approach in order to present the most relevant information. This paper is limited in scope and focusses on four distinct energy markets. The paper will also briefly discuss the closure of the Hazelwood power station in Victoria’s Latrobe Valley and possible impacts this will have on markets, including forecasts.

A brief analysis of key markets will outline the structure of energy markets in Victoria and provide a general outlook for what can be expected in the near future. The energy markets and focus of this paper are:

- the National Electricity Market (NEM) – an analysis of the structure of the market and the price setting mechanisms in order to understand how internal and external changes can affect markets and prices;
- the Victorian Retail Electricity Market – understanding the efficiency of the market, how well it serves consumers and price trends;
- the Eastern Gas Market – a brief look at the structure and functioning of the market, with a more substantial look at the effect of market transition and what it means for Victoria; and
- the Victorian Declared Wholesale Gas Market (VDWGM) – a more detailed look at how gas imbalances are traded in Victoria and the issues facing the wholesale market.

The structure of these markets in a larger framework is outlined below:
Energy sources

The primary energy sources in Victoria are coal and gas, while wind and solar generation are used in smaller capacities. Victoria’s 430 billion tonnes of brown coal comprise a significant proportion of worldwide brown coal reserves. Gas resources are primarily concentrated in the offshore Commonwealth waters of the Otway and Gippsland Basins. The Gippsland Basin has been a major gas source, historically generating one third of Australia’s gas production.5

Electricity

Fossil fuels remain the major source of Victoria’s electricity and account for more than 85 per cent of electricity generation in Victoria.6 Electricity is primarily supplied from brown coal generators in the Latrobe Valley, with current reserves holding adequate amounts of coal to fulfil energy demand for several hundred years.7

Unlike black coal—which is found primarily in New South Wales and Queensland—Victorian coal fields contain coal with high rates of ash and water, known as brown coal.8 Brown coal, also referred to as lignite, has a heating value only about one quarter of that of black coal, making it less efficient for energy production and a higher emitter of greenhouse gases.9 Black and brown coal continue to be the leading resources for electricity generation in Australia, accounting for 73 per cent of all generation, as shown in the figure below.

Figure 1. Electricity generation in Australia

![Electricity generation in Australia](image)


9 Ibid.
Eighty per cent of Victoria’s estimated 430 billion tonnes of brown coal is located in the Gippsland Basin. The Latrobe Valley region holds an estimated measured resource of 65 billion tonnes, approximately half of which is identified as being potentially economically viable to extract.\(^9\) Outside of the Gippsland Basin, further brown coal deposits are located in the Otway Basin and across the Murray Basin.\(^1\)

Victoria currently operates four fossil fuel power stations, which burn coal to generate the bulk of the electricity they produce; these are listed below.

**Table 2. Coal-fuelled power stations in Victoria**

<table>
<thead>
<tr>
<th>Power station</th>
<th>Maximum capacity</th>
<th>Owner(s)</th>
</tr>
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<tbody>
<tr>
<td>Hazelwood</td>
<td>1,600 megawatts</td>
<td>72 per cent Engie, 28 per cent Mitsui &amp; Co.</td>
</tr>
<tr>
<td>Loy Yang A</td>
<td>2,200 megawatts</td>
<td>AGL Energy</td>
</tr>
<tr>
<td>Loy Yang B</td>
<td>1,050 megawatts</td>
<td>70 per cent GDF SUEZ Aust., 30 per cent Mitsui.</td>
</tr>
<tr>
<td>Yallourn</td>
<td>1,480 megawatts</td>
<td>EnergyAustralia</td>
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The March 2017 closure of the Hazelwood power station is expected to reduce the surplus electricity generation that Victoria has traditionally exported.\(^1\) Currently, the Hazelwood Power Station accounts for:

- 14 per cent of total firm capacity in Victoria;
- 12 per cent of combined firm capacity across Victoria and South Australia; and
- four per cent of the total firm capacity installed in the NEM.\(^1\)

The Australian Energy Market Operator (AEMO) estimates that black coal generation from New South Wales and gas-fired generation from South Australia will lift output to supply over 90 per cent of demand previously met by Hazelwood.\(^1\) AEMO has outlined that there will be sufficient capacity available to ensure effective operation of the NEM after the closure of Hazelwood.\(^1\)

**Hydroelectricity**

Hydroelectricity generation plants also contribute to electricity generation in Victoria. However, due to the limited availability of water resources, the amount of electricity in Victoria sourced from hydroelectric power is relatively low. The Department of Environment, Land, Water and Planning states that much of Victoria’s hydroelectricity potential is considered to be already developed, meaning there is limited potential for further growth.\(^1\)

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\(^{11}\) ibid


\(^{13}\) ibid.

\(^{14}\) ibid.

\(^{15}\) ibid.

\(^{16}\) ibid.
Solar
Solar energy generation has been growing and Victoria has excellent solar resources, with average yearly solar exposure ranging between 12–20 Megajoules per square metre per day. The past decade has seen a rapid growth of solar generation, primarily due to feed-in tariffs, rising energy costs and mandatory renewable energy targets. In Victoria, generation has tended to be focussed in the private and commercial sector, rather than in large-scale industrial generation facilities.

Wind
Victoria has 17 major operating wind farms, with a combined wind energy capacity of 1,249 Megawatts. Because of the large geographical areas with favourable wind conditions, there is the likely possibility of future wind power development in the state. In 2014–15, wind power accounted for 4.9 per cent of total national electricity demand.

Distribution
Electricity is distributed through overhead power lines and by underground cables, which have a combined length of approximately 200,000km. Electricity distributors own and manage electricity distribution infrastructure which delivers power across Victoria. Within Victoria, there are five electricity distribution areas—three encompassing Melbourne and the inner suburbs and two covering the outer suburban areas and regional Victoria:

- Powercor Australia: western suburbs and western Victoria;
- Ausnet Services: outer northern and eastern suburbs and eastern Victoria;
- United Energy Distribution: southern suburbs and Mornington Peninsula;
- Citipower: city and inner suburbs; and
- Jemena: northern and north-western suburbs.

Gas
Gas is Australia’s third-largest energy resource after coal and uranium. The abundance of gas resources has led to steady development of the gas industry and a rapid growth in liquid natural gas (LNG) project development opportunities. The consensus is that Australia has sufficient gas resources to meet projected domestic demand and export needs. Australia’s largest recoverable gas reserves are found in the offshore Carnarvon and Browse Basins in Western Australia, the offshore Gippsland and Otway Basins in Victoria, the offshore Bonaparte Basin in the Northern Territory, and the onshore Cooper-Eromanga Basin in South Australia. The figure below shows eastern gas market infrastructure and resources.

21 ibid.
23 ibid., p. 20.
24 ibid.
The bulk of Victoria’s natural gas is extracted from the Gippsland Basin and produced at the Longford processing plant in South-Eastern Victoria. A growing amount of gas, however, is extracted from the adjacent Bass and Otway Basins, shown in figure three above.

Proven and probable conventional gas reserves in eastern Australia are almost entirely sourced from the offshore Victoria Gippsland and Otway Basins and the South Australian Cooper-Eromanga Basins. It is projected that the Gippsland Basin still has significant reserves after more than 40 years of production. The Cooper-Eromanga Basins, however, have been producing gas for over 35 years and their reserves have declined substantially.25 The eastern gas market has significant gas resources currently in development, along with significant potential reserves that could be developed in the future if economically viable. However, such resources would need to be extracted and developed in a timely manner in order to keep up with domestic and LNG export demand.26

25 ibid., p. 22.
26 ibid., p. 36.
Energy markets

Energy in Victoria is traded through separate market mechanisms for gas and electricity. Both electricity and gas markets have been structured to meet the demands of different generators and buyers, meaning there are separate markets for retail and wholesale trade. There are several distinct energy markets which operate in Victoria, including the residential and wholesale markets for gas and electricity. Due to its limited scope, this paper will offer an analysis of the key aspects of these markets only, rather than provide an equal focus on each market and sub-market.

Energy markets in Victoria have tended to grow with population and economic growth. For example, the number of retail customers in the Victorian electricity market grew by approximately 1.6 per cent in 2014–15. For the same period, there was a 1.3 per cent and 6 per cent increase in residential and small business customers respectively. Similar trends are observed in the gas market, with growth in residential and business customers equaling approximately 1.8 per cent and 9 per cent respectively.

There are a number of emerging issues in energy markets that have an impact on the price and reliability of energy supply. Electricity markets are divided into several sub-markets, each with individual structures and challenges. For example, the decreasing average demand and rising volatility in peak demand periods will continue to challenge electricity markets; there are also several issues relating to a lack of cost-effective pricing, namely an increase of PV solar generation and renewable energy technologies, retail competition mechanisms and phasing out of fossil fuel-based generation.

Gas markets are undergoing changes in their structure and losing long-held market and price stability. Producers in the market sell gas to large industrial, mining and power-generation customers. Gas is also sold to energy retailers who then on-sell it to residential and business customers. In the past, gas was perceived as a substitute to coal and coal-fired electricity generation, meaning cheap coal capped gas prices. Gas prices have, however, become more closely aligned to international prices since the development of Queensland’s LNG export industry.

Electricity

The two most important electricity markets to take into account are the NEM and the Victorian Retail Electricity Market. The NEM is the largest electricity market in Australia and extremely important in regional electricity trade and prices. Market forces in the NEM will become more relevant in Victoria with the closure of Hazelwood, as Victoria is likely to turn into an electricity net importing state rather than a net exporting one. The retail electricity market in Victoria is also important to consider in understanding market structure and outcomes. Victoria was the first jurisdiction in Australia to introduce full contestability in the retail electricity market. Although the market is considered to be competitive, prices for consumers have continued to rise.

29 Swoboda (2016) op. cit.
30 ibid.
National Electricity Market

The NEM is the wholesale electricity market covering Victoria, New South Wales (including the ACT), Queensland, South Australia and Tasmania. The market is regulated through the Australian National Electricity Rules, which are developed and maintained by the Australian Energy Market Commission (AEMC) and have the force of law for participating states and territories. The NEM involves wholesale generation transported via high-voltage transmission lines from generators to industrial users and local energy distributors, which then transfer energy to local users. The transfer of electricity from generators to consumers is facilitated through a spot market in which output from all generators is aggregated and scheduled at five minute intervals. Production is thus matched to consumer demand and the energy price is calculated through this mechanism.

In 2015–16, generation from Victoria provided 27 per cent of the NEM’s total operational consumption, of which 86 per cent came from brown coal generation. In the same period of time, Victorian energy generation exceeded the demand needs, with a total of 6,576 GWh of surplus energy exported via transmission networks to neighbouring regions, including New South Wales, South Australia and Tasmania. AEMO has outlined that surplus Victorian generation provides a cost-competitive alternative to black coal generation in New South Wales and gas-fired generation in South Australia. In 2015–16, Victorian energy exports provided:

- 14 per cent of South Australia’s operational consumption;
- six per cent of New South Wales’ operational consumption; and
- six per cent of Tasmania’s operational consumption.

Figure four below outlines the registered capacity of electricity supply in each NEM jurisdiction by fuel source.

**Figure 4. NEM registered capacity in regions by fuel source**

Source: data compiled from Australian Energy Regulator, 'Registered capacity in regions by fuel source', AER.

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34 Ibid.
Exchange of electricity between producers and consumers in the NEM is facilitated through a pool in which the output of all generators is accumulated and scheduled to meet demand. The pool is not physical, but rather a set of procedures managed by AEMO in conjunction with market participants and regulatory agencies. Electricity is traded using pool arrangements because it cannot be stored for future use—meaning supply must change dynamically with demand—and because one unit of electricity is indistinguishable from any other unit, making it impossible to determine the generator’s origin.36

The spot market

Wholesale electricity trade is conducted within the framework of a spot market in which supply and demand are instantaneously matched through a central dispatch process.

A dispatch price is determined every five minutes, while six dispatch prices are averaged at half-hour intervals to determine the spot price for each trading interval. This spot price is then used to settle financial transactions for all electricity traded within the NEM. A maximum spot price, also known as a market price cap, of $12,500 per megawatt hour (MWh) is applied. This is the maximum price at which generators can bid into the market.37 Spot prices throughout the NEM were significantly lower in 2014–15 than averages in 2013–14. In Victoria, average wholesale prices fell by 42 per cent for the same period, compared to 38 per cent in South Australia and 32 per cent in NSW.38 The average volume weighted spot prices for electricity in the NEM are represented in the chart below.

Figure 5. Volume weighted average electricity spot prices in Victoria

Source: data compiled from Australian Energy Regulator, ‘Quarterly volume weighted average spot prices’, AER.

37 Ibid., p. 6.
Forecasts of expected electricity demand are regularly conducted by AEMO in order to effectively operate the NEM. Demand in the Victorian regions of the NEM is characterised primarily by short-term demand peaks during summer months. These periods of significantly increased demand are countered with special arrangements, rather than constant excess base-load generation capacity in the system. Peaks are met through a combination of peak generators—built specifically to service extreme demand periods—and demand side participation, which sees large-scale consumers temporarily withdraw from the market. The following chart visually displays the demand periods in Victoria from winter 2007 to winter 2016.

**Figure 6. Electricity demand in Victoria by season**

![Chart](image_url)

Source: data compiled from Australian Energy Regulator, ‘Seasonal peak demand (region)’, AER.

Maximum demand—a key driver of network investment—has generally remained flat throughout the NEM. In 2014–15, maximum demand in Victoria was almost 20 per cent below historical peaks recorded around 2008–09. Nonetheless, after five years of decline, demand from the grid tended to steady in 2014–15. Along with the weakening of industrial energy demand since 2008, commercial and residential consumers have reduced their consumption, primarily through the adoption of energy-efficient technologies. The uptake of energy-efficient technologies reflects the introduction of government subsidies and incentives, along with rising energy prices. The reduced demand for electricity has also led to coal- and gas-powered generation plants being removed from the market. In total, capacity withdrawals from 2011–12 to 2014–15 exceeded generation entry. This trend has led to a freeze in investment for new fossil fuel-based generation plants. However, large scale solar generation has been slow to develop, primarily because of its high cost per megawatt hour (MWh) compared to other technologies.

On 7 October 2016, the Council of Australian Governments (COAG) Energy Ministers agreed to an independent review of the NEM to assess the security and reliability of energy supply. The review will also aim to provide advice to governments regarding a national blueprint on energy reform. In December 2016 the Preliminary Report of the Review was released, in which the following seven key themes were identified:

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39 ibid., p. 9.
40 ibid.
42 ibid.
- technology is transforming the electricity sector;
- consumers are driving change;
- the transition to a low emissions economy is underway;
- variable renewable electricity generators can be effectively integrated into the system;
- market design can support security and reliability;
- prices have risen substantially in the last five years; and
- energy market governance is critical.

The Preliminary Report also outlined that the impending closure of the Hazelwood power station highlights the need for action.43

**Issues with the NEM**

The structure of the NEM is changing from a model of primarily large-scale synchronous generation to a model of increased smaller, distributed and intermittent non-synchronous generation. Policies aimed at reducing carbon emissions, particularly the Large-scale Renewable Energy Target (LRET), have encouraged intermittent generation from new entrants into the market; particularly wind generation. Although intermittent generators such as wind and solar previously made up a very small proportion of total electricity supply, they are now a key part of the generation structure and continue to grow.44

The increasing changes in the electricity generation mix mean that NEM outcomes are connected with three key areas:45
- environmental policy – for example, the LRET has resulted in substantial investment in wind and solar generation;
- the wholesale gas market – electricity prices are affected by gas-fired power stations which are expected to be the price-setting generator; and
- system security – an increased reliance on renewable intermittent generation affects the market’s ability to ensure a secure supply of electricity.

**Victorian Retail Electricity Market**

The retailing of electricity is the business of providing electricity to customers by retailers through the acquisition of electricity in bulk, the purchase of network services from distributors and the sale of that electricity to small consumers.46 The Victorian retail electricity market is a market of around 2.3 million connections, 98 per cent of which are considered to be small consumers—usually households and small businesses.47 The retail electricity market sits below the NEM and provides a framework for retailers to sell and distribute electricity to end users.

In 2002, the Essential Services Commission (ESC) began to deregulate the retail electricity market to increase competition. Between 2002 and 2008, the ESC set certain tariffs, known as ‘reference’ or ‘standing’ tariffs, intended to be fall-back tariffs for consumers who did not accept market tariffs. Since 2009, however, the ESC has ceased to regulate any retail tariffs.

The retail energy market in Victoria is dominated by four companies—AGL, Energy Australia, Origin Energy and Snowy Hydro—which hold over 80 per cent of the retail electricity and gas markets. The

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45 ibid.
46 CME Australia (2016) *Australia’s retail electricity markets: who is serving whom?* Melbourne, CME.
47 CME Australia (2016) *A critique of the Victorian retail electricity market*, Melbourne, CME.
following graph outlines the market share of customers for the major companies relative to competing retailers by year and market segment.

Figure 7. Market share of retail electricity customers

![Market share of retail electricity customers](image)


A report published by CME Australia in June 2015 showed that the Victorian retail electricity market offers poor value for money relative to what it has in the past and when compared to retail markets elsewhere in the NEM.48 Further, prices in the Victorian retail electricity market are high when compared to Australian and international jurisdictions.49 The Australian Energy Regulator has stated that, within the NEM, Victoria tends to have the most expensive retail electricity bills.50

In November 2016, the Victorian Government announced an independent review of Victoria’s electricity and gas retail markets. The review will examine the operation of electricity and gas markets and outline options to improve consumer outcomes.51

Price trends

Residential electricity prices are expected to rise over the next two years, primarily because of an increase in wholesale costs following the closure of the Hazelwood power station.52 The increased entry of wind and solar generators into the market and the retirement of coal-fired generators will also lead to variations in residential electricity prices.53

In Australia, the residential price for electricity is made up of three supply-chain cost components: network costs, which include transmission and distribution costs and make up 40 to 55 per cent of the price; competitive market costs, which include wholesale and retail costs and make up 40 to 50 per cent of price; and environmental and other policy costs, which make up five to 15 per cent of the price.

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48 ibid., p. 19.
49 CME Australia (2016) *International comparison of Australia’s household electricity prices*, Melbourne, CME.
53 ibid.
In Victoria, approximately 91 per cent of consumers are on a market offer, which consists of a 44 per cent competitive market component, 49 per cent regulated network component, and a 6.7 per cent environmental policy component. According to the AEMC, residential market electricity prices are expected to increase by 8.4 per cent in 2017–18. The following chart outlines the price components for residential electricity prices in Victoria.

**Figure 8. Trends in Victorian electricity supply chain components**

![Chart showing trends in Victorian electricity supply chain components](chart.png)


The primary drivers of residential electricity price trends are wholesale market costs, normally comprising around 70 per cent of the competitive market costs. These costs are expected to rise throughout Australia over the next two years. Wholesale prices are expected to increase because of coal-fired generator closures and the implementation of renewable energy schemes. Generator retirements are expected to increase wholesale electricity costs, retail electricity prices and wholesale spot price volatility. The introduction of more renewable generation is expected to decrease wholesale electricity costs, but increase retail electricity prices and wholesale spot price volatility.54

**Closure of Hazelwood**

The closure of the Hazelwood power station highlights the larger transition in the NEM towards smaller, non-synchronous and low-emissions generators. The AEMC outlines that the wholesale electricity market will respond to such changes in the supply-demand balance over time, noting that future investment decisions will be influenced by expected wholesale prices and policy issues.55 The wholesale cost increases in Victoria will ultimately flow on to other regions within the NEM because of the interconnectedness of electricity markets. Prices are expected to thus increase in South Australia by around 20 to 40 per cent from 2016–17 to 2017–18. Forecasts show that the closure of Hazelwood will result in wholesale electricity prices rising between 2015–2018, followed by a decrease in 2018–19 as a result of predicted new wind generation led by renewable energy policy.56 Specifically, wholesale electricity costs are expected to rise from $55 per megawatt hour (MWh) in 2015–16 to $75 per MWh in 2018–19, an increase of 35 per cent.57 As generation from Hazelwood accounts for around 20 per cent of Victoria’s electricity consumption, its closure is expected to have a significant impact on the wholesale market.

The closure of Hazelwood will also affect the expected flow of electricity between interconnected regions across the NEM. It is expected that in 2017–18, Victoria will switch from being a net exporter

54 ibid.
55 ibid., p. vi.
56 ibid., p. vi.
57 ibid., p. vi.
of energy to New South Wales to being a net importer.\textsuperscript{58} Less exports of electricity from Victoria to South Australia are likewise expected. Forecasting conducted by Frontier Economics on the effects of annual average NEM spot prices with and without the closure of Hazelwood indicate that, in 2018–19, the wholesale electricity purchase costs due to the closure will be higher by $26 per MWh, or 55 per cent, in Victoria.\textsuperscript{59}

**Future developments could affect prices**

A number of developments have been announced which will potentially affect future residential retail electricity prices in Victoria. The following future developments have been identified by the AEMC:

- Merits reviews – Victorian energy distribution businesses have made applications to the Australian Competition Tribunal for merits reviews of the AER’s distribution determinations for the period 2016–20. Regulated network price trends could change depending on the outcome of these reviews;
- Victoria’s Emissions Reduction Target (VERT) – a long-term target of net zero greenhouse gas emissions in Victoria by 2050;
- Victorian Renewable Energy Targets (VRET) – the Victorian Government’s commitment to a VRET of 25 per cent by 2020 and 40 per cent by 2025;
- Victorian Government’s Energy Efficiency and Productivity Strategy – to further develop and support energy efficiency; and
- Essential Services Commission’s review for distributed generation – an ongoing inquiry into the ‘true value of distributed generation to Victorian consumers’, which may lead to changes in feed-in tariffs, affecting prices.\textsuperscript{60}

**Gas**

Natural gas continues to play an increasingly important role in Victoria’s energy industry since production first commenced in Bass Strait approximately 45 years ago. Due to relatively low-cost supplies, gas has penetrated the residential, commercial and industrial markets. In recent years, gas consumption has expanded to include the power generation market to match rising base load and peaking generation capacity.\textsuperscript{61}

Gas markets are changing rapidly with the continued growth of the LNG export industry. There are three primary gas markets which affect and operate within Victoria: the eastern gas market, the Victorian Wholesale Declared Gas Market (VDWGM) and the Victorian retail gas market. Victoria does not participate in the short-term trading market (STTM) which operates in New South Wales, Queensland and South Australia. Instead, Victoria uses the VDWGM as a gas balancing mechanism, without the participation of other states. The eastern gas market—which is the main market for gas trading in eastern Australia—has recently begun a transition to accommodate a larger amount of LNG exports, fundamentally changing the market structure. Due to the significant increase in overseas gas exports, domestic prices are becoming increasingly linked to the volatile international gas market.\textsuperscript{62} Forecasts suggest that gas prices in Australia will rise over the medium to long term.\textsuperscript{63}

\textsuperscript{58} ibid., p. 31.
\textsuperscript{59} ibid., p. vii.
\textsuperscript{60} ibid., p. 142.
\textsuperscript{62} ibid., p. 38.
**Eastern Gas Market**

The eastern gas market—also known as the east coast gas market—is central to the market framework of gas in Victoria. The eastern gas market links Victoria, New South Wales, Queensland, South Australia and Tasmania and constitutes the largest gas market in Australia. The transition to LNG exporting from the eastern gas market is well underway and the linking of the domestic eastern gas market to international markets has resulted in significant changes in security of supply and domestic pricing.

The diagram below represents the structure of the eastern gas market supply chain.

![Diagram of gas market supply chain](source_image)


One of the defining tenets of the eastern gas market is the level of interconnection between regions. For example, each capital city within the market—with the exception of Brisbane—has direct access to two or more sources of supply.\(^64\) Although natural gas is produced from four main regions in eastern Australia, in 2013–14 the Victorian offshore Basins of Otway, Bass and Gippsland supplied the greatest volumes.\(^65\)

The eastern gas market has historically been, and continues to be, the largest of the three domestic gas markets in Australia. The higher demand represented in the eastern gas market is based on a number of factors, including:

- a larger population compared to western and northern gas markets;
- greater climatic variability, contributing to a seasonal gas demand profile;
- electricity generation dominated by coal-fired generation; and
- greater concentration of manufacturing industries.

Demand comes from residential and commercial users, industrial users and electricity generators. Industrial demand is characterised by a limited number of gas-intensive industries, such as aluminium smelting, brick and cement production, mining and chemical production.\(^66\) Twenty-six per cent of Victoria’s total gas demand comes from the residential and commercial sector, 44 per cent from the industrial sector and 30 per cent from the gas-powered generation (GPG) sector.\(^67\) After Queensland, Victoria has the second highest gas consumption within the market, due to the important role gas plays in the residential and commercial sector.\(^68\)

Gas demand in Victoria, like in other jurisdictions, is expected to decline in the near future. AEMO forecasts an overall decline of 23 per cent by 2024, most notably in the GPG sector, followed by the

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\(^{65}\) Ibid., p. 30.  
\(^{68}\) Ibid.
The residential and commercial sectors are projected to have limited growth, despite a trend of increasing wholesale prices.  

**Issues with the eastern gas market**

Victoria and all regions and participants in the eastern gas market face a host of uncertainties and challenges. The gas and electricity markets are becoming increasingly interdependent, while demand is becoming further linked to the international gas sector.

Victoria, like other regions in the east coast gas market, has been affected by recent developments within the market, such as the development of three LNG projects in Queensland. It is generally accepted that the development of these export-orientated LNG terminals has provided significant economic benefits. However, an increase in gas prices, due to the linking of domestic prices with international gas market prices, has created problems for domestic gas consumers.

The dramatic change in the supply-demand balance and new contractual arrangements for gas have led to significant market disruption. Although there has been significant investment in supply, transport and storage infrastructure in recent years, the eastern gas market requires increased gas supply. A share of domestic production has been diverted to fulfil LNG production and existing conventional gas fields are being depleted over the medium to long term.

The Office of the Chief Economist suggests that, in a neutral economic scenario, total gas consumption is expected to increase by 30 per cent, driven by an increase in LNG exports and growth in gas-powered generation. GPG is expected to increase as gas is used as a transition fuel to a low-emissions energy system. Residential, commercial and industrial gas use, however, is expected to decline, with corresponding declines in gas-intensive industries. LNG exports are expected to continue to grow, as outlined in the chart below, which shows the expected growth and domination of LNG export demand.

**Figure 9. Total maximum demand by region and LNG exports**

The Australian Competition and Consumer Commission (ACCC) has conducted an inquiry into the east coast gas market, focussing on the increasing complexity and uncertainty of the market. The 2016 report made several recommendations, including:

- enabling new gas supply to come onto the market, particularly in south-eastern Australia;
- revisiting the regulatory coverage of pipelines and increasing the ability for pipelines with market power to be regulated; and
- improving the consistency and transparency of the provision of information to the market.

The AEMC has stated that the emerging LNG export industry in Queensland has placed upward pressure on domestic gas prices and resulted in increased price volatility. Two factors have contributed to this trend:

- the increase in LNG exports has significantly increased east coast demand and created a connection between domestic gas prices and international prices, which are often higher and more volatile; and
- unexpected changes in demand from the LNG industry which could result in large changes in gas flows across the east coast, leading to further price volatility.

AEMO’s 2016 National Gas Forecasting Report has highlighted some major challenges facing Australian gas markets. A number of factors which influence our gas markets include:

- the changing domestic role of gas, challenging supply and prices;
- changes occurring in the economy, industry and consumers;
- links to volatile international gas markets; and
- the transition to a lower emissions market structure.

**Victorian Declared Wholesale Gas Market**

The VDWGM is a wholesale gas market established to enable competitive and dynamic trading on injections into and withdrawals from the Victorian Gas Declared Transmission System. The VDWGM is important for Victoria as it provides the state with a mechanism to trade imbalances that exist between what is supplied and what is consumed.

Participants in the VDWGM are able to inject or withdraw desired amounts of gas into the market, thereby trading any imbalances that may exist. In the example below, Participant B withdraws five Tj (Terrajoules) more than they inject into the market, therefore they must purchase this gap in gas of five Tj from the wholesale market at the market price. Participant A, on the other hand, injects five Tj more than they withdraw. Participant A’s surplus supply is then sold to the wholesale market at the market price.

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The market price of gas is determined five times a day and is calculated assuming there are no physical constraints on the pipeline. Participants offer gas into the market through a competitive bidding process, from which the bids are ordered by price and bought according to the total forecast demand.\(^7\)

During a gas day, which commences at 6am Eastern Standard Time and lasts for 24 hours, market participants will make withdrawals and injections from the market. Injections are always controllable, while withdrawals can be either controllable or uncontrollable, which refers to whether the injections and withdrawals are price sensitive.\(^7\) Controllable transactions occur when market participants place bids into the wholesale market. A bid for withdrawal will see a participant place a bid into the market indicating the price that they are willing to pay to use a certain quantity of gas. A controllable bid for injection sees a participant place a bid to inject gas into the wholesale market, these bids are then accepted or rejected by the market.\(^8\) Uncontrollable withdrawals occur when market participants withdraw gas at any price.

**Issues with the VDWGM**

The VDWGM is generally seen as having met its objectives of supporting retail competition and encouraging the diversity of supply—providing an effective and competitive gas balancing service and facilitating gas trade in Victoria based on short-term prices.\(^8\)

In March 2015, the Victorian Government asked the Australian Energy Market Commission to conduct a review of the VDWGM. The purpose of the review was to ‘consider whether the current Victorian arrangements provide appropriate signals and incentives for investment in pipeline capacity, allow market participants to effectively manage price and volume risk and facilitate the efficient trade of gas

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\(^7\)ibid., p. 10.


\(^8\)ibid., p. 9.

to and from adjacent markets’. Subsequently, the AEMC have made a number of draft recommendations, several of which are based on changes in the east coast gas market.

The review has also outlined several emerging issues resulting from the design of the market. The changes taking place in the east coast market present these new challenges but also exacerbate existing concerns regarding the market design. The primary issues include:

<table>
<thead>
<tr>
<th>Inability to effectively manage risk</th>
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<tr>
<td>• Because of the VDWGM’s design, market participants are unable to manage their risk through the market itself.</td>
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<tr>
<td>• Participants face significant wholesale trading risks which may result in higher than necessary gas prices for consumers.</td>
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<tr>
<td>• The existing gas market arrangements do not appear to be able to cope with the structural changes underway in the gas sector.</td>
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<thead>
<tr>
<th>Lack of transparent and meaningful gas prices</th>
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<tr>
<td>• Current arrangements in the market are unsuitable for delivering a meaningful and market-based reference price for LNG.</td>
</tr>
<tr>
<td>• A liquid financial derivatives market has not emerged, reducing the amount of market information available to participants.</td>
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<th>Limited market-driven investment</th>
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<tr>
<td>• Investment decisions result from a regulatory process in the framework of AER’s review of participants’ access arrangements.</td>
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<tr>
<td>• The framework does not respond to market signals effectively.</td>
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<th>Trading between hub locations</th>
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<tr>
<td>• The disjointed nature of market arrangements in eastern Australia inhibits efficient trading between locations.</td>
</tr>
<tr>
<td>• Market participants wishing to trade across markets face increased transaction costs.</td>
</tr>
<tr>
<td>• The need for participants to bid and offer gas into the VDWGM adds complexity to their operations and requires them to incur additional fees.</td>
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</table>

The AEMC has made four recommendations for substantial reform to the VDWGM, primarily to create a ‘Southern Hub’ for gas trading. The first recommendation is to implement a new Southern Hub model in which trading would occur on a voluntary and continuous basis. The AEMC outlines that the hub would be virtual, in that it would retain the existing infrastructure and framework of the Declared Transmission System (DTS). The second recommendation relates to each market participant having financial incentives to balance its supply and demand position under a continuous and mandatory balancing mechanism. Within this model, the system operator would continue to be responsible for ensuring system security. The third recommendation advocates for the Southern Hub to incorporate explicit and tradeable capacity rights for entry and exit from the DTS. The AEMC argues that these rights would enable participants to have confidence that their nominated withdrawals and injections would be achieved. Lastly, recommendation four outlines the need for transitional measures to stimulate liquidity in the commodity market to assist market participants with changing market conditions.

**Price trends**

Within the gas supply chain there are four main cost components: wholesale gas, transmission pipelines, distribution networks and retailers. These are the components which make up the final gas

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82 Ibid., p. 1.
84 The Declared Transmission System, also known as the Victorian Transmission System, is a transmission pipeline network which transports natural gas within Victoria and to NSW via interconnector. Further information can be found on the AEMC website.
price paid by industrial and residential consumers. Environmental policy costs related to gas, with the exception of carbon pricing, tend to be low and their impact on prices is negligible.86

For more than a decade, Victoria has had the lowest industrial gas prices when compared to other Australian states and territories. Industrial prices carry two basic cost components: wholesale gas costs and transmission pipeline costs. In Victoria, wholesale gas costs make up the majority of the industrial gas price. Industrial gas prices have been steadily rising in all states except Western Australia, where prices have been declining since 2009. Victorian industrial gas prices have remained lower than other Australian jurisdictions, primarily due to the proximity of Bass Strait supplies and distance from the Gladstone LNG Projects in Queensland.87

The future of industrial gas prices will be linked to the gas supply and demand balance, along with the ability to overcome transmission constraints in transporting gas. The growing demand and lack of new sources of gas supply in the east coast gas market could also increase industrial prices. It is not clear if excess supply will occur in order to ease gas price pressures.

Residential gas prices have a number of factors by which they are influenced, including distribution network tariffs, wholesale gas costs, average household consumption and the extent of retail competition. For all states other than Victoria, distribution network charges are the largest cost component. Uniquely, Victoria is the only state with an environmental policy that directly affects residential gas prices, the cost of which, however, is estimated to be minimal.88 Gas prices in Victoria for the period 2006 to 2015 have remained steady with incremental rises.89

The future of residential prices will be influenced by a variety of factors, including wholesale gas costs, the level of retail competition, residential gas demand and regulatory decisions regarding distribution network charges.90 The chart below outlines average daily weighted gas prices in Victoria from 1 September 2008 to 1 May 2016.

Figure 11. Average daily weighted gas prices in Victoria

Source: data compiled from Australian Energy Regulator, ‘Victorian gas market average daily weighted prices by quarter’.

87 Ibid., p. 3.
88 Ibid., p. 5.
89 Ibid., p. 6.
90 Ibid., p. 6.
The average daily weighted gas prices for Victoria can be compared with the average gas prices by quarter in the STTM displayed below.

**Figure 12. Average daily ex ante gas prices by quarter for each STTM hub**

![Average daily ex ante gas prices by quarter for each STTM hub](image)

Source: data compiled from Australian Energy Regulator, 'STTM – Quarterly Prices'.

The linkage of domestic prices to international gas market prices is also an important development to consider in future price trends. Pricing mechanisms in the Asia-Pacific market—the destination for Australian LNG exports—are linked to oil prices. This differs from the pricing mechanism historically used in the eastern gas market.

Long-term bilateral contracts have traditionally been the preferred means of wholesale trade, as occurs in the eastern gas market. Transportation agreements are made between pipeline operators and gas shippers, while gas supply agreements are made between gas producers and gas users. Because of a lack of transparency in bilateral energy contracts, details are not publicly available.

A combination of uncertainty, limited competition, potential scarcity of gas supply and lack of transparency in the market creates the potential for inefficient market outcomes, including a higher risk of rising gas prices.

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93 Bureau of Resources and Energy Economics (2014) op. cit.
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