

Demand Report

Appendix to Nexus between energy
security and emissions reduction
Business Case

Central NSW Joint Organisation

November 2023

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Key definitions

A summary of the key terms utilised throughout this report has been listed below.

Term	Definition
Business	For the purposes of this report, 'business' customers include commercial or industrial customers.
Capacity	'Capacity' in this report refers to the rated maximum limit of zone substation infrastructure.
CAGR	'Compound Annual Growth Rate' refers to the annual growth rate over the specified time period.
Commercial	For the purposes of this report, 'commercial' customers refer to businesses excluding any 'industrial' customers.
Consumption	'Consumption' refers to the electricity used by residential, commercial and large industrial customers. It can be supplied by the electricity grid (grid consumption) or through own sources (self-met consumption). It is commonly quoted in MWh throughout this report.
DER	'Distributed Energy Resources' refer to small-scale energy resources that are connected to the distribution network that can produce electricity or actively manage demand. Examples of DER include residential solar PV, batteries, electric vehicles, demand response enabled appliances, etc.
Distribution Network	'Distribution Network' transports electricity at lower-voltages to end-use customers.
DNSP	'Distribution Network Service Provider' is the operator of the distribution network. In the case of the CNSWJO region, Endeavour Energy is the DNSP for Lithgow and Essential Energy is the DNSP for the remaining area.
EV	'Electric Vehicle' is a type of vehicle that has an electric motor and batteries, instead of an internal combustion engine that relies on gas or liquid fuels.
LGA	'Local Government Area'.
Peak Demand	'Peak Demand' is the maximum electricity demand used by customers during any given day. It is commonly quoted in MW or MVA throughout this report.
Industrial	For the purposes of this report, 'industrial' customers are any large industrial operations with material consumption, all of which currently, or are planned to, operate private electricity distribution infrastructure connected directly to the transmission network (i.e. no DNSP infrastructure involvement).
kW / MW / GW / TW	'Kilowatts / Megawatts / Gigawatts / Terawatts' are units of electrical capacity or power. 1 TW = 1,000 GW = 1,000,000 MW = 1,000,000,000 kW.
kWh / MWh / GWh / TWh	'Kilowatt-hours / Megawatt-hours / Gigawatt-hours / Terawatt-hours' are units of power consumption, for example 1kWh is 1kW consumed continuously for one hour.
Network Constraint	A 'Network Constraint' is an enforced limit on the power system to avoid exceeding operating limits, for example thermal overload, voltage instability, etc. In the context of this report it refers to constraints on available capacity of zone substations.
Residential	'Residential' for the purposes of this report refers to private homes or dwellings connected to the electricity grid.
Rooftop Solar PV	'Solar Photovoltaic (cells)' refers to solar panels that convert sunlight into electricity through photovoltaic cells.
TNSP	'Transmission Network Service Provider' is the operator of the transmission network. In NSW Transgrid is the TNSP.
Transmission Network	'Transmission Network' transports electricity at high-voltages from generators to major demand centres.
Zone Substation	'Zone Substation' are points that receive electricity from the transmission or sub-transmission network and transform it to 11kV for the distribution network.

1

Executive Summary

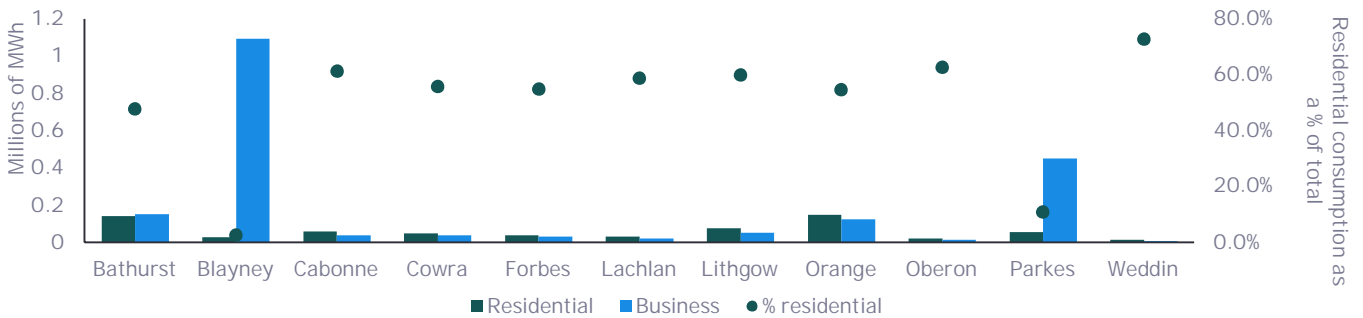
1 Executive Summary

The consumption of electricity in Central NSW varies across the region and is driven by a range of factors, including population growth and industry characteristics in each Local Government Area (LGA). Forecasts developed for this Report predict that total electricity consumption will grow from 2,685 GWh in 2023 to 3,117 GWh in 2050 (a 16.1% increase). To meet this increase, additional capacity will be required, given that some LGAs are already facing network constraints resulting in reliability and security issues. Ten localised areas across the Central NSW region have been identified as being impacted by network constraints. This report summarises current and forecast demand for electricity in Central NSW and constraints on the distribution network. For information on the capacity and constraints of the transmission network, please refer to the Capacity Assessment.

Electricity consumption is influenced by population size and industry characteristics

Electricity consumption is currently highest in Blayney and Parkes, and lowest in Weddin, Oberon and Lachlan. This reflects the major business customers in the area, namely the Special Activation Precinct (SAP) and Northparkes Mine in Parkes, and Cadia Mine in Blayney. The smaller consumption figures in the southern and western parts of the Central NSW area are reflective of the smaller populations and the absence of energy intensive industry customers. The share of residential consumption as a proportion of total consumption varies between councils, and is lowest in Blayney (due to the Cadia Mine) and highest in Weddin. This is illustrated in the chart below that shows the proportion of residential consumption with blue dots. This metric may be an indicator of the major driver of future growth (i.e. residential or industrial consumption).

Figure 1: Energy Consumption by LGA, FY23

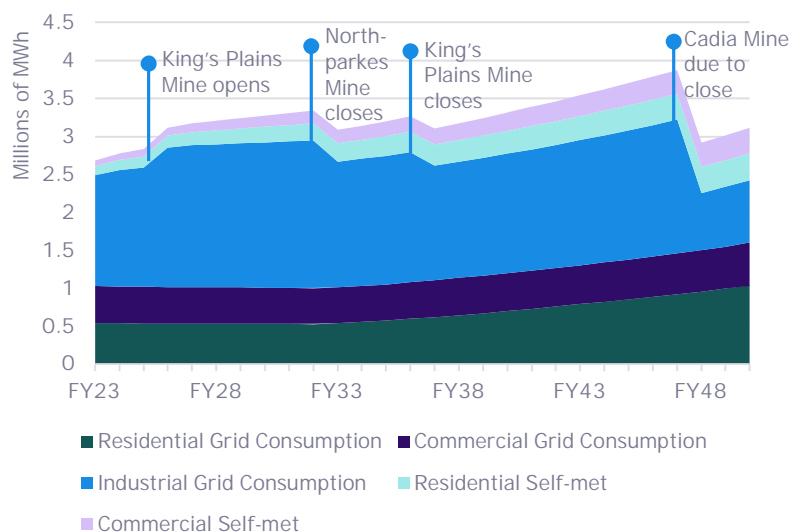


Sources: Essential Energy and Endeavour Energy forecasts, Newcrest Mining, CMOC & Regional Growth NSW Development Corporation (RGDC)

Electricity consumption is expected to grow annually by 0.5% per year from FY23-FY50 in Central NSW, with closures of industrial sites counteracting growth in residential and business consumption

The projected future electricity consumption is illustrated in Figure 2 opposite. This forecast is based on information provided by the distribution network service providers ((DNSPs), who have forecast to FY32), and supplemented with publicly available information of the electricity consumption of large industry businesses in the region. Beyond FY32, trends used by the Australian Energy Market Operator (AEMO) for NSW have been applied to forecast consumption out to 2050. Analysis indicates that electricity consumption from industry is the largest contributor to forecast demand (black shading in Figure 2) contributing to the peak consumption in FY47 at 3.9 TWh. However, it is the only sector expected to decline over time due to the significant drop in FY48 reflecting the anticipated closure of the Cadia mine. Importantly, analysis indicates that the largest growth will occur in residential consumption, growing by an average annual rate of 2.7% to FY50.

Figure 2: Central NSW Electricity Consumption Forecast



Sources: AEMO ISP forecast; Essential Energy and Endeavour Energy forecasts
 Note: FY23 business consumption is comprised of Cadia Mine (49.5%), Northparkes Mine (14.4%), Parkes SAP (5.0%) and other businesses (31.1%).

1 Executive Summary

Electricity consumption is expected to grow at varying rates across the region

According to forecasts developed for this Report, absolute growth in consumption is expected to be largest in Bathurst, Orange and Lithgow as the largest population centres in Central NSW. Additionally, the expected new gold mine at King's Plains will increase the consumption in Blayney Shire for the period it operates. Forecast percentage growth trends vary between LGAs out to 2050. Blayney is expected to experience the largest decline with a 89.6% decline in demand for electricity from the grid due to the forecast closure of Cadia mine in 2047. At the other end of the spectrum, Bathurst is expected to experience 110.4% growth in electricity consumption as a result of population growth and the electrification of residential energy use. As Cadia and other mines operate on separate distribution infrastructure, their closure will not influence network constraints assessed here; future constraints have been identified for Bathurst which are elaborated on in Chapter 4.

10 areas across the Central NSW region are currently facing network constraints or supply issues

Some parts of the distribution network in Central NSW are already experiencing network constraints, with current levels of consumption and demand leading to security and reliability issues for customers in those areas. Forecast growth is expected to further exacerbate this. Based on data analysis and interviews with councils, 7 of the 11 Local Government Areas (LGAs) within the Central NSW region have been identified as currently experiencing energy security or reliability issues. Broadly, the analysis highlights that more substations located within LGAs in the western parts of the region appear to be affected by constraints (and the energy security and reliability issues that arise as a result), when compared to LGAs in the east.

Figure 3 illustrates a substation's available capacity under peak load conditions.¹ Those substations highlighted in red are reaching their capacity limits, indicating a network constraint. Based on this data, of the 30 substations in Central NSW, 8 are considered to have current constraint issues.

Figure 4 illustrates the average customer minutes lost in 2022; an indication of reliability in that area. It illustrates that Lachlan and Weddin experience the highest number of minutes lost. As a result, the two substations in Lachlan have been flagged as currently experiencing issues, bringing the total number of substations with constraint issues to 10 (Weddin is already captured based on the data from Figure 3).

Note: Major customers operate on private substations and due to confidentiality requirements that data is not available.

*Reliability data from Endeavour Energy was not provided in a format that enabled comparable analysis and so has been omitted from Figure 4.

Figure 3: Substation capacity

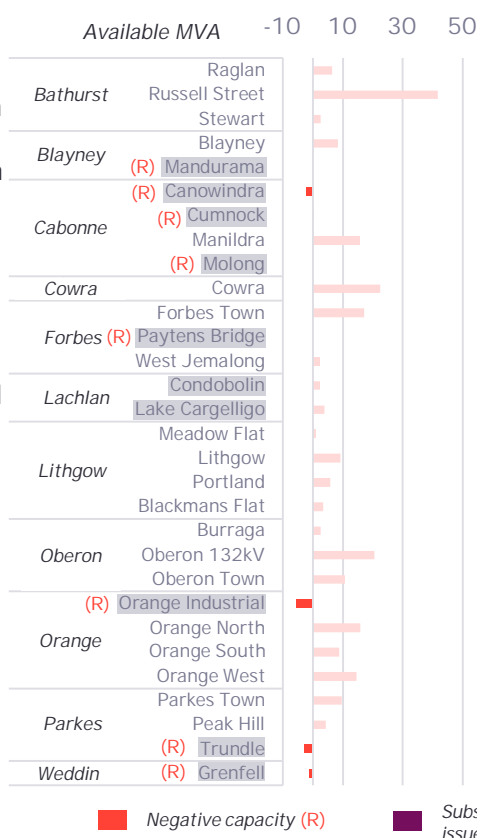
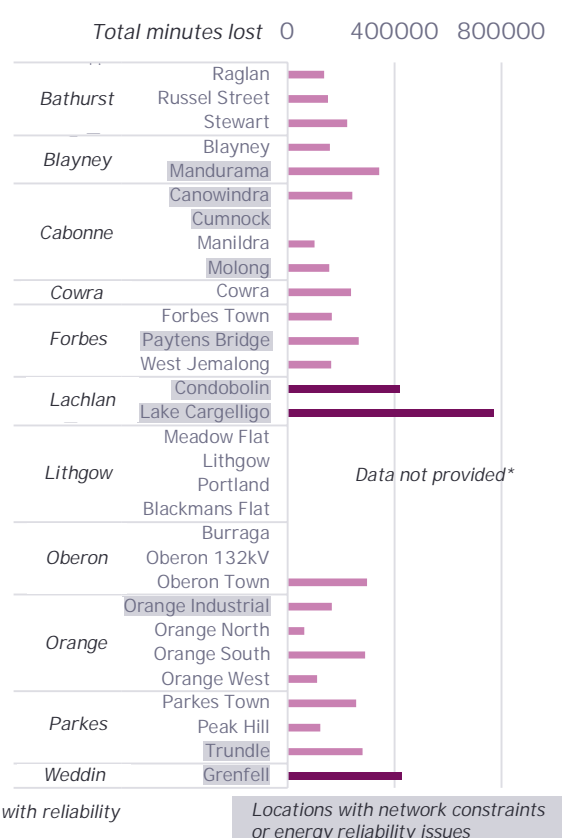


Figure 4: Total customer minutes lost



Sources: Essential Energy & Endeavour Energy substation demand data from Distribution Annual Planning Reports; Essential Energy reliability data.

¹ Substation capacity is calculated by subtracting a zone substation's peak demand and electricity exports (e.g. from solar PV) from the substation firm normal cyclic rating capacity.

2

Introduction

2 Introduction

Background

Both the Commonwealth and NSW governments have committed to decarbonisation through legislated policy, targeting net-zero emissions by 2050. Central NSW aims to support the broader government agendas by achieving net-zero by 2050.²

Decarbonising the energy system is a core part of meeting our net-zero goals. The Central NSW Joint Organisation (CNSWJO) recognises that an orderly transition to a renewable energy future will require investment in infrastructure in the region. Therefore, CNSWJO is seeking to build the case for a targeted approach to energy infrastructure investment in the region to:

1. Increase energy security for the region; and
2. Reduce emissions, consistent with NSW Government net-zero goals.

To date, the energy transition has been led by the uptake of solar power, in which Australia is a global leader. Australia has the seventh largest installed capacity of solar photovoltaics (PV) and the highest capacity per capita.³ In large part this is supported by the advanced uptake of rooftop solar PV on homes, with approximately 1 in 3 homes having installed rooftop solar pv.⁴ However, the transition to renewable energy also requires investment in other variable renewable generation (such as wind) and firming technologies (flexible generation to ensure consistent energy supply, such as batteries) that can adequately substitute the role that coal-fired power generation currently plays (currently around two-thirds of NSW generation) while maintaining a secure and reliable electricity system. The current transmission and distribution networks were also not designed to accommodate the transition, and will need investment.

This report supports the Business Case that identifies the required investment to address the nexus between emissions reduction and energy security in Central NSW. Specifically, this report sets out the capacity of the transmission electricity system to host NEM-connected renewable energy assets.

Objectives

The objectives for this report are to:

- Understand historical demand for electricity across Central NSW.
- Understand projected future consumption and expected changes over time.
- Understand how the forecast consumption will be served.

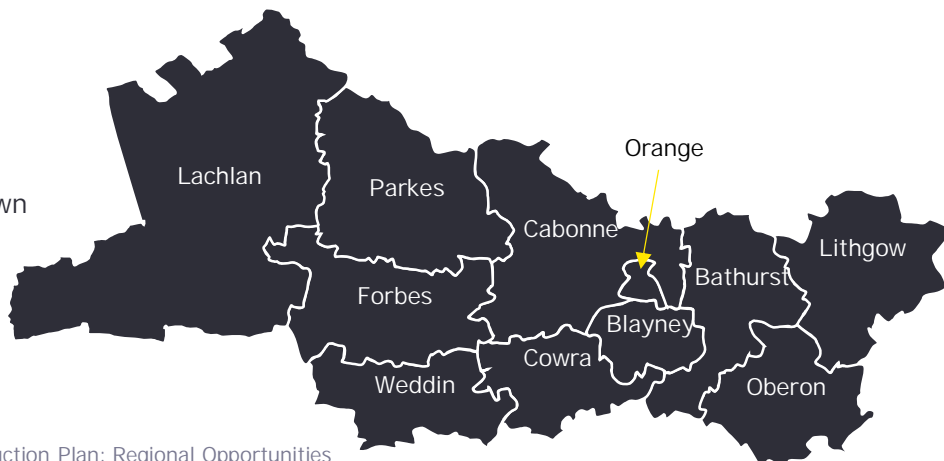
Scope

The scope of this report relates to item 2 of the overall scope of work. It includes the assessment of electricity consumption and demand within Central NSW over the forecast period from 2023 to 2050. This report does not explicitly consider the consumption of gas or other energy sources, unless it is captured under the electrification or fuel switching forecast demand driver, explained further in Appendix i. Demand and analysis of network constraints is limited to the 'light load' analysis of zone substations, and does not consider other aspects of the network that may cause constraints.

Figure 5: Central NSW Joint Organisation area

Central NSW region

The Central NSW area spans 11 regional councils in regional NSW, to the west of Greater Sydney. Member councils of the Joint Organisation (JO) include those shown in Figure 5.



2. Central NSW Joint Organisation, Emissions Reduction Plan: Regional Opportunities

3. BP, Statistical review of world energy, 2022

4. Global Australia, Solar Energy: Australia's Renewable Energy Leader

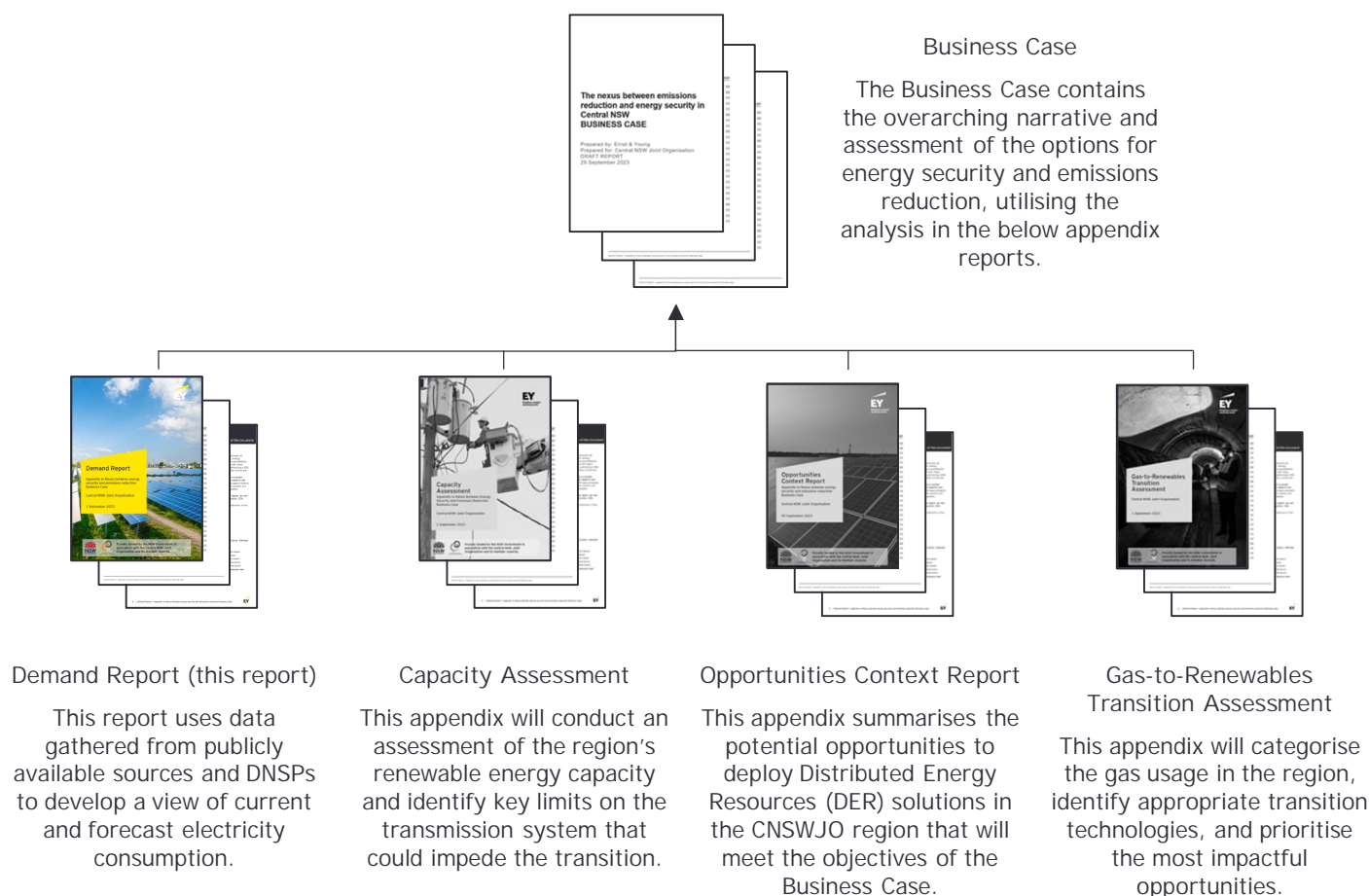
9 Demand Report – Appendix to Nexus between energy security and emissions reduction Business Case

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Alignment to other documents

This Demand Report (this report), has been developed in conjunction with three other reports, which cumulatively form the appendices documenting the analysis that supports the Business Case. Figure 6 illustrates the appendix reports produced for the Business Case and an overview of the content. This report should be read in conjunction with the Business Case and its appendices.

Figure 6: Summary of alignment between documents



Purpose of this report

This report summarises the current and expected electricity consumption over the forecast period within Central NSW. Forecast consumption will be used as the base case in the Business Case. The base case is a scenario that forecasts the future demand without additional intervention, and will serve as the baseline from which options are compared against. This report includes a description of the methodology, assumptions and results underpinning the analysis of historical and forecast demand. It draws on a combination of publicly available information and data gathered from consultation with stakeholders, including councils and DNSPs. More information about the data sources and scope of this report is overleaf.

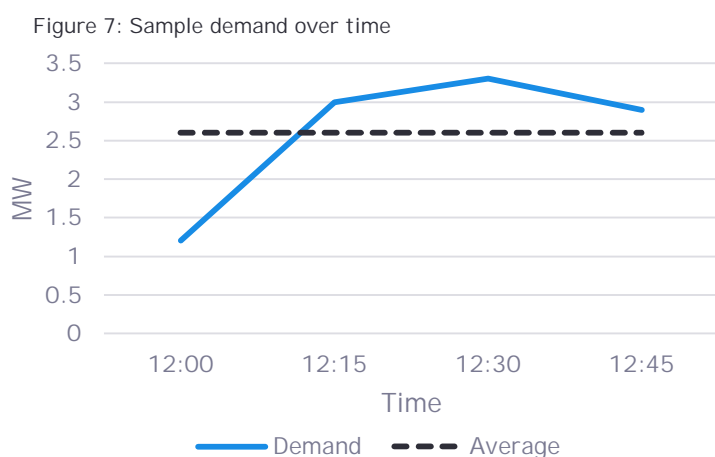
The analysis set out in this report provides an overview of:

1. The historical electricity consumption by LGA, inclusive of major customers such as local mining operations
2. Current distribution network constraints (to compliment the information in the Capacity Assessment) and forecast electricity demand, inclusive of current and future major customers with committed development plans that impact energy use.
3. An overview of the proportion of demand that will be served by the grid and consumption that will be met by distributed sources 'behind-the-meter'.

Explanation of key terminology

In this report, terminology utilised is in some circumstances quite similar, but holds different meanings. The below explains some of the key terminology referred to throughout this report, in addition to that explained within key definitions on page 4.

'Demand' and 'Consumption'



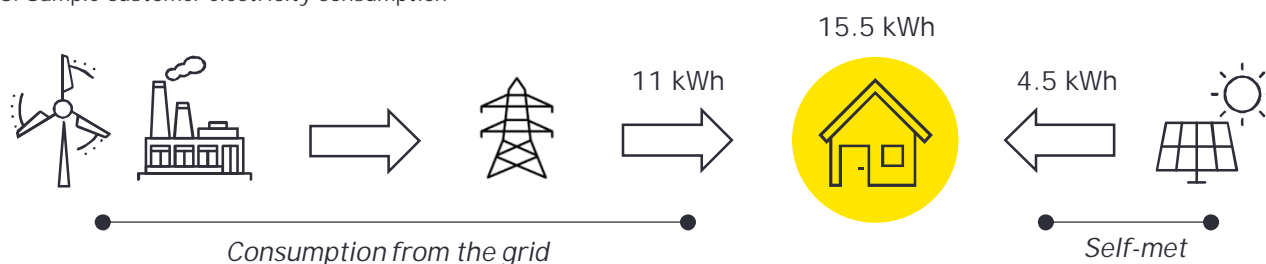
Demand is a point in time measure, expressed in MW or MVA. It reflects the rate of electricity being supplied at a given moment. In the example detailed in Figure 7, demand fluctuates between 1.2 MW and 3.3 MW over the hour.

Consumption is a measure of the electricity utilised over time, which is expressed in MWh. 1 MWh is therefore 1 MW of power consumed continuously for 1 hour. In the example illustrated in Figure 7, the consumption is the average MW consumed over the hour, which is 2.6 MWh.

'Self-met' and 'from the grid' consumption

Throughout this report, two kinds of consumption are referred to: 'self-met' and 'from the grid' consumption. In the example below, the yellow house is the customer. In the below illustrative example, the sample customer uses 15.5 kWh of electricity. During the day, while the sun is shining, the customer's rooftop solar PV generates the electricity required to meet their consumption needs, this is referred to as 'self-met' or 'behind-the-meter' consumption. In the example, 'self-met' consumption is 4.5 kWh. The remainder of their electricity consumption will be met by the grid, sourced from utility-scale generation infrastructure, passed through the transmission and distribution networks to the customer's home. Therefore, in the below example, the customer's consumption from the grid is 11 kWh.

Figure 8: Sample customer electricity consumption



'Constraint' and 'Reliability'

In the assessment of current network constraints with respect to zone substations, both 'constraints' and 'reliability' are referred to. Constraints are estimated by comparing peak electricity demand from a substation to the rated capacity of that substation, resulting in an estimated available capacity. A negative estimated available substation capacity determines whether network constraints exist or are likely to exist in future, for the purposes of this report.

Reliability refers to the quantity of time where electricity supply is interrupted for customers (or 'lost minutes'). Reliability can be a result of constrained network infrastructure, but equally may be influenced by damage to network assets, weather or other unforeseeable causes.

3

Central NSW Electricity
Demand - Historic

Chapter overview

This chapter provides an overview of historic electricity consumption across Central NSW, including key demographic indicators that influence electricity consumption, such as population. The chapter includes:

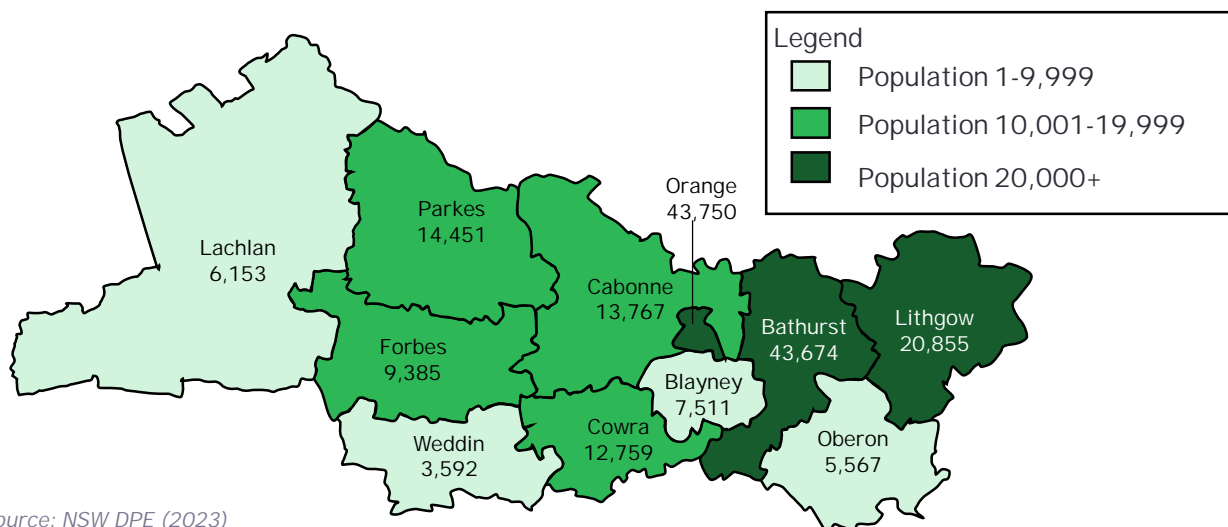
- Current and historical electricity consumption by residential and business customers.
- An overview of consumption from major industrial electricity customers in the region.
- The current state of distributed energy resources (DER) uptake in the region.
- An overview of network infrastructure.
- Network constraint and reliability assessment for zone substations in the region.

Overview of historical Central NSW population trends

According to the NSW Department of Planning and Environment (DPE), the population in Central NSW was 181,464 in 2021, accounting for 2.2% of total NSW population and increasing from 166,293 in 2000. On average, the area has a similar median age to the state of NSW (39), ranging from 37 in Orange to 52 in Weddin. Population ranges significantly, from 3,592 in Weddin to 43,750 in Orange.

Population growth and business growth have been key drivers in higher electricity consumption in the region.

Figure 9: Population by council, 2021



Source: NSW DPE (2023)

Note: 2021 data is used to align with information from the most recent ABS Census

Table 1: Population growth

LGA	2000	2021	% growth
Bathurst	35,504	43,674	23.0%
Blayney	6,478	7,511	15.9%
Cabonne	12,447	13,767	10.6%
Cowra	12,989	12,759	-1.8%
Forbes	10,062	9,385	-6.7%
Lachlan	7,651	6,153	-19.6%
Lithgow	20,451	20,855	2.0%
Oberon	5,257	5,567	5.9%
Orange	36,701	43,750	19.2%
Parkes	14,927	14,451	-3.2%
Weddin	3,826	3,592	-6.1%
Total	166,293	181,464	9.1%

Source: NSW DPE (2023)

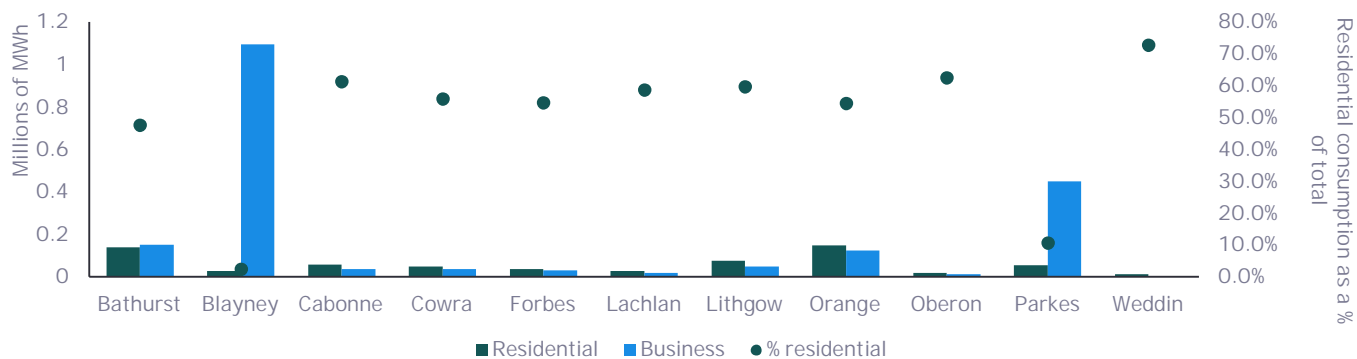
Population growth has been largely driven by population growth in the two most populated LGAs, Bathurst and Orange. Other LGAs with strong population growth include Blayney. Partially offsetting this have been population declines in Lachlan, Forbes and Weddin.

Overview of historical electricity consumption

Figure 10 illustrates the total electricity consumption from the grid (as historical self-met consumption data is not available) for each LGA in financial year (FY) 2023, split between business and residential customers. The blue points on the graph illustrate the proportion of total consumption from the grid in each LGA that is from residential homes, illustrating the concentration of industrial customers across the region and LGAs with higher relative proportions of residential consumption. In FY23, residential consumption represented 24.7% of the total, with businesses representing 75.3% of total usage (21.0% from commercial customers and 54.3% from large industrial customers).

As can be seen in Figure 10, electricity consumption is highest in Blayney (1,124 GWh) and Parkes (505 GWh) (largely due to large industry presence) and lowest in Weddin (20 GWh), Oberon (34 GWh) and Lachlan (52 GWh). The presence of intense mining operations in Blayney and Parkes, as well as the Parkes Special Activation Precinct (SAP), increases the total consumption of Central NSW by more than double (from 1,226 GWh without industrial customers to 2,685 GWh with them included). Excluding the impact of the industrial customers located in Blayney and Parkes, the LGAs with the largest total consumption of electricity from the grid become Bathurst (293 GWh), Orange (273 GWh) and Lithgow (128 GWh), most likely due to the fact that they have the largest number of residents (refer Table 1).

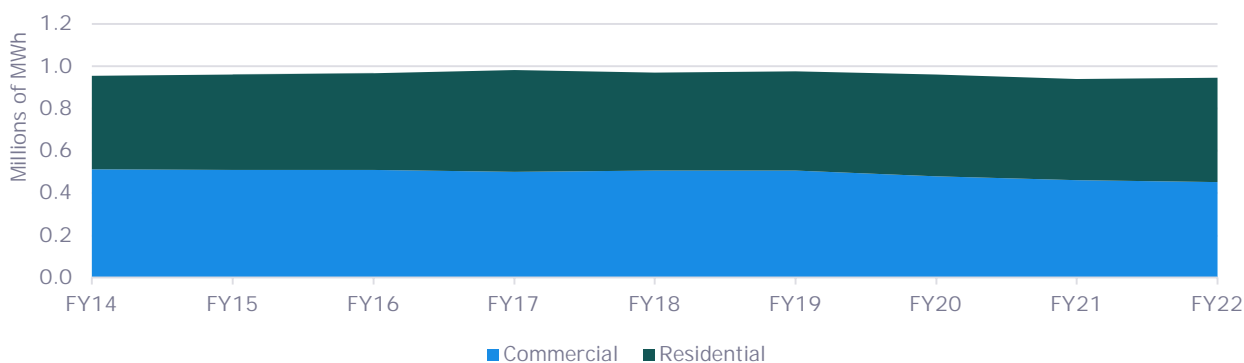
Figure 10: Energy Consumption by LGA, FY23



Sources: Data collected from Essential Energy, Endeavour Energy, Newcrest Mining, CMOC, and RGDC

Figure 11 below illustrates the historical trend in consumption, which in total has not grown significantly over the 9 years of historical data. Notably, residential consumption has increased as a proportion of total, however only slightly, from 46.4% (FY14) to 52.1% (FY22). The proportional change in split of residential and business consumption was as a result of residential consumption growing and business consumption declining. In addition to residential consumption growing by 11.1% from FY14 to FY22, the quantity of residential connections also grew comparatively slower, by 8.7% from 67,576 in FY14 to 73,488 in FY22. Despite the business consumption declining, the quantity of business customer connections grew marginally (from 9,389 in FY14 to 9,752 in FY22). There are multiple possible explanations for this, including but not limited to, increasing self-met consumption (historical self-met data is not available), decreases in business electricity consumption due to declining business output, churn in the types of businesses towards less energy intensive operations, or investments in energy efficiency.

Figure 11: Historical Central NSW Consumption

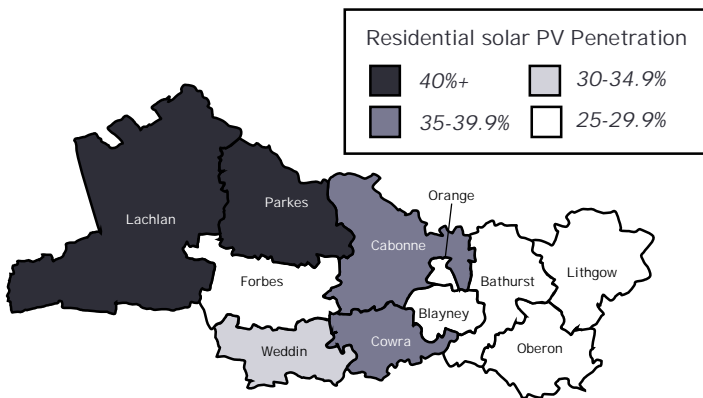


Sources: Data provided by Essential Energy and Endeavour Energy (2023), Note: FY14 - FY22 historical data excludes any self-met consumption or aforementioned major customers as data is not available

Residential DER uptake

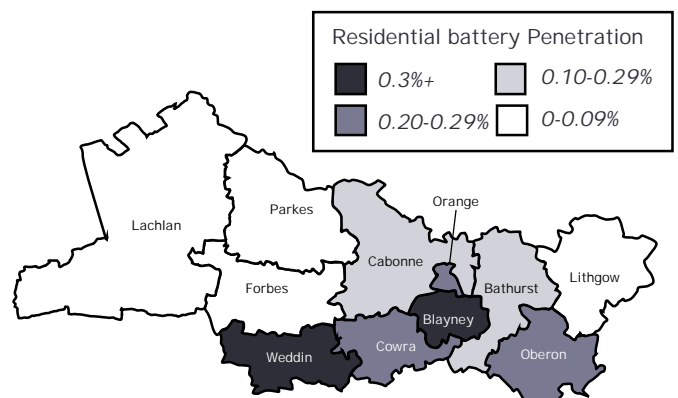
Residential DER technology adoption varies across Central NSW. Within Central NSW, residential solar penetration is generally higher in the west, reflecting the high solar potential there (see the Capacity Assessment or the Opportunities Context Report for more information on solar resource availability across the region). Battery penetration in Central NSW (0.2%) is slightly lower compared to the NSW average of 0.3%, ranging between 0.0% in Lithgow and 0.3% in Blayney. This adoption of DER has meant that a proportion of electricity needs are being self-met through on-site generation.⁵

Figure 12: Residential solar PV penetration, 2023



Source: Australian PV Institute

Figure 13: Residential battery penetration, 2023



Source: EY analysis of AEMO DER register & DPE household data

Business DER uptake

There is estimated to be 828 solar systems connected across the Central NSW region, which when compared to the DNSPs' number of business customer connections, equates to an approximate 8.5% penetration rate in the region. The quantity of solar connections in Central NSW equates to approximately 4% of the total number of business solar PV systems across NSW. However, the size of solar PV systems fitted to businesses are on average larger than residential systems, with a rating of 16.4 kVA compared to 4.8 kVA.

Batteries are even less widely adopted for business operations, with an estimated two systems in Central NSW, which is approximately 1% of the total 188 systems installed across NSW.⁶

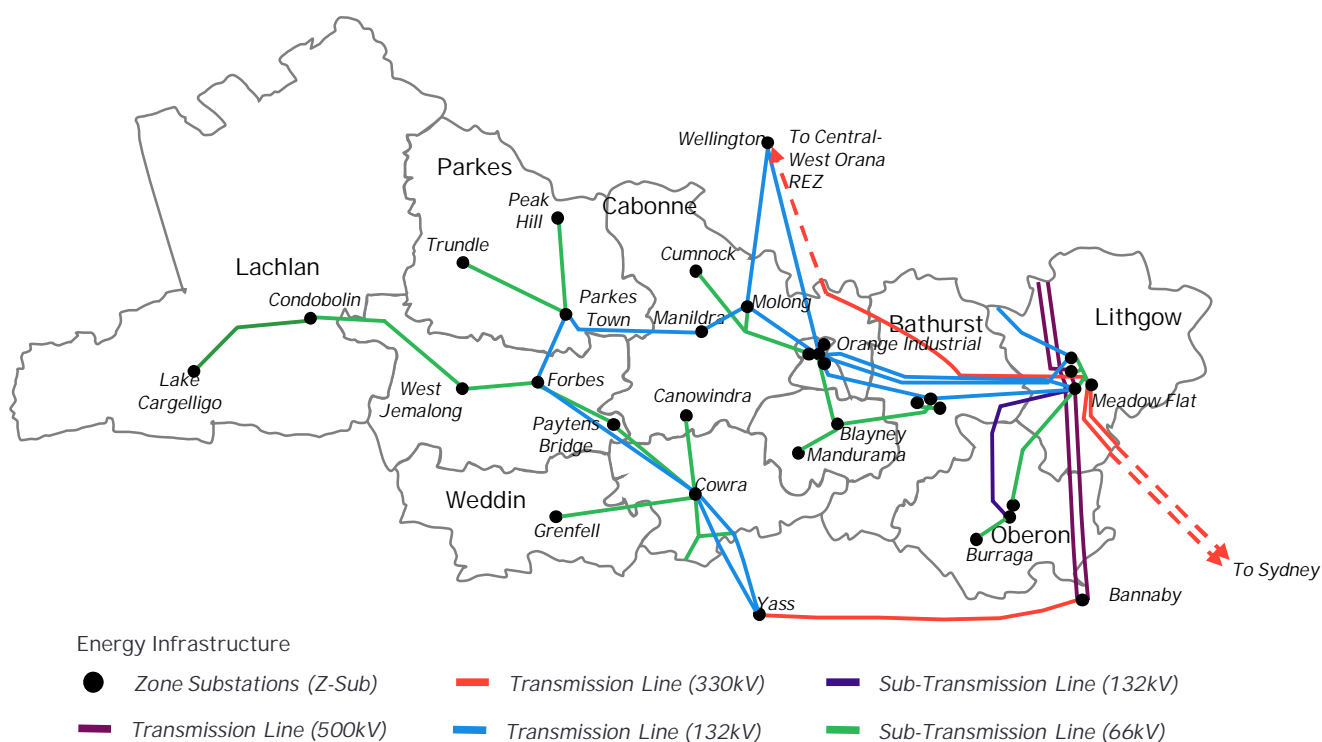
5. EY analysis of data from the AEMO DER register which can be found at <https://aemo.com.au/energy-systems/electricity/der-register> as well as DPE household data found at <https://www.planning.nsw.gov.au/research-and-demography/population-projections>

6. EY analysis of AEMO DER register
Demand Report – Appendix to Nexus between energy security and emissions reduction Business Case

Overview of key distribution network infrastructure

The Central NSW region is supplied electricity through transmission and distribution infrastructure. The Capacity Assessment provides detail on the transmission infrastructure in the region. Essential Energy and Endeavour Energy are the DNSPs for the Central NSW region. The western parts of Parkes and Forbes, as well as the entirety of Lachlan and Weddin, are served electricity entirely by Essential Energy's 66kV and below distribution infrastructure. Figure 14 below illustrates the network down to the 132kV and 66kV sub-transmission network operated by the DNSPs (coloured blue and green), and its connections to the 132kV+ transmission network operated by Transgrid (coloured purple, red and amber). The DNSPs additionally have 22kV and 11kV lines to distribute power across the region, not illustrated within Figure 14.

Figure 14: Map of key electricity network infrastructure in the Central NSW region



Sources: Essential Energy, Endeavour Energy and Transgrid

Network constraints

The Central NSW region is serviced by 30 zone substations operated by Essential Energy and Endeavour Energy, that connect power between the high-voltage transmission and sub-transmission network, and the low-voltage local networks.

Available substation capacity has been calculated by comparing estimated peak demand with rated substation capacity, where substations that have negative available capacity under peak demand conditions are deemed as 'constrained'.⁷

Substations coloured in red have negative capacity under peak demand conditions.

Figure 15: Substation capacity



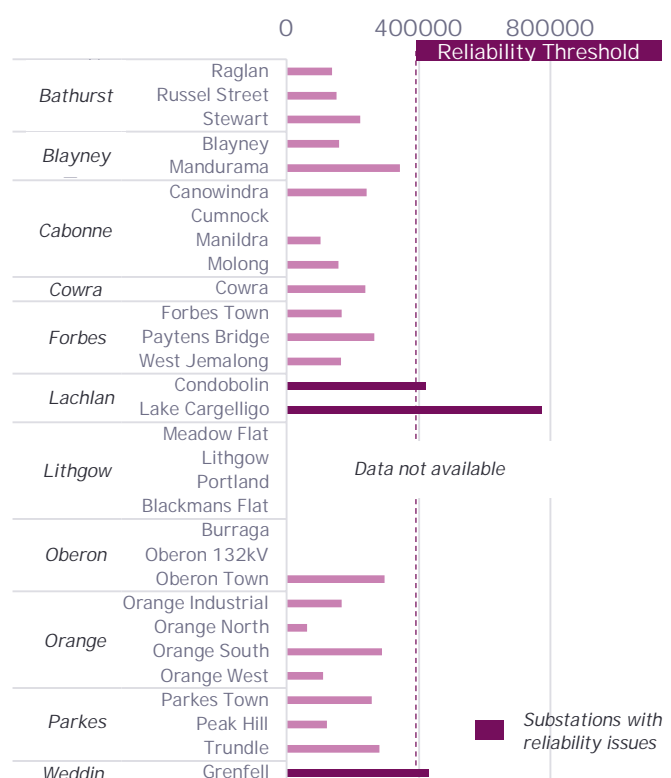
Network reliability

The total 'lost minutes' measure the quantity of time that supply to customers has been interrupted from each zone substation.

The three zone substations identified as having reliability issues are categorised on the basis they exhibit materially higher total customer minutes lost compared to the rest of Central NSW.

Condobolin, Lake Cargelligo, and Grenfell all recorded customer minutes lost more than one standard deviation above the Central NSW mean of 241,069 minutes lost.

Figure 16: Total customer minutes lost



7. Calculation of typical load and definition of constraint threshold have been determined in consultation with Essential Energy

Industrial electricity customers

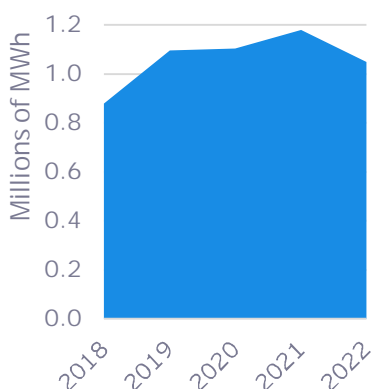
Industrial electricity customers, as defined in key definitions on Page 4, were not captured in the data received from the DNSPs, though they are deemed to be significant customers of electricity in the region. Electricity consumption for these operations has been taken from publicly available sources or estimated where limited data exists, and included in the forecasts presented in Chapter 5.⁸ The three identified businesses are estimated to have consumed 1,458 GWh of electricity in FY23 or 54.3% of total consumption from the grid in Central NSW. The three customers are discussed below.

Newcrest’s Cadia Mine

Located in Blayney Shire, approximately 25km from Orange. The site holds one of the largest discovered copper and gold deposits in the world. In FY22 the site produced approximately 561 koz of gold and 106kt of copper.⁹

Electricity consumption for the site has been fairly stable over the last 5 years varying from a low of 878 GWh to a peak of 1,180 GWh.¹⁰

Figure 17: Cadia electricity consumption FY18 - FY22



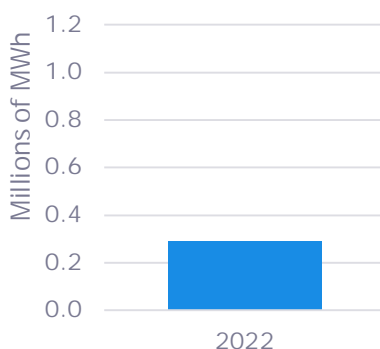
Source: Newcrest Mining

China Molybdenum Company’s (CMOC) Northparkes Mine

Located in Parkes Shire, 27km from the Parkes town centre. The mine produces copper and gold, processing 7.6 million tonnes of ore in 2022 of which approximately 80% comes from underground operations.¹¹

Electricity consumption for the site in 2022 was 289,718 MWh, with an average demand of 33 MW.¹²

Figure 18: Northparkes Mine consumption FY22



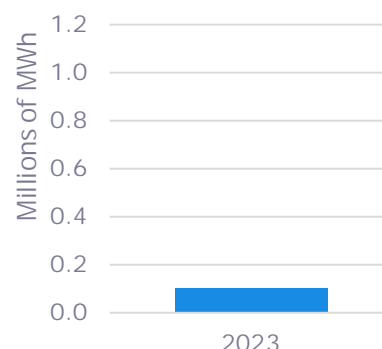
Source: CMOC

Parkes SAP

The SAP will be a 4,800 ha industrial precinct co-located with the existing east-west rail line, and the planned north-south Inland Rail route. The site is expected to create up to 3,000 jobs.¹³

The site is not yet fully operational, with development ongoing. The estimated electricity demand for FY23 was 105,120 MWh, with an average demand of 12 MW.¹⁴

Figure 19: Parkes SAP consumption FY23



Source: RGDC

It is worth noting there are other mines in the region with no private substation. Information for these mines was included in the data provided by DNSPs, and therefore included in the consumption estimates for each LGA.

Examples of these mines include:

- Cow Flat Limestone in Bathurst.
- Excelsior Quarry in Lithgow.
- Mineral Hill in Lachlan.
- Clarence Colliery in Lithgow.
- Springvale in Lithgow.
- Airly in Lithgow.
- Pine Dale Coal Mine in Lithgow.

8. Sourced from Newcrest Mining Sustainability Reports, Energylink Services, RGDC

9. Newcrest Mining, <https://www.cadiavalley.com.au/newcrest/cvo>

10. Newcrest Mining Sustainability Reports

11. CMOC, <https://www.northparkes.com/wp-content/uploads/2023/05/the-northparkes-report-2022.pdf>

12. Energylink Services, <https://www.energylinkservices.com.au/post/cmoc-northparkes-mines-electricity-supply-contract-request-for-information#:~:text=About%20Northparkes%20Mines&text=The%20mine%20consumed%20approximately%20260,will%20continue%20into%20the%20future>

13. Department of Regional NSW, <https://www.nsw.gov.au/regional-nsw/regional-business-and-economy-nsw/special-activation-precincts/parkes-activation-precinct>

14. Estimates provided by RGDC

4

Central NSW Electricity
Demand - Historic LGA
Deep Dive

4 Central NSW Electricity Demand – Historic LGA Deep Dive

Chapter overview

This chapter provides a segmented summary of historic electricity consumption by LGA, including key demographic indicators that influence electricity consumption, such as population. The chapter includes:

- Electricity intensive businesses identified by councils through consultations.
- The current state of population, households and industries in the LGA.
- Electricity consumption from the grid for each LGA, split by business and residential customers.
- Network constraint analysis for each zone substation in the LGA.



Bathurst overview

Bathurst’s population in FY23 was estimated to be 45,914 with 17,639 private dwellings. In addition to the town of Bathurst, other population hubs include Eglinton and Raglan.

Electricity intensive businesses in Bathurst include:

- Allied Timber, a sawmill.
- Australian Native Landscapes, a landscape supply provider
- Devro, a food manufacturer.
- Aprilla Grids, a road infrastructure supplier including stock grids and cattle grids.
- Simplot, a frozen food manufacturer.
- Mars Petcare and Masterpet, pet food manufacturers.

Figure 20: Bathurst snapshot

45,914 People
17,639 Households

Source: DPE

Figure 21: Top 3 industries by business quantity



Source: ABS

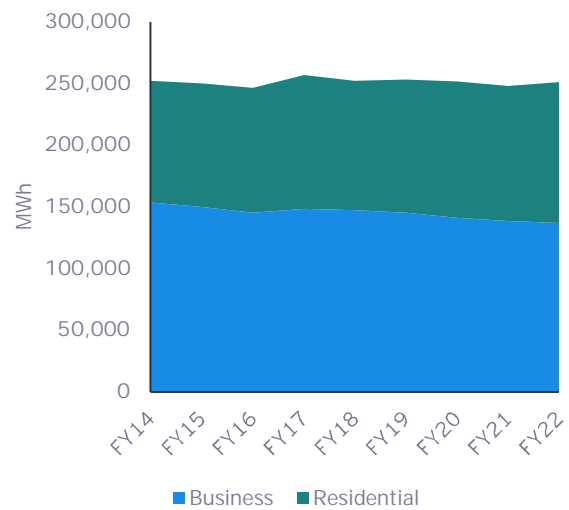
Electricity consumption

Total electricity consumption in Bathurst has remained relatively steady over the period at 252,263 MWh in FY14 to 251,149 MWh in FY22. The data shows that business consumption in Bathurst has been declining over the last nine years, whereas there has been an increase in residential consumption over the same period.

Business electricity usage declined 10.9% over the available data period, a marginally smaller decline than the average trend across Central NSW. This trend is contrary to the number of business customers, that grew 3.7% over the period.

Residential electricity usage increased substantially over the FY14-FY22 period, growing by more than 15.8%. The growth trend is above that of Central NSW more broadly and substantially above that of the increase in residential customer network connections (at 12.5%). Therefore, electricity consumption from the grid per connection from residential customers grew, while it declined on a per connection basis from business customers.

Figure 22: Bathurst consumption FY14 – FY22



Source: Essential Energy

Network constraints

As Bathurst is located in the east of the region, it benefits from proximity to key transmission infrastructure (additional detail contained in Figure 14).

The three zone substations operated by the DNSP in Bathurst have no identified network constraints based on current peak demand. The available capacity at these substations ranges between 2.5 and 41 MVA.

Additionally, no issues in relation to electricity supply reliability have been identified. Customer minutes lost (minutes where customer supply is interrupted) range between 136,000 to 221,000 minutes, below the Central NSW average of 241,069 minutes.

Figure 23: Bathurst Substation capacity FY23

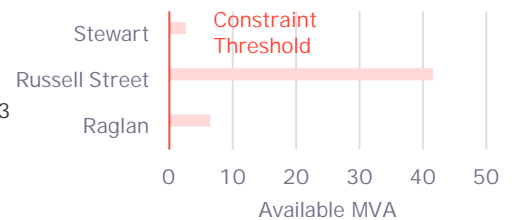
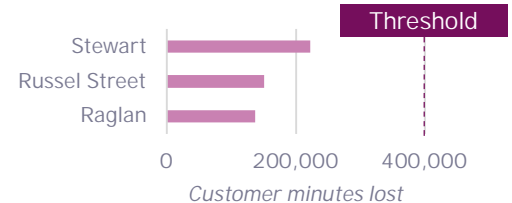


Figure 24: Bathurst supply interruptions FY23



Source: EY analysis of Essential Energy data

4 Central NSW Electricity Demand – Historic LGA Deep Dive



Blayney overview

Blayney's population in FY23 is estimated to be 7,358 with 2,989 private dwellings. Population hubs include the towns of Blayney, Millthorpe and Forest Reefs.

Electricity intensive businesses include:

- Blayney SeaLink, a cold storage operation.
- Linfox, a transport, logistics and supply chain business.
- Nestle Purina Petcare, a pet food production plant.
- Cadia, a gold and copper mine (expanded upon in the Major customers analysis on page 18).

Figure 25: Blayney snapshot

7,358 People
2,989 Households

Source: DPE

Figure 26: Top 3 industries by business quantity



Source: ABS

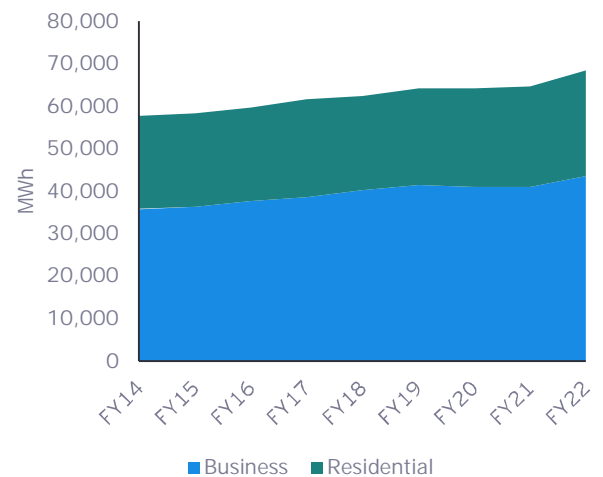
Electricity consumption

Total electricity consumption in Blayney has risen over the historical period, from 57,686 MWh in FY14 to 68,350 in FY22.¹⁵ The data in Figure 27 illustrates that both residential and business consumption growth have contributed to the increase in electricity usage over the last 9 years.

Business electricity usage rose significantly from 35,834 MWh to 43,570 MWh, a 21.6% increase. The increase is the highest growth in business electricity consumption across the entire Central NSW region. Data for Cadia mine was not available for the entire FY14-FY22 period, and has therefore been excluded from Figure 27. So this growth in business consumption is despite the additional demand from the Cadia mine. Business connections did increase over the time period, but not at a rate commensurate to consumption growth from businesses (2.2% CAGR increase in consumption, compared to 0.6% CAGR increase from connections).

Residential electricity usage also increased in Blayney, but at a faster rate than business consumption. Consumption in FY14 was 21,852 MWh, which grew by 13.4% to 24,781 MWh in FY22.

Figure 27: Blayney consumption FY14 - FY22



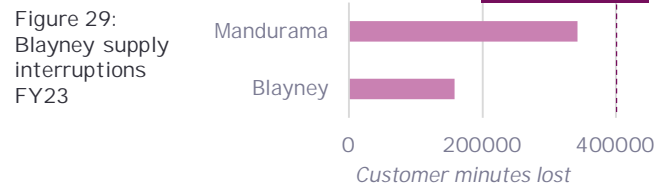
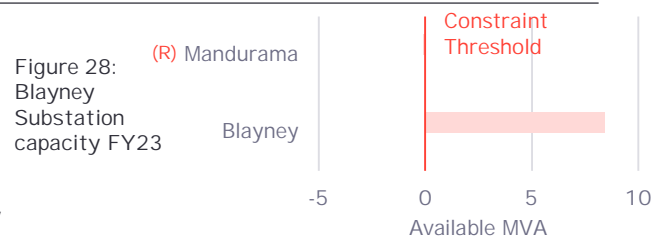
Note: Data excludes Cadia Mine as publicly available historical data is limited to that presented on Page 18. Source: Essential Energy

Network constraints

Blayney is located towards the east of the Central NSW region, therefore it has relative proximity to strong transmission infrastructure, with the DNSP's sub-transmission lines connected to the Transgrid network at Orange and Panorama.

One of the two substations in Blayney has been identified as experiencing current network constraints, exceeding rated capacity by 0.1 MVA under peak demand conditions.

During analysis of substation reliability, the Mandurama substation was identified as experiencing issues. The substation recorded approximately 342,000 minutes of supply interruption in FY23, above the Central NSW average of 241,069 minutes.



Source: EY analysis of Essential Energy data

15. Excluding consumption from Cadia mine, please refer to page 18



Cabonne overview

Cabonne had an estimated population of 13,970 in FY23 with 5,408 private dwellings. Population hubs include the towns of Molong and Canowindra.

Electricity intensive businesses in Cabonne include:

- Manildra flour mill and MSM milling, producing bakery products and vegetable oils.
 - In 2019, MSM Milling replaced their LPG boilers with a 5MW biomass fuelled boiler (see Gas to Renewables Assessment).
- Large-scale egg farms.

Figure 30: Cabonne snapshot

13,970 People
5,408 Households

Source: DPE

Figure 31: Top 3 industries by business quantity



Source: ABS

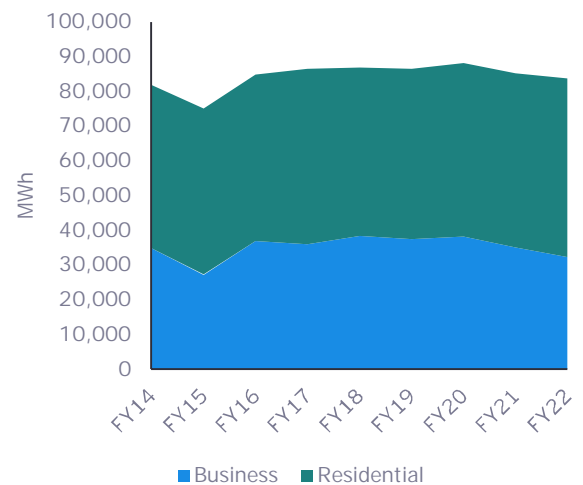
Electricity consumption

Electricity consumption in Cabonne has grown marginally over the nine year historical period, from 81,930 MWh in FY14 to 83,811 MWh in FY22. Growth over the period was primarily driven by residential usage.

Business electricity usage declined slightly over the 9 year window, starting at 34,996 MWh and dropping to 32,302 in FY22. This represented a decrease of 7.7%, which was less than the average Central NSW trend of a 11.6% decline.

Residential electricity consumption increased by 9.7% in Cabonne, from 46,935 MWh in FY14 to 51,509 MWh in FY22. Customer connections only grew 5.8% over the same period therefore growth was largely driven by increased consumption per connection. However, residential growth in consumption remained below the Central NSW average of 11.1% from FY14-FY22.

Figure 32: Cabonne consumption FY14 - FY22



Source: Essential Energy

Network constraints

Cabonne is in the central-north of the region with the distribution network there connected to Transgrid's 132kV network. Three of the four distribution substations in Cabonne have been assessed as constrained (refer Figure 33), meaning under peak demand conditions, there is no available capacity.

Analysis of reliability data indicates a more positive picture, as no substations in Cabonne appear to have issues with reliability. All substations have customer minutes with interrupted supply lower than that of the Central NSW average. However, data for Cumnock was not available (due to data collection gaps from the DNSP). The substation with the highest lost minutes in Cabonne is Canowindra with 241,330 minutes, which is close to the Central NSW average of 241,069 minutes.

Figure 33: Cabonne Substation capacity FY23

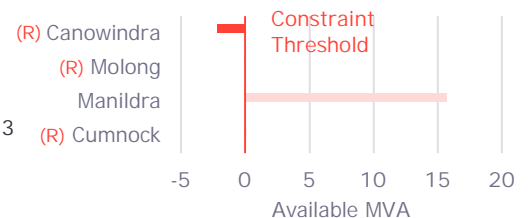
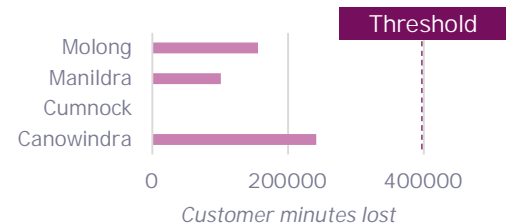


Figure 34: Cabonne supply interruptions FY23



Source: EY analysis of Essential Energy data

4 Central NSW Electricity Demand – Historic LGA Deep Dive



Cowra overview

Cowra had an estimated population of 13,013 in FY23 with 5,685 private dwellings. Large population hubs in the LGA include Cowra town and Woodstock.

Electricity intensive businesses in Cowra include:

- A materials recycling facility, this business required additional power but network constraints resulted in the facility installing a diesel generator to firm-up supply.
- Breakout River Meats, an abattoir in Cowra.

CLEAN Cowra Ltd has been noted as a regional community organisation which advocates for community-owned renewable energy. While not a major electricity customer in its own right, CLEAN is developing a model to empower communities to generate their own energy by converting their biomass waste into gas, fertilisers and fuels to support the transition.

Electricity consumption

Electricity consumption in Cowra has decreased slightly over the nine year historical period, from 78,242 MWh in FY14 to 75,562 MWh in FY22. Over the period, the change in consumption stemmed from residential consumption increasing and business consumption decreasing.

Business electricity usage declined over the period, starting at 39,113 MWh in FY14 and dropping to 33,989 in FY22. This represented a 13.1% decrease, which is greater than the average Central NSW trend for business consumption at 11.6% decline.

Over the same period, residential electricity consumption increased from 39,129 MWh to 41,573 MWh, reflecting a 6.2% increase. Customer connections only grew by 4.6% over the same period, therefore indicating growth in consumption was largely driven by increased number of customers. However, the net effect overall was a decline in consumption, due to the size of the decrease in business consumption.

Network constraints

Cowra is located to the south of the Central NSW region. The distribution network in this area connects to Transgrid’s 132kV transmission lines between Forbes and Yass.

The one substation in Cowra has been shown to have ample capacity based upon analysis, with 9.5 MVA available. However, consultation with the council noted current constraints in central Cowra, which may be a result of constraints on components of the network not analysed here (i.e. between the substation and end customer).

Analysis of reliability data also reflected some reliability issues, with customer minutes off-supply in FY23 being approximately 237,000, just under the average for Central NSW of 241,069. However, lost minutes has not risen to the level of the reliability threshold determined in for the purposes of this report.

Figure 35: Cowra snapshot

13,013 People
5,685 Households

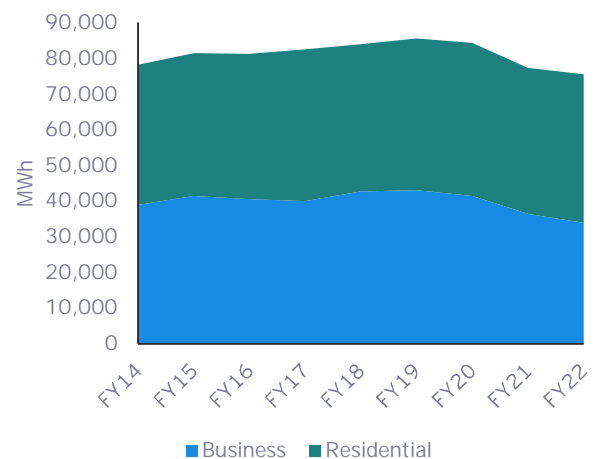
Source: DPE

Figure 36: Top 3 industries by business quantity



Source: ABS

Figure 37: Cowra consumption FY14 - FY22



Source: Essential Energy

Figure 38: Cowra Substation capacity FY23

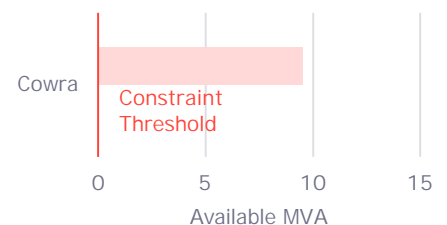
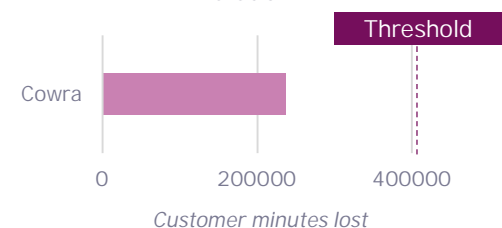


Figure 39: Cowra supply interruptions FY23



Source: EY analysis of Essential Energy data

4 Central NSW Electricity Demand – Historic LGA Deep Dive



Forbes overview

Forbes had an estimated population of 10,216 in FY23 with 4,167 private dwellings. The main population hub in the area is Forbes town.

Electricity intensive businesses include:

- John Deere.
- Massey Ferguson.
- New Holland.
- Moxey Farms, which utilises a 3MW biodigester to meet their own energy needs without reliance on the grid.

Figure 40: Forbes snapshot

10,216 People
4,126 Households

Source: DPE

Figure 41: Top 3 industries by business quantity



Source: ABS

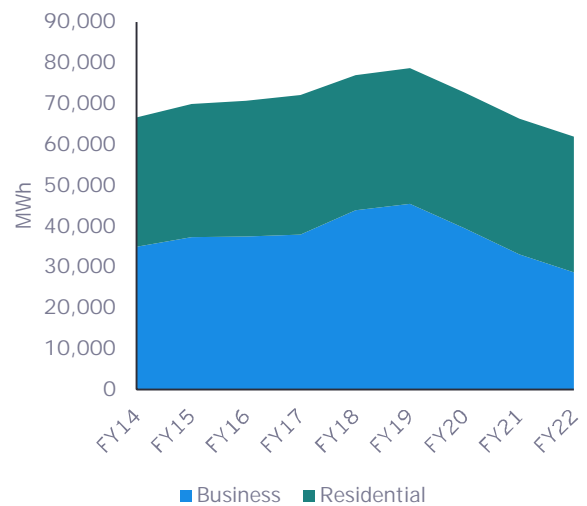
Electricity consumption

Consumption of electricity in Forbes has declined over the period, from 66,636 MWh in FY14 to 62,041 MWh in FY22. Over the period, the change in consumption was as a result of residential consumption increasing while business consumption decreased at a more rapid rate.

Business electricity usage declined over the period, starting at 34,925 MWh and dropping to 28,677 MWh in FY22. This represents a decrease of 17.8% from FY14-FY22 or 36.9% from the peak in FY19 (of 45,490 MWh) to FY22, substantially more rapid than the average Central NSW trend for business consumption, which was a 11.6% decline. There was a marginal increase in business customer connections over the period, so the decline may be as a result of increase behind-the-meter generation or improved energy efficiency.

Over the same period, residential electricity consumption increased from 31,711 MWh to 33,364 MWh, or a total of 5.2% growth. However, the net effect overall (when considering both business and residential customers) was a decline in consumption.

Figure 42: Forbes consumption FY14 - FY22



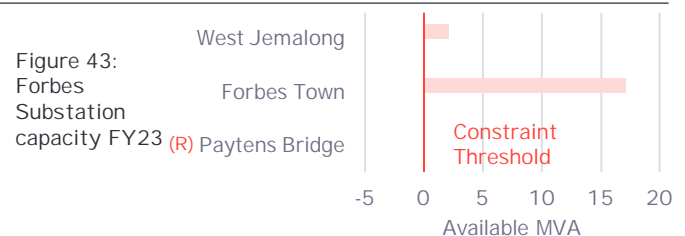
Source: Essential Energy

Network constraints

Forbes is in western Central NSW. The distribution network in this area is connected to the furthest western side of Transgrid's 132kV transmission lines between Parkes and Cowra.

Substation network constraints have been noted in one of the three substations in Forbes. Paytens Bridge appears to marginally exceed transformer rating at -0.01 MVA, under peak demand conditions.

Assessment of customer minutes off-supply did not reveal any substantive reliability issues, with only Paytens Bridge exceeding the Central NSW average customer minutes lost by approximately 10%.



Source: EY analysis of Essential Energy data



Lachlan overview

Lachlan had an estimated population of 5,941 in FY23 with 2,421 private dwellings. Large population hubs include Condobolin and Lake Cargelligo.

Electricity intensive businesses in Lachlan include:

- Maspro Engineering, designing and manufacturing of mining machinery.
- Durotank, manufacturing of bulk fuel storage tanks and fuel trailers.

Electricity consumption

Consumption of electricity from the grid in Lachlan has declined over the historical period, starting at 49,935 MWh in FY14 and dropping to 46,380 MWh in FY22. Over the period, residential growth remained steady, while business consumption decreased, while being subject to fluctuations.

Business electricity usage declined over the period, starting at 24,292 MWh in FY14, dropping to a low of 15,691 MWh in FY21, and rebounding to 19,255 MWh in FY22. The overall decrease was 20.7% from FY14-FY22, a faster decline than the average Central NSW trend for business consumption (which was a 11.6% decrease) which wasn't reflected in lower business customer connections which remained largely the same. The fluctuating trend could be attributed to the severe drought impacting business operations from FY17-FY21, an increase in behind-the-meter generation or improved energy efficiency.

Over the same period, residential electricity consumption increased from 25,643 MWh to 27,125 MWh, or a total growth of 5.8%. Residential consumption growth was just above that of customer connection growth at 4.2% from FY14-FY22, indicating that consumption per household has increased in recent years.

Network constraints

Lachlan is the most western of the Central NSW LGAs. The area is not serviced by any transmission infrastructure. Instead, lengthy distribution lines owned and operated by Essential Energy transport energy from the transmission line in Forbes to either the Lake Cargelligo or Condobolin substations. The two substations in Lachlan do not appear to have any constraint challenges, with ample available MVA. Any constraint issues experienced in Lachlan may be as a result of constraints with more granular components of the network not assessed here (between the substation and end customer). The analysis of reliability data reveals that Lachlan's substations have the two highest customer time interrupted from electricity supply in the entire Central NSW region, substantially above the average. Lake Cargelligo being the worse of the two with approximately 772,000 minutes lost; a tripling of the Central NSW average.

Figure 45: Lachlan snapshot

5,941
People

2,421
Households

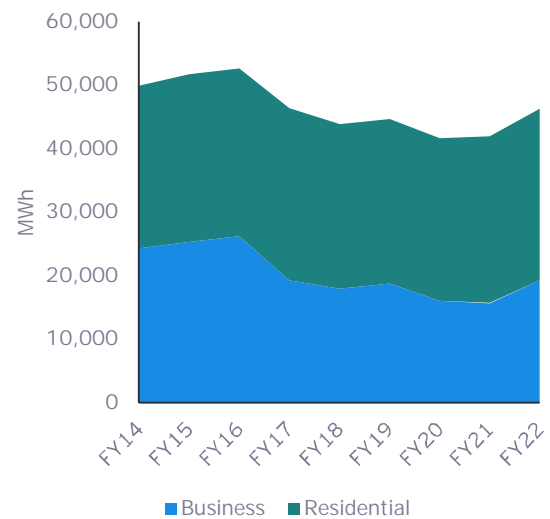
Source: DPE

Figure 46: Top 3 industries by business quantity

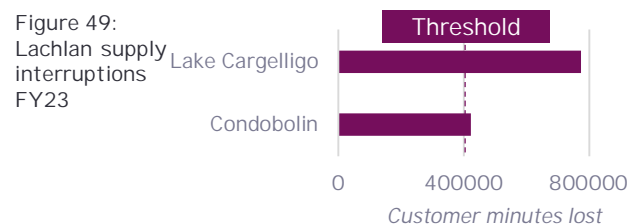
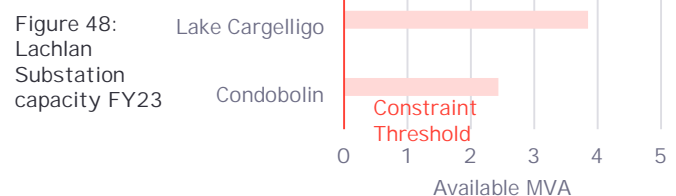


Source: ABS

Figure 47: Lachlan consumption FY14 - FY22



Source: Essential Energy



Source: EY analysis of Essential Energy data



4 Central NSW Electricity Demand – Historic LGA Deep Dive

Lithgow overview

Lithgow had an estimated population of 21,481 in FY23 with 9,297 private dwellings. Major population hubs in the region include the town of Lithgow, Bell, Bowenfels, Little Hartley, Marrangaroo, Portland and Rydal.

Electricity intensive businesses in Lithgow include:

- Several quarry and mining operations.
- The Ferrero confectionary factory.
- Defence manufacturing industries.

Figure 50: Lithgow snapshot

21,481
People

9,297
Households

Source: DPE

Figure 51: Top 3 industries by business quantity



Source: ABS

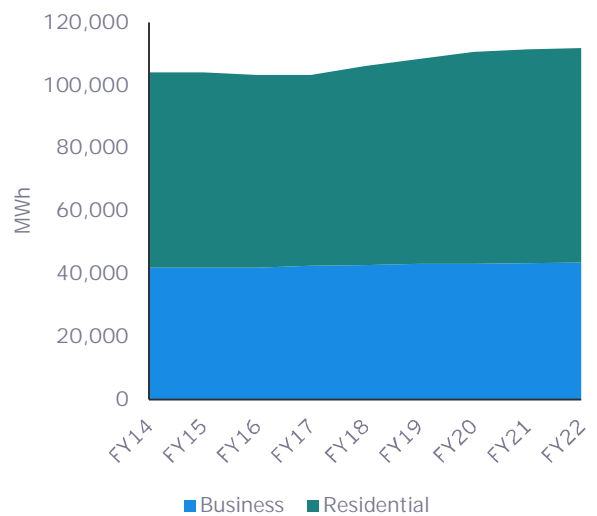
Electricity consumption

Electricity consumption in Lithgow has increased over the nine year period from FY14 to FY22 by a total 7.3%. In FY14 consumption was 104,178 MWh which increased to 111,930 MWh in FY22. Over the period, both residential and business usage has contributed to steady growth.

Business electricity usage has increased slowly since FY14, starting at 42,105 MWh in FY14 and increasing to 43,583 MWh in FY22. This equates to a business consumption growth rate of 3.7% over the period. This is higher than the broader Central NSW trend where business consumption fell by 11.6%.

Over the same period, residential electricity consumption increased by 10.0%, from 62,163 MWh in FY14 to 68,347 MWh in FY22. Residential consumption growth was approximately half that of the broader Central NSW trend in residential consumption growth rate, which was 20.1%. Residential consumption growth substantially outpaced estimated population growth, which was 0.1% over the FY14-FY22 period.

Figure 52: Lithgow consumption FY14 - FY22



Source: Endeavour Energy

Network constraints

Lithgow is the most eastern LGA of Central NSW. The area contains several transmission lines, including the large 500kV north-south lines that transport power along the NSW coastline.

None of the substations analysed in Lithgow presented network constraints under peak demand conditions.

Reliability data from the DNSP in Lithgow was unable to be presented in a comparable format.

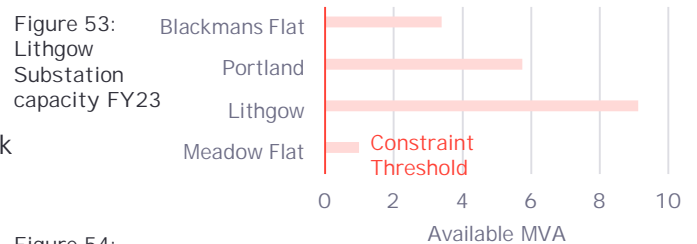


Figure 54: Lithgow supply interruptions FY23

Data not available

Source: EY analysis of Endeavour Energy data



Oberon overview

Oberon had an estimated population of 5,429 in FY23 with 2,264 private dwellings. The majority of the LGA population live in the town of Oberon.

Electricity intensive businesses in Oberon include:

- Borg manufacturing, a manufacturer of panels, laminates and custom doors. The facility has already made progress towards renewable energy transition with a large rooftop solar array.
- Forestry businesses.

Figure 55: Oberon snapshot

5,429 People
2,264 Households

Source: DPE

Figure 56: Top 3 industries by business quantity



Source: ABS

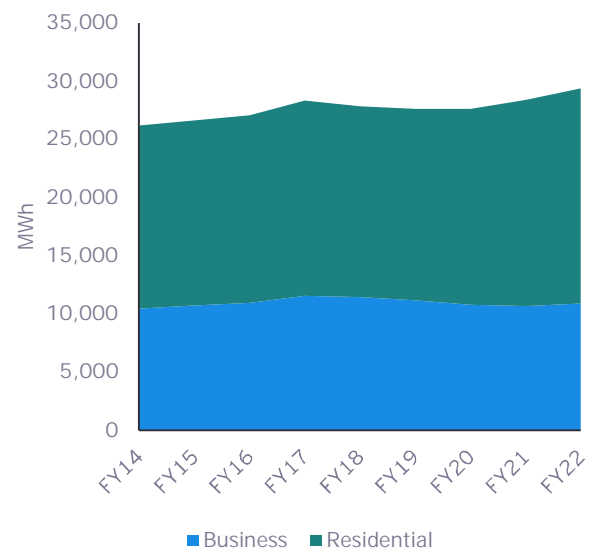
Electricity consumption

Electricity consumption in Oberon has increased over the nine year period from FY14 to FY22 by 12.1%. In FY14, consumption in Oberon was 26,231 MWh increasing to 29,400 MWh by FY22. Over this period, business consumption remained fairly steady, with growth being driven by residential customers.

Business electricity consumption increased minimally over the nine years from FY14 to FY22, starting at 10,443 MWh in FY14 and increasing to 10,874 MWh in FY22. This equates to a total growth from business consumption of 4.1% from FY14-FY22, potentially driven by the 7.9% increase in business customer connections. This is different to the general trend in the region, which overall reflected a 11.6% decline in business consumption over the same period.

From FY14 to FY22, residential electricity consumption grew substantially from 15,788 MWh in FY14 to 18,526 MWh in FY22, equating to a total growth rate of 17.3%. This significantly outpaced the broader trend across the region of a 11.1% increase in residential electricity consumption, and the increase in residential customer connections of 9.5%.

Figure 57: Oberon consumption FY14 - FY22



Source: Essential Energy

Network constraints

Oberon is located in the southeast of the Central NSW region. The proximity to Lithgow means the distribution network in the LGA has close access to transmission infrastructure, including the 500kV lines which traverse Oberon.

Based on the data analysed, there are no substations in Oberon experiencing significant network constraints. Burraga substation has the lowest capacity in the LGA, with 2.5 MVA available under peak demand conditions.

Reliability data was only available for one of the zone substations in Oberon (due to gaps in data provided by the DNSP), which revealed interruptions to electricity supply just above the Central NSW average.

Figure 58: Oberon Substation capacity FY23

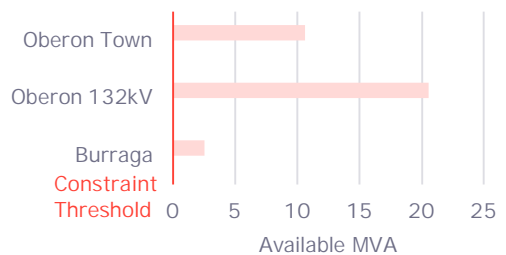
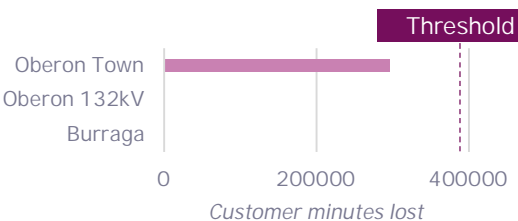


Figure 59: Oberon supply interruptions FY23



Source: EY analysis of Essential Energy data



Orange overview

Orange had an estimated population of 43,769 in FY23 with 17,775 private dwellings. The majority of the population lives in the town of Orange.

Electricity intensive businesses in Orange include:

- Charles Sturt University.
- Orange Hospital.
- NSW Department of Primary Industries.

Figure 60: Orange snapshot

43,769 People
17,775 Households

Source: DPE

Figure 61: Top 3 industries by business quantity



Source: ABS

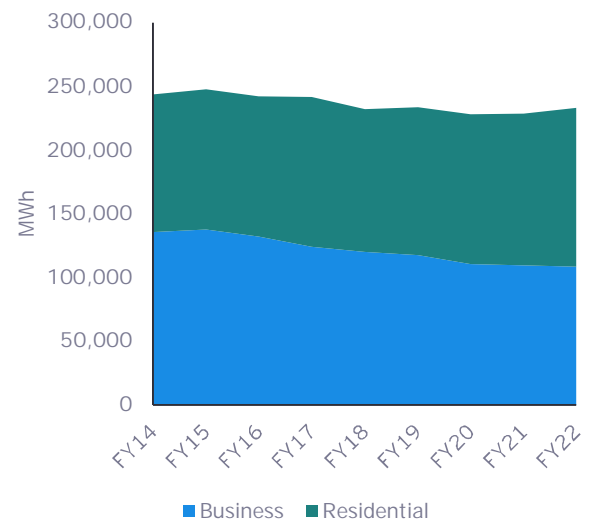
Electricity consumption

Electricity consumption in Orange has decreased by 4.5% over the nine year period from FY14 to FY22. At the start of FY14, consumption was 243,847 MWh falling to 232,921 MWh in FY22. Over this period, business consumption dropped considerably, with growth in residential consumption almost offsetting the decrease.

Business electricity usage in Orange decreased substantially over the period, from 135,765 MWh in FY14 to 108,586 MWh by FY22. The total decline in business consumption was 20.0%, double the pace of the broader Central NSW trend at 11.6% decline, and contrary to the 10.4% increase in business customer connections. This might be partially attributed to the closure of the Electrolux factory in 2016.

Residential electricity consumption grew significantly from 108,082 MWh in FY14 to 124,335 MWh in FY22, an increase of 15.0%. This outpaced the growth trend in Central NSW residential consumption of 11.1%, and new customer connections at 11.7%

Figure 62: Orange consumption FY14 - FY22



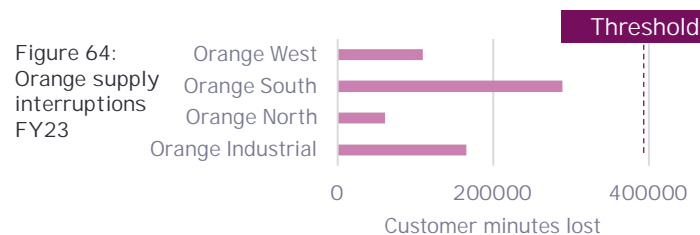
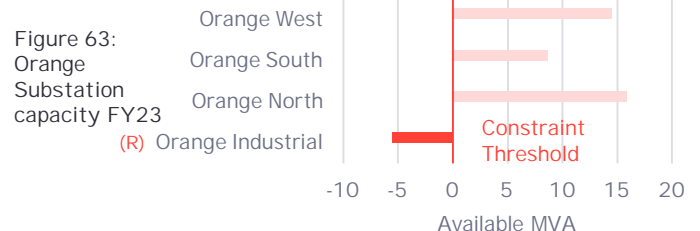
Source: Essential Energy

Network constraints

Orange is located in the middle of the Central NSW region. The distribution network in Orange has multiple connections to Transgrid's 132kV transmission lines.

One of the four substations in Orange (Orange Industrial) is constrained, exceeding the rated capacity of the substation by 5.5 MVA, under peak demand. Adjacent substations however do not appear to be similarly constrained, with the next most constrained substation at Orange South, with 8.7 MVA available.

None of the substations in Orange were categorised as having reliability issues, with only Orange South (288,861 mins) exceeding the Central NSW average in interrupted minutes (241,069 minutes).



Source: EY analysis of Essential Energy data



Parkes overview

Parkes had an estimated population of 14,612 in FY23 with 6,089 private dwellings. The majority of the population lives in the town of Parkes.

Electricity intensive businesses in Parkes include:

- Northparkes Mine, which has a private substation and isn't captured in data provided by Essential Energy.
- The Parkes Waste Facility.
- The Parkes SAP.

Figure 65: Parkes snapshot

14,612 *People* 6,089 *Households*

Source: DPE

Figure 66: Top 3 industries by business quantity



Source: ABS

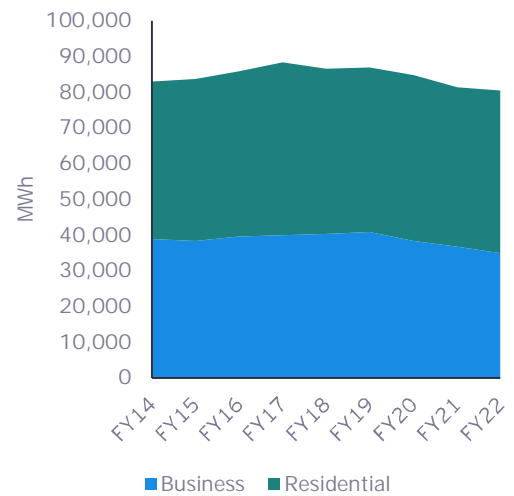
Electricity consumption

Electricity consumption in Parkes has marginally decreased by 3.0% over the nine year period from FY14 to FY22. Consumption in FY14 was 82,988 MWh falling to 80,488 MWh in FY22. Over the period, business consumption dropped slowly, with growth in residential consumption almost offsetting this decrease.

Business electricity consumption decreased over the period, with FY14 consumption at 38,888 MWh and falling to 34,980 MWh in FY22. Data for Northparkes Mine and Parkes SAP was not available over the historic period and has therefore been excluded from this analysis. The total decline in business consumption was 10.1% from FY14 to FY22, in line with the broader Central NSW trend of 11.6%. Business customer connections over the same period did not substantively change (growing 0.01%).

Over the FY14 to FY22 period, residential electricity consumption grew from 44,100 MWh in FY14 to 45,558 MWh in FY22, reflecting an increase of 3.3%. This is roughly a third the growth trend in Central NSW residential consumption of 11.1%. Residential customer connections increased more slowly compared to the Central NSW trend, which may account for the modest growth in comparison.

Figure 67: Parkes consumption FY14 - FY22



Note: Data excludes Northparkes Mine and the Parkes SAP as historical data is limited to that presented on Page 18. Source: Essential Energy

Network constraints

Parkes is located towards the western edge of the Central NSW region. The distribution network in Parkes connects with Transgrid's 132kV transmission line, which extends from Wellington to Forbes.

Of the three zone substations in Parkes, the one located at Trundle is categorised as constrained, with -2.8 MVA available under peak demand conditions.

No substations in Parkes were noted as having reliability issues, with Trundle and Parkes town being slightly above average in terms of lost customer minutes.

Figure 68: Parkes Substation capacity FY23

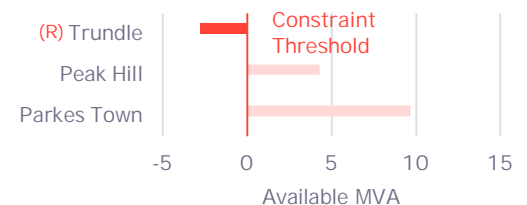


Figure 69: Parkes supply interruptions FY23



Source: EY analysis of Essential Energy data

4 Central NSW Electricity Demand – Historic LGA Deep Dive



LGA Deep Dive: Weddin

Weddin overview

Weddin had an estimated population of 3,602 in FY23 with 1,648 private dwellings. The majority of the population is concentrated in the town of Grenfell.

Electricity intensive operations include:

- Manufacturing businesses.

Figure 70: Weddin snapshot

3,602 *People* 1,648 *Households*

Source: DPE

Figure 71: Top 3 industries by business quantity



Source: ABS

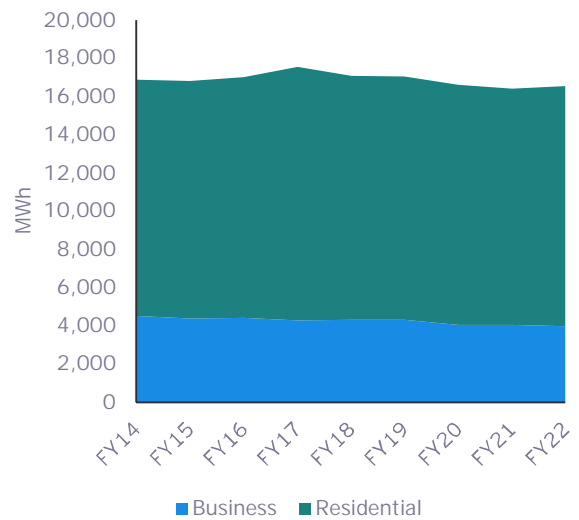
Electricity consumption

Electricity consumption in Weddin has marginally decreased by 2.0% over the nine year period from FY14 to FY22. In FY14 consumption was 16,901 MWh slightly declining to 16,566 MWh in FY22. Over the period, business consumption has fallen, with increases in residential consumption partially counteracting this decrease.

Business electricity consumption decreased over the period, from 4,529 MWh in FY14 to 3,984 MWh in FY22. This is a total decline in business consumption of 12.0% from FY14 to FY22, in line with the broader Central NSW trend of 11.6% decline. This was however contrary to the trend in business customer connections which grew by 4.4% over FY14 – FY22.

Over the FY14 to FY22 period, residential electricity consumption grew from 12,372 MWh in FY14 to 12,582 MWh in FY23, reflecting an increase of 1.7%, below that of the growth in residential customer connections at 4.3%. This is substantially below the growth trend in Central NSW residential consumption of 11.1%.

Figure 72: Weddin consumption FY14 - FY22



Source: Essential Energy

Network constraints

Weddin is located towards the southern edge of the Central NSW region. The distribution network in Weddin has no local connection points to Transgrid's transmission infrastructure.

Weddin has one zone substation which is deemed as constrained, with -1 MVA of capacity under peak demand conditions.

The same zone substation in Grenfell also appears to have reliability challenges, with approximately 429,000 minutes of interruptions to customer supply in FY23; the second highest in the Central NSW area.

Figure 73: Weddin Substation capacity FY23

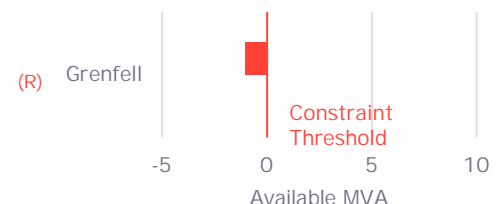
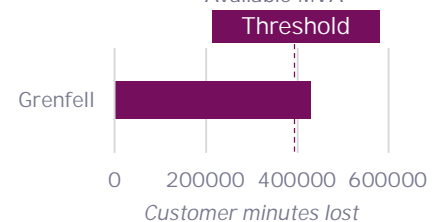


Figure 74: Weddin supply interruptions FY23



Source: EY analysis of Essential Energy data

5

Central NSW Electricity Demand - Forecast

Chapter overview

This chapter details the forecasts for electricity consumption across Central NSW. The forecasts span from FY23 to FY50 (inclusive). Further, this chapter includes:

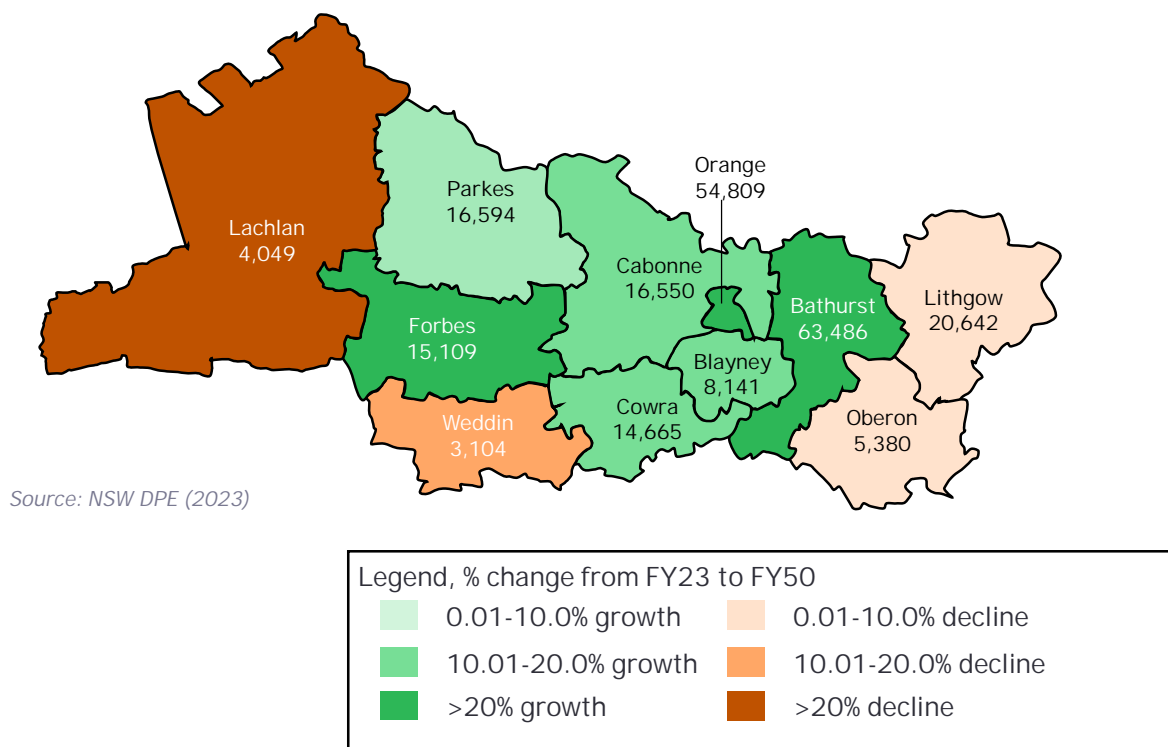
- Forecast growth in population and households.
- Forecast energy consumption broken into customer types and anticipated changes over the forecast period.
- Summary of expected drivers of consumption trends.
- An overview of forecast consumption from current and future major electricity customers in the region.

Overview of forecast population growth

The population of Central NSW is forecast to shift substantially over the coming 30 years. As illustrated below in Figure 75, the majority of the population growth is focused towards the middle of the region, with LGAs on the edges (Lachlan, Lithgow, Oberon and Weddin) forecast to experience declines.

The Central NSW population in FY23 is estimated to be 184,725, which will grow by 20.9% to an eventual total of 223,317. The fastest growth centres from FY23-FY50 are forecast to be Forbes (47.9% growth), Bathurst (41.7% growth) and Orange (25.2% growth).

Figure 75: Population forecast by council, FY50



Limitations of forecast population data

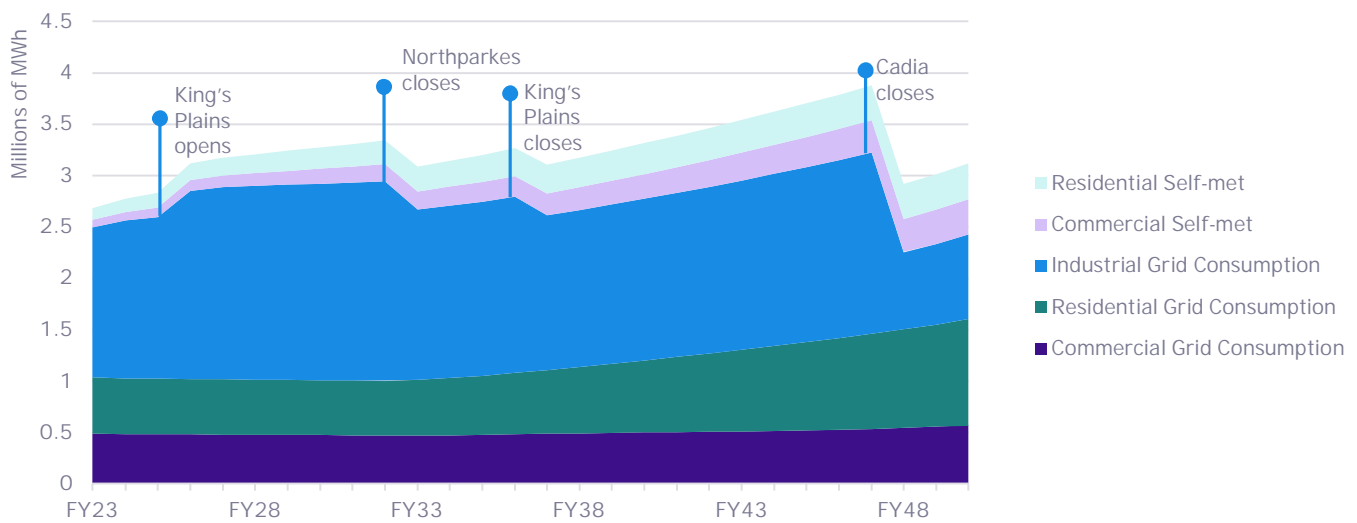
The population projections sourced from DPE are a set of Common Planning Assumptions, leveraged by the NSW Government to plan services and infrastructure. These assumptions have been utilised for the forecasts detailed within this report to align with other infrastructure proposals.

Consultation with CNSWJO and its' member councils have noted that there are limitations to the accuracy of the Common Planning Assumptions. For example, when comparing the projections with the latest census conducted in 2021, the current population of Blayney will not be reached until 2029 and Oberon will never reach its current population. Other councils have noted that the projections do not align with their experiences, considering demand for and growth in land prices. In the event the projected population is understated, this may too translate into forecasts that are also understated.

Forecast electricity consumption overview

Electricity consumption from the grid in Central NSW is expected to continue to increase until FY32 (at 2,946 GWh), as shown in the Figure below. After this point the region is forecast to experience a reduction in consumption due to Northparkes Mine closing, before increasing once again to a total consumption from the grid and self-met sources to a peak in FY47 (of 3,874 GWh). This pattern is expected to repeat with general population and business growth combined with electrification increasing electricity needs, but the closure of King’s Plains Mine and Cadia Mine reducing consumption creating a ‘saw-tooth’ trend with an overall slight increase in electricity consumption. The figure below highlights how sensitive the forecast profile is to the effect of major customers’ electricity consumption through the clear drops in consumption over the next 30 years.

Figure 76: Central NSW electricity consumption forecast



Source: EY analysis of DNSP and AEMO forecast data

The forecast in Figure 76 is based on information provided by the DNSPs, which have forecast to 2032, and this data has been supplemented with publicly available information on the electricity consumption of large industry businesses in the region (see page 36 for more information). Beyond 2032, trends used by the Australian Energy Market Operator (AEMO) for NSW have been applied to forecast consumption out to 2050. Considering the components of growth, the analysis indicates:

- Total residential electricity consumption is expected to increase from 663 GWh in FY23 to 740 GWh in FY30, before increasing to 1,385 GWh in FY50 (a CAGR of 2.7% from FY23-FY50). Consumption from the grid is expected to increase from 548 GWh in FY23 to 1,037 GWh in FY50 (a CAGR of 2.3%). Self-met consumption is expected to increase from 115 GWh to 348 GWh (a CAGR of 4.0%) primarily driven by increased rooftop solar PV generation.
- Commercial electricity consumption is expected to increase from 563 GWh in FY23 to 910 GWh in FY50 (a CAGR of 1.7%), with self-met consumption increasing from 75 GWh to 343 GWh (a CAGR of 5.6%) and consumption from the grid increasing from 488 GWh to 567 GWh (a CAGR of 0.5%).
- Industrial electricity consumption has no estimated self-met component as publicly available information either made no mention of, or confirmed the absence of, ‘behind-the-meter’ generation infrastructure. Consumption in FY23 is estimated at 1,458 GWh, growing to a peak of 1,944 GWh in FY32 (a CAGR of 2.9% from FY23-FY32), and continuing to an eventual total of 822 GWh in FY50 (a CAGR of -2.0% from FY23-FY50).

There are multiple limitations to the above forecast, including but not limited to:

- The consumption profiles and closure dates for mines are likely to change over the forecast period.
- No consideration has been given to the impact of climate events on consumption, which are difficult to predict.
- Unforeseen future policy settings may substantially influence the pace and scale of electrification and self-met consumption.

Forecast electricity consumption overview

Figure 77 below illustrates the various sources of electricity consumption growth in Central NSW over the forecast period. It is based upon AEMO’s modelled assumptions for the NSW electricity market.¹⁶ The components of Figure 77 are defined as:

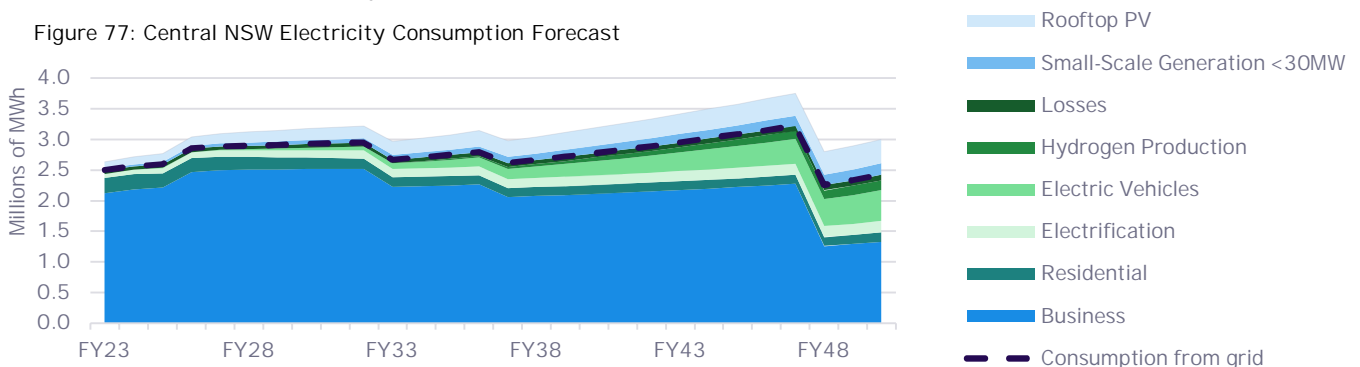
- ‘Demand from grid’ refers to electricity consumption that is met through the generators connected to the National Electricity Market (NEM), including but not limited to sites such as coal-fired power stations, mid-scale renewable generators, rooftop solar PV that is sold back to the grid.
- ‘Losses’ refer to the electricity that is lost during transport along transmission and distribution networks between generators and the end customer.
- ‘Hydrogen production’ is any electricity consumption associated with the processing of hydrogen.
- ‘Electric Vehicles’ is the energy consumption used to charge electric vehicles (EVs).
- ‘Electrification’ is the additional electricity consumption associated with other technologies transitioning off fossil fuel, gas or other fuel sources in favour of electrified means, including for example household appliances.
- ‘Residential’ and ‘Business’ refers to all other consumption, excluding the aforementioned sources. For example residential consumption driven by EVs is accounted for in the ‘Electric Vehicles’ category.

Figure 77 further covers two sources of ‘behind-the-meter’ or ‘self-met’ consumption.

- ‘Rooftop PV’ refers to consumption met by rooftop solar PV arrays less than 100kW; and
- ‘Small-Scale Generation’ refers to any other generator not scheduled or dispatched by AEMO with a rating less than 30MW.

Three key trends of note are expected to shape the forecast electricity consumption out to FY50:

1. The continued uptake in ‘behind-the-meter’ generation from residential and commercial customers will continue to become more prominent, and slow the rate of growth in consumption served by the grid (expanded upon on page 39).
2. The continued implementation of supportive policies will drive the adoption of EVs in Australia, and the transition away from gas towards electrified equipment and appliances (expanded upon on page 39).
3. The consumption trends of major industrial customers.



The peak of Central NSW’s total electricity consumption (both from the grid and self-generated) is expected to occur in FY47 (3,874 GWh), however, only 83.2% of this is expected to be drawn from the grid, with the remainder being supplied by rooftop solar PV or small-scale renewable generation. The peak of Central NSW’s consumption from the grid is also expected to occur in FY47, at 3,225 GWh. This equates to 3.8% of NSW’s total consumption from the grid, whereas only 2.2% of NSW households are forecast to be within Central NSW. Consumption from the grid is expected to decline to a low of 2,255 GWh in FY48, as the last of the mine sites included in the analysis is forecast to close by the end of FY47. By FY50, demand from the grid is expected to rise again to 2,425 GWh, comprised of 33.9% from the Parkes SAP and the remainder from other sources.

To better understand the regions’ expected electricity consumption, the following pages present consumption separately for the largest industrial customers (i.e. key mines and precincts) and all other customers (including residents and other commercial customers). This is to illustrate the broad drivers affecting residential and commercial consumption over the forecast period, which structurally differs from the drivers affecting the mining sector and Parkes SAP in Central NSW.

16. AEMO, 2022 Integrated System Plan

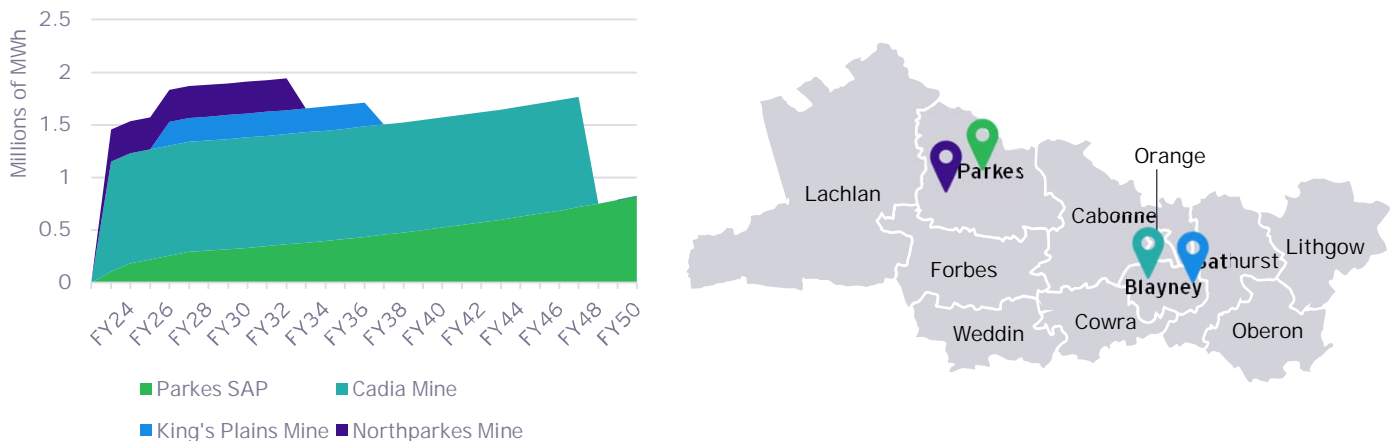
Forecast industrial electricity consumption overview

Forecast consumption from industrial customers in the region is expected to continue to be the dominant driver of consumption growth, with a peak of industrial consumption forecast in FY32 of 1,944 GWh.

Electricity consumption for major customers has been estimated using publicly available information, as DNSPs are bound by confidentiality restrictions and cannot disclose electricity consumption of any one customer. The electricity consumption of mining operations has been estimated based upon annual reports and other public information where available and it has been assumed that consumption is unlikely to substantially change over the life of the mine. Forecast growth profiles for the Parkes SAP have been provided by RGDC, based upon consultation with prospective SAP investors and their own growth assumptions.

A summary of consumption from each of the large industrial customers in Central NSW is illustrated in Figure 78, supplemented by additional detail below. The map on the right hand side of Figure 78 shows the location of the industrial customers analysed here. The large customers assessed here as well as any future expected mine sites will likely connect to their own substation and associated infrastructure linked to the transmission network. As such, large customers are unlikely to impact capacity analysis presented in section 6.

Figure 78: Forecast consumption from major industrial customers in Central NSW



Sources: Newcrest Mining, Energylink Services, Regis Resources, RGDC

Newcrest's Cadia Mine

As illustrated in Figure 17 on page 18, Cadia Mine's historic electricity consumption has remained fairly stable. To estimate future consumption of the mine, the FY22 electricity consumption figure of 1,049 GWh has been extrapolated out over the life of the mine. The FY22 figure used for forecasting is only a 1% variation from the five year average historical consumption.¹⁷ Cadia Mine is forecast to be operational until FY47, in alignment with available projections.¹⁸ From FY25, it is assumed that Cadia Mine will purchase 40% of their electricity through a Power Purchase Agreement from Rye Park Wind Farm, which does not impact their grid-sourced consumption.¹⁹

CMOC's Northparkes Mine

Goonumbla Northparkes Mine is expected to be operational until FY32, with electricity consumption estimates out to 2025 sourced from public documentation, and then expected to continue for the life of the mine with a yearly estimated consumption of 304 GWh.²⁰

Regis Resources' King's Plains Mine (McPhillamy's Gold Project)

McPhillamy's Mine reaches a Final Investment Decision (FID) in the next year and is expected to become operational in FY26. According to available information, the average demand of the mine is estimated to be 26 MW, which totals an annual consumption of approximately 225 GWh of electricity sourced the grid.²¹

17. Newcrest Mining, 'Cadia Valley Operations AEMR 2021-22'

18. S&P Global

19. Newcrest Mining, 'Newcrest signs renewable energy PPA to help deliver 20% reduction in greenhouse gas emissions'

20. Energylink Services, 'NorthParkes Mine – Electricity Contract RFI'

21. Regis Resources, 'McPhillamys Gold Project – Environmental review of proposed power supply to the mine development and pipeline development'

36 | Demand Report – Appendix to Nexus between energy security and emissions reduction Business Case

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Forecast industrial electricity consumption overview

Parkes SAP

Based on guidance from RGDC NSW, the Parkes SAP is operational and connected to the distribution network, with a future connection to the transmission network indicated as likely. Electricity consumption is anticipated to be 105 GWh in FY23 continuing to grow to 821 GWh in FY50.²² The SAP is the only industrial customer with forecast growth as businesses continue to invest and set-up operations there. RGDC has noted that the SAP is a strong candidate for an embedded network and are in the process of developing a business case to gain approval for procurement of an embedded network operator.

Out of scope

Other mines have been considered out-of-scope for this report, as they have not received development approval at this stage.²³ Further, Sunrise Mine has been deemed out of scope in spite of development approval, as there is no committed or estimated date for the commencement of operations until funding can be secured.²⁴ As such, the above total industrial consumption could be considered as a lower bound given the possibility for additional industrial customers or mines to commence operations in the region in the future.

22. Based on data provided by RGDC

23. Department of Planning and Environment, 'Planning Portal', <https://www.planningportal.nsw.gov.au/map>

24. Sunrise Energy Metals, 'Media Release', <https://wcsecure.weblink.com.au/pdf/SRL/02636487.pdf>

Forecast electricity consumption (excluding industrial customers)

Electricity consumption from both the grid and self-met sources (i.e. behind-the-meter generation, like rooftop solar PV) is expected to increase marginally from around 1,226 GWh in FY23 to around 1,396 GWh in FY32, a 1.3% CAGR (inclusive of commercial and residential customers). Over the same period, this consumption growth slightly outpaces forecast population growth at 0.7% CAGR. Both residential and commercial consumption is then expected to grow at a faster pace between FY32 and FY50, to approximately 2,295 GWh in FY50, reflecting a 2.7% CAGR. Over those 19 years, electricity consumption is expected to substantially outpace population growth at 0.6% CAGR indicating total electricity consumption per capita is expected to increase.

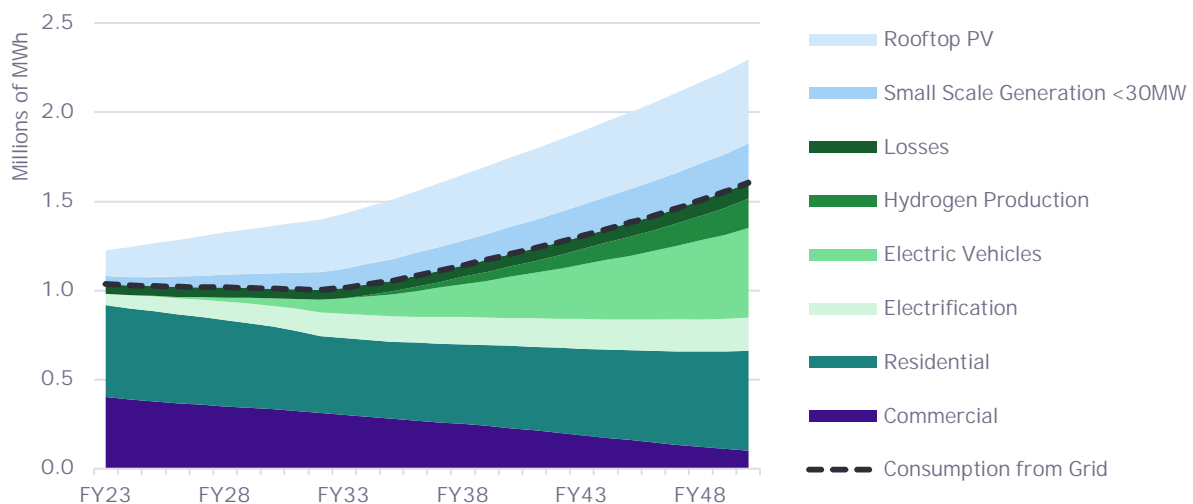
Figure 79 below illustrates the different components that influence consumption growth. It shows that while overall consumption from commercial and residential customers rises, consumption from the grid is forecast to decline slightly over the first nine years of the forecast period due to the expected growth in rooftop solar PV.²⁵ Electricity consumption from the grid in FY23 is estimated to as 1,035 GWh, which declines to 1,002 GWh.

As previously noted, the key drivers of consumption growth are the increase in self-met consumption from behind-the-meter generation, and the forecast uptake of electrified transport, appliances and equipment.²⁴

EVs and general electrification will increase the consumption from the grid over the forecast period. Though both are significant influences on future consumption, EV related consumption is forecast to grow at 27.1% CAGR, while electrification is forecast to grow at 3.9% CAGR. The two growth drivers impact customers to differing extents, as general electrification is expected to predominantly arise from commercial customers (78.6% of all electrification is commercial related by FY50), and EVs will largely impact residential consumption (81.2% of EV consumption is expected to be residential by FY50).²⁶

The other substantial influences on future consumption from the grid will be the proportion of consumption that is self-met from rooftop solar PV and small scale generation. Self-met generation is anticipated to grow from 15.5% of total electricity consumption (FY23), to an eventual total of 30.1% (FY50).

Figure 79: Central NSW Electricity Consumption Forecast (excluding industrial customers)



Source: EY analysis of DNSP and AEMO data

25. AEMO, '2022 Integrated System Plan'

26. EY analysis of CSIRO forecasts, 'Detailed electric vehicle databook', <https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp/2022-isp-inputs-assumptions-and-scenarios>

6

Central NSW Electricity
Demand - Forecast LGA
Deep Dive

6 Central NSW Electricity Demand – Forecast LGA Deep Dive

Chapter Overview

This chapter details the forecasts for electricity consumption in Central NSW across each of the LGAs. The forecasts span from FY23 to FY50 (inclusive). Further, this chapter includes:

- Summary of relevant future considerations summarised from councils consultations.
- The forecast growth of population and households in the LGA.
- Forecast electricity consumption from the grid for each LGA, split by business and residential customers.
- Forecast electricity consumption that will be 'self-met' for each LGA, split by business and residential customers.
- Forecast network constraint analysis for each zone substation in the LGA.



Bathurst overview

Bathurst Regional Council was consulted on 29 June 2023 to understand the council’s views on current energy constraints, priorities, and their plans for the future. Key insights informing the forecast included:

- A key challenge for the council is future-proofing electricity supply to enable Bathurst to grow and cater for a growing population.
- Timelines indicated by the DNSP for distribution network augmentations are considered lengthy by the council and a key obstacle for precinct development.
- Future business development in Bathurst is expected to be diverse, and includes a planned gateway business park.
- The council has planned for numerous residential developments, including a forthcoming subdivision in Laffing Waters for 2,270 lots.

Figure 80: FY50 Bathurst snapshot

63,486
People ▲ 41.7% increase from FY23

25,361
Households ▲ 45.6% increase from FY23

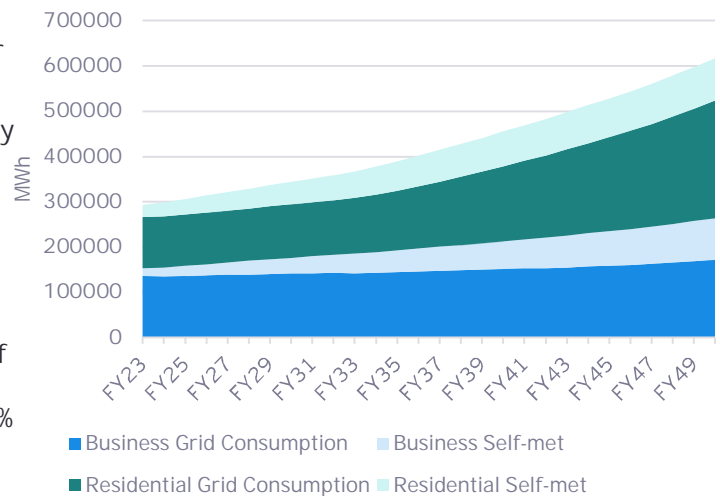
Source: DPE

Electricity consumption

Bathurst is forecast to have the largest population in Central NSW, growing by 1.2% per year. Total electricity consumption is expected to grow commensurately, from 293,183 MWh in FY23 to 616,825 MWh in FY50 (2.7% per year or 110.4% total).

Consumption from businesses is expected to grow modestly (2.0% per year), while consumption from residential customers is expected to increase comparatively faster (3.4% per year). Residential consumption is likely to increase due to the concurrent effects of the general electrification of appliances and growth of EVs in the long-term, as well as the expectation of a growing population base requiring new residential developments. As a result of this residential growth, Bathurst is forecast to experience the greatest consumption growth in Central NSW of 110.4% from FY23 to FY50.

Figure 81: Bathurst forecast consumption



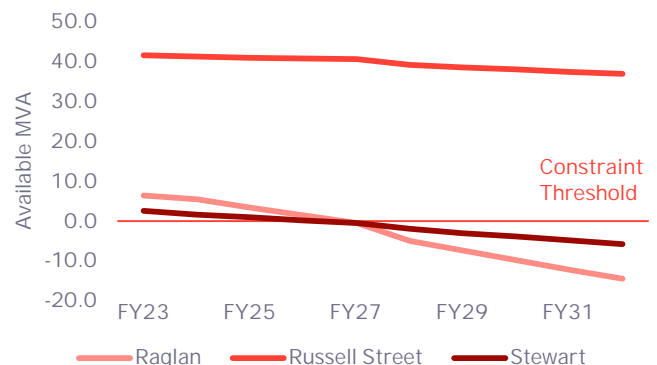
Source: EY analysis of DNSP and AEMO data

Network constraints

Bathurst has three distribution zone substations. In the near term, no substations are forecast to become constrained with more than 5 MVA available capacity at each substation.

Raglan substation is forecast to develop constraints in future due to the connection of the Laffing Waters development. Under peak demand conditions, Raglan substation is expected to exceed capacity rating in FY27 and become constrained. Similarly, based on current trend analysis, Stewart substation is also forecast to become constrained in FY27. Though Raglan is expected to decline at a faster rate due to the forecast demand from the new development, which will total a peak demand of 11 MVA once fully occupied.²⁷

Figure 82: Forecast Bathurst Substation capacity



Source: EY analysis of DNSP and AEMO data

27. Delta Star Designs, 'Laffing Waters Precinct Master Plan'



Blayney overview

Blayney Shire Council was consulted on 19 July 2023 to understand the council's views on current energy constraints, priorities, and their plans for the future. Some of the key insights informing the forecast include:

- Affordability is an issue, with the council seeing an increase in costs.
- Council has some solar PV projects and are looking at battery options.
- The council suggested there are opportunities for improvement with respect to interactions with the DNSP to facilitate regional growth.
- McPhillamy's (King's Plains) Mine is likely to achieve a FID in the next few years, and it is council's view that it will likely extend beyond its stated 11-year life.

Figure 83: FY50 Blayney snapshot

8,173
People ▲ 11.1% increase from FY23

3,335
Households ▲ 11.6% increase from FY23

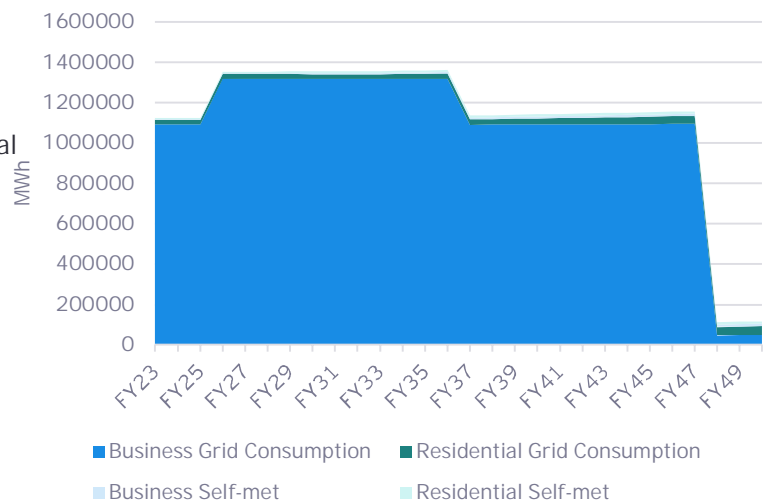
Source: DPE

Electricity consumption

Blayney's forecast is dominated by electricity intensive industries. Two mining operations are included in the forecast, Cadia Mine and the additional future King's Plains Mine. Consumption in FY23 starts at 1,124,609 MWh, and eventually falls to 117,438 MWh in FY50, once the mines close operations based on current projections (7.8% annual decline).

Business grid electricity consumption peaks in FY36 at 1,318,997 MWh, however it is worth noting that this forecast is sensitive to the currently stated 11-year life of King's Plains Mine, which is expected to close in FY36. If new deposits are found, or extensions granted to the mine's licence, the consumption peak would likely shift further into the future. Residential consumption is forecast to grow 2.4% annually (92.4% total), above the 0.4% population growth rate.

Figure 84: Blayney forecast consumption



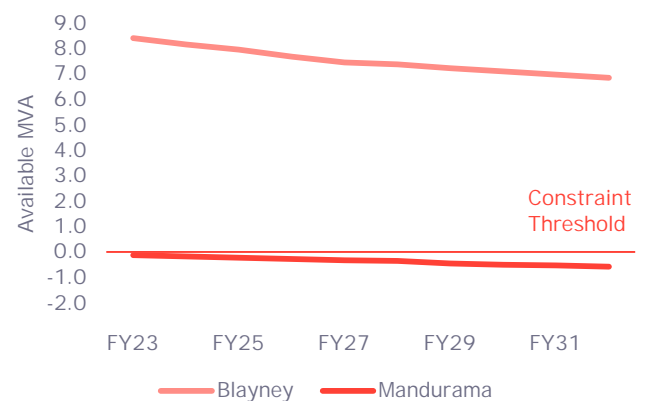
Source: EY analysis of DNSP and AEMO data, Note: Forecast includes Cadia Mine and King's Plains Mine

Network constraints

There are two zone substations in Blayney. Mandurama substation has been identified as currently experiencing constraints, with -0.1 MVA of available capacity under peak demand. This capacity issue is expected to continue deteriorating gradually over the long-term without intervention. Blayney substation is more likely to decline in capacity more rapidly as a result of increased power exporting from behind-the-meter generation back to the grid to supply other consumption. Exports utilise substation capacity in addition to electricity generated from utility-scale infrastructure.

The two major industrial customers identified above do not have any impact on local zone substation capacity, as they currently, or are forecast to, operate private substations connected to the transmission network.

Figure 85: Forecast Blayney Substation capacity



Source: EY analysis of DNSP and AEMO data



Cabonne overview

Cabonne Council was consulted on 7 July 2023 to understand the council's views on current energy constraints, priorities, and their plans for the future. Some of the key insights that informed the forecast include:

- Molong has grid capacity for ultra-fast EV charging.
- Molong planning proposal for 700 residential lots over 20 years.
- There is some community opposition to solar farms.
- Some groups of farms and villages want a community-based approach where the area is off the grid.
- The DNSP has determined infrastructure expenditure on upgrades would not meet regulatory test thresholds.
- An inhibitor to providing affordable housing is cost-effective power connections.

Figure 86: FY50 Cabonne snapshot

16,550
People ▲ 18.5% increase from FY23

6,730
Households ▲ 24.4% increase from FY23

Source: DPE

Electricity consumption

Cabonne total electricity consumption is forecast to grow from 95,060 MWh in FY23 to 170,415 MWh in FY50 (2.1% CAGR). The majority of Cabonne's electricity consumption is expected to be from residential customers.

Residential consumption from the grid is forecast to decline slightly until FY32, in alignment with the broader forecast trend in NSW, as more customers meet their electricity needs with solar PV and other small generators. Residential consumption is then forecast to grow substantially, from FY32 to FY50, due to the impacts of EV adoption and electrification of appliances, a 2.4% CAGR from FY23-FY50.

Business consumption growth will be primarily served through self-met means (growing at 5.5% CAGR) as consumption from the grid grows at 0.3% CAGR, resulting in total business growth of 1.6% CAGR.

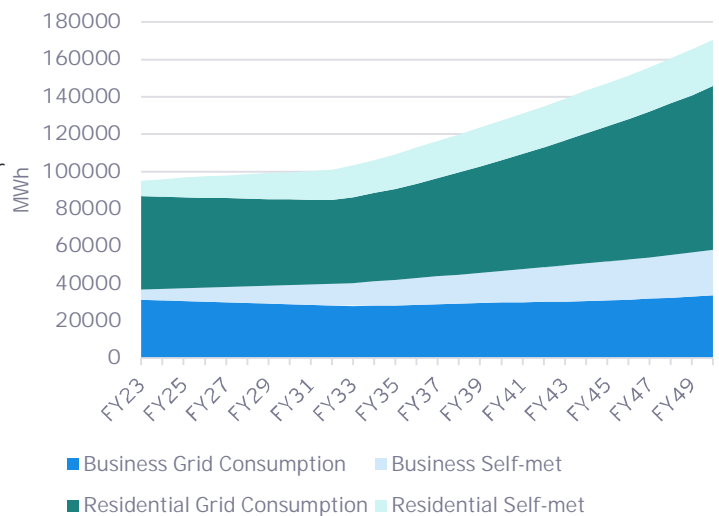
Network constraints

There are four zone substations across Cabonne, three of which are currently constrained.

Manildra substation has the most capacity in the LGA, which is not expected to vary over the forecast period. All other substations are deemed constrained. Canowindra substation is forecast to have the most substantial constraints, continuing to decline to -3.5 MVA (FY32) of available capacity under peak demand conditions.

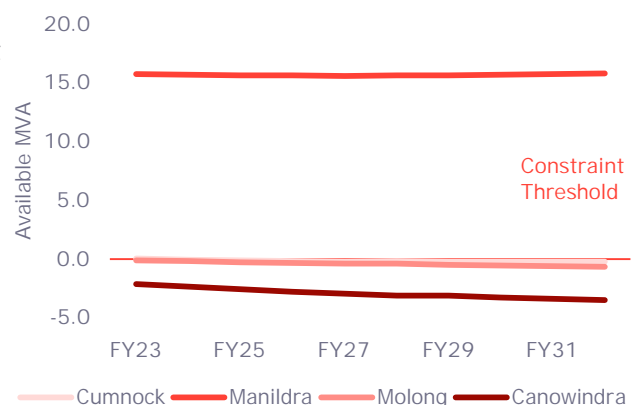
Conditions at Molong and Cumnock substations are also forecast to continue to decline and become more constrained over the forecast period, without remedial action being taken.

Figure 87: Cabonne forecast consumption



Source: EY analysis of DNSP and AEMO data

Figure 88: Forecast Cabonne Substation capacity



Source: EY analysis of DNSP and AEMO data

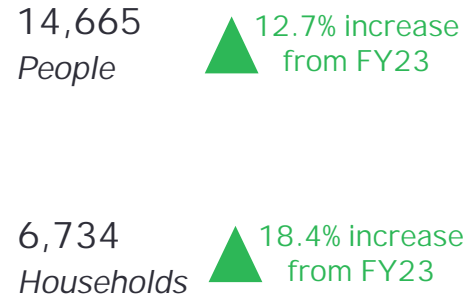


Cowra overview

Cowra Council was consulted on 12 July 2023 to understand the council’s views on current energy constraints, priorities, and their plans for the future. Some of the key insights that informed our analysis include:

- Organic industry growth is constrained because the council has been informed of electricity network infrastructure constraints, with the transformer upgrade already inhibiting growth of a local recycling facility.
- Power costs are reducing the competitiveness of Cowra in attracting business investment.
- Existing businesses have turned to diesel generators due to network constraints, although no quantitative data was available to support this.

Figure 89: FY50 Cowra snapshot



Source: DPE

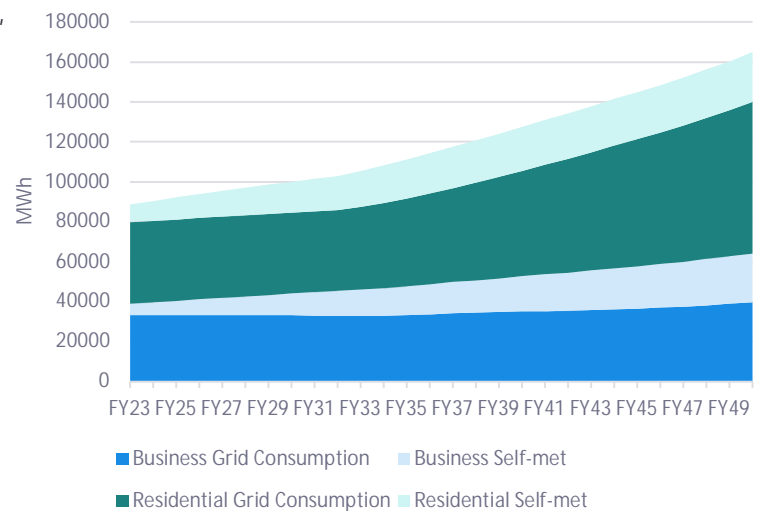
Electricity consumption

Cowra electricity consumption from the grid is forecast to remain generally flat over the short to medium-term, accelerating in growth over the longer-term. Consumption in FY23 is estimated to be 88,572 MWh, which then increases to 164,761 MWh in FY50 (a 2.2% CAGR). This would outpace forecast population growth at 0.4% CAGR.

Growth in residential consumption is strong, when compared to other LGAs, at 2.6% CAGR over the forecast period. This is in spite of forecast residential customer connection growth being lower than other LGAs in the Central NSW region. This is due to the trend in increased consumption per residential connection.

Business consumption is forecast to grow by 1.8% CAGR to FY50, outpacing overall business growth of -0.6% due to the forecast closure of industrial sites.

Figure 90: Cowra forecast consumption



Source: EY analysis of DNSP and AEMO data

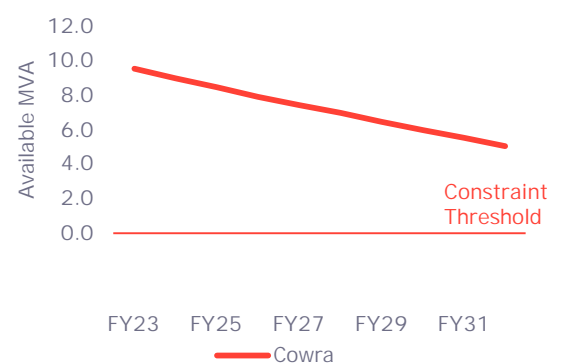
Network constraints

There is one zone substation in Cowra, which has no apparent capacity challenges at present, based on the data provided by the DNSP.

The substation capacity is expected to decline by 4.7% from 9.5 MVA in FY23 to 5.1 MVA in FY32. It is not forecast to become constrained for the remainder of the forecast period, in spite of expected growth in electricity consumption and population.

In consultation, Cowra Council noted that current network constraints is inhibiting growth and business operations. This is not evident in the data at the distribution zone substation level but may be as a result of either network constraints at a more granular level of the network, between the zone substation and the customer connection point, or due to the size of proposed developments and its required capacity (such as for EV fast-chargers) – information which has not been available for analysis.

Figure 91: Forecast Cowra Substation capacity



Source: EY analysis of DNSP and AEMO data



Forbes overview

Forbes Shire Council was consulted on 4 July 2023 to understand the council’s views on current energy constraints, priorities, and their plans for the future. Some of the key insights that informed our analysis included:

- The council did not note any current energy constraints, but is concerned about future proofing energy supply.
- Council also noted there is greater opportunity to collaborate with DNSPs to facilitate growth ambitions.
- High electricity demand is expected from agricultural machinery manufacturers.
- Rising costs of electricity and energy are at the front of the community’s mind.
- Successive severe flooding events have impacted the community and access to electricity.

Figure 92: FY50 Forbes snapshot

15,109
People ▲ 47.9% increase from FY23

6,525
Households ▲ 56.6% increase from FY23

Source: DPE

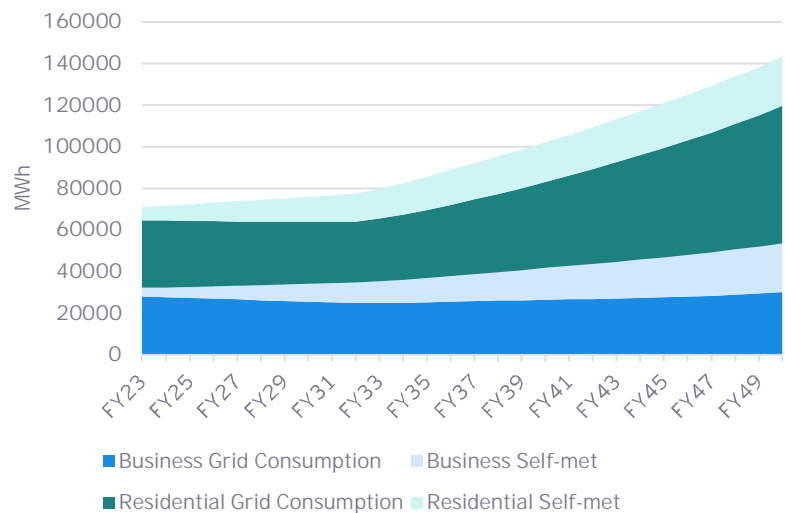
Electricity consumption

Total Forbes electricity consumption is forecast to grow approximately by 2.5% CAGR over the forecast period, in alignment with the Central NSW average CAGR over the period of 2.4%. This represents growth from 71,142 MWh in FY23 to 143,343 MWh by FY50. The consumption growth exceeds that of population growth in the area at 1.4% CAGR.

The key driver of the higher growth rate will be increases in households in the area, likely as a result of investments in employment precincts (such as Parkes SAP), that neighbour Forbes. Consequently, over the forecast period residential consumption is expected to grow by 3.0% CAGR, as illustrated in Figure 93.

Business electricity consumption growth will be slower than that of residential, at 1.8% CAGR.

Figure 93: Forbes Forecast Consumption



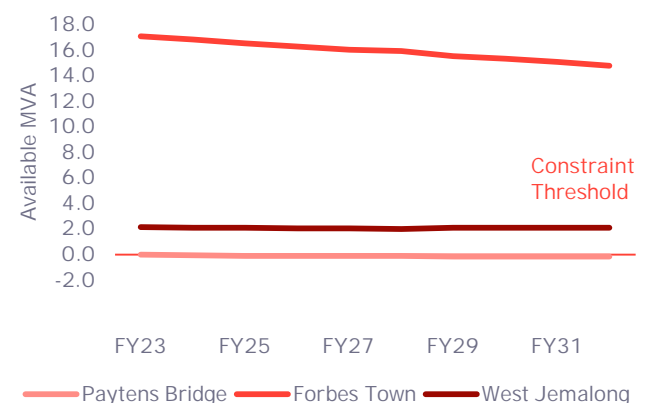
Source: EY analysis of DNSP and AEMO data

Network constraints

There are three zone substations in Forbes. One of which (Paytens Bridge) is experiencing current constraints. This is expected to remain the case over the forecast period without intervention.

The capacity at Forbes town substation is anticipated to decline the most in absolute terms, due to the increase in exports from behind-the-meter sources which utilise transformer capacity. Under peak demand conditions, available capacity declines from 17.1 MVA in FY23 to 14.8 MVA in FY32 but is not anticipated to reach the constraint threshold.

Figure 94: Forecast Forbes Substation capacity



Source: EY analysis of DNSP and AEMO data

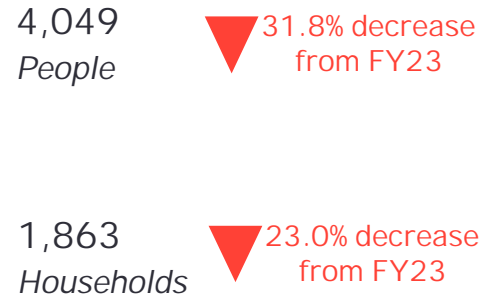


Lachlan overview

Lachlan Shire Council was consulted on 6 July 2023 to understand the council’s views on current energy constraints, priorities, and their plans for the future. Key insights that informed our analysis include:

- That council has been informed that electricity network requires expensive augmentation to accommodate new business, making the region uncompetitive.
- There are weather-induced brown-outs that present issues for the residential and business sectors.
- Manufacturers have introduced back-up power in their operations to address electricity constraints.
- Consumption growth is expected due to expansions of current mines and the likelihood of Sunrise Mine in the future.
- Funding constraints of the council limit their options to introduce DER.

Figure 95: FY50 Lachlan snapshot



Source: DPE

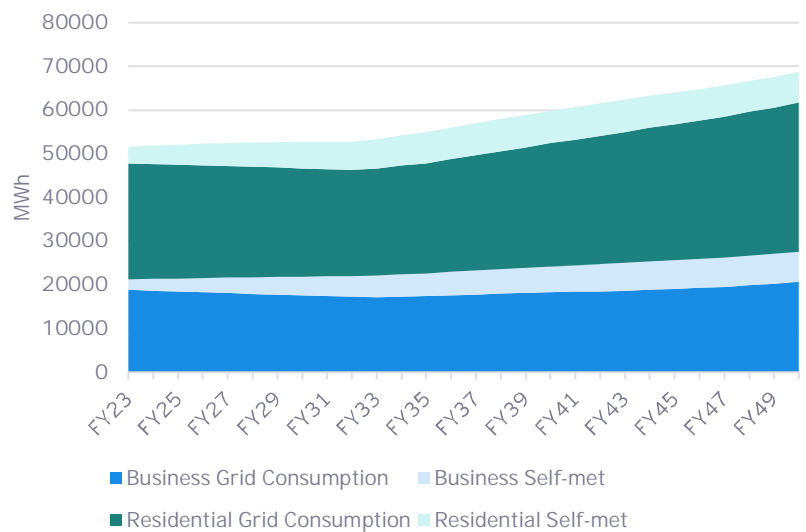
Electricity consumption

Lachlan’s total electricity consumption is forecast to grow approximately by 1.0% CAGR over the forecast period. This represents growth from 51,540 MWh in FY23 to 68,732 MWh by FY50.

The subdued growth in electricity consumption is the net effect of projected increases in consumption per household and a decline in the number of households in the LGA. Despite the -1.3% CAGR decline in forecast population, the forecast consumption growth due to the impacts of EVs and electrification of appliances will more than offset any potential population decline, with residential consumption growth estimated at 1.1% CAGR.

Business consumption is also forecast to increase over the forecast period, but at a slower rate of 0.9% CAGR from FY23-FY50.

Figure 96: Lachlan forecast consumption

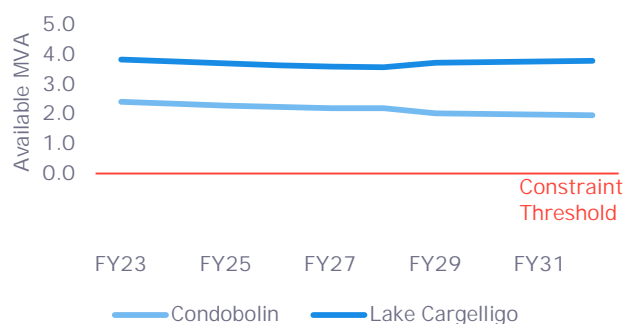


Source: EY analysis of DNSP and AEMO data

Network constraints

There are two zone substations in the Lachlan area, one at Condobolin and the other further west at Lake Cargelligo. Neither of the substations are experiencing current or forecast constraints based on data available, and this situation is not expected to change materially over the forecast period. It was identified that the zone substations in Lachlan are experiencing current reliability issues, with the highest quantity of minutes lost due to supply interruptions. This may continue to be the case in the future, but it is difficult to forecast due to the unpredictable nature of interruptions.

Figure 97: Forecast Lachlan Substation capacity



Source: EY analysis of DNSP and AEMO data



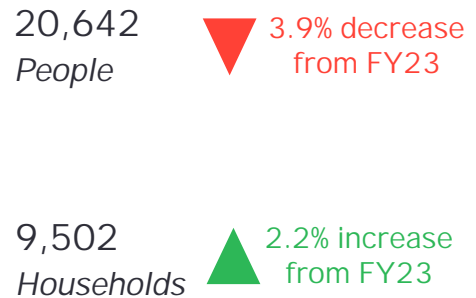
6 Central NSW Electricity Demand – Forecast LGA Deep Dive

Lithgow overview

Lithgow City Council was consulted on 12 July 2023 to understand the council’s views on current energy constraints, priorities, and their plans for the future. Some of the key insights that informed our analysis include:

- Power generation is a big economic stream for Lithgow, with 500kV transmission lines located within the LGA.
- Lithgow is unique as it has a number of coal mines with associated industrial precincts going forward.
- The mines and power station are key local employers, affecting community sentiment towards renewable energy.
- The council is attempting to attract industries such as hydrogen and advanced manufacturing, due to their access to high-voltage electricity.

Figure 98: FY50 Lithgow snapshot



Source: DPE

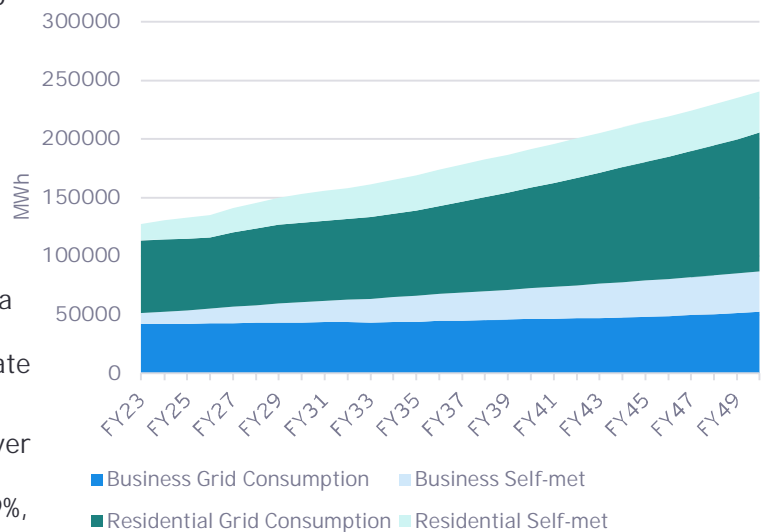
Electricity consumption

Lithgow’s total electricity consumption is forecast to grow by 2.3% CAGR from FY23 to FY50, the fifth fastest in the Central NSW region. Consumption is forecast to increase from 127,679 MWh to a final total of 240,619 MWh.

In spite of modest household growth, and marginal forecast population decline, increased consumption will be driven by the general trend of increased residential consumption per household. As Lithgow has a high proportion of residential consumption as a percentage of total (59%, which is second only to Weddin), consumption from households will accelerate demand in the future.

Business consumption is forecast to grow at 1.9% over the FY23 to FY50 period, in line with the average CAGR for business consumption in Central NSW (1.9%, excluding the impact of industrial customers).

Figure 99: Lithgow forecast consumption



Source: EY analysis of DNSP and AEMO data

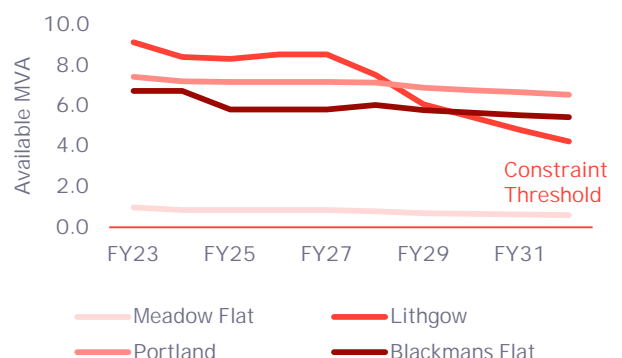
Network constraints

Of the four substations assessed within Lithgow LGA, none have been identified as experiencing network constraints, nor are they forecast to become constrained over the forecast period.

Lithgow zone substation is forecast to decline more quickly than other substations, with available MVA under peak demand declining from 9.1 MVA in FY23 to 4.8 MVA in FY32, likely as a result of population growth in central areas.

Reliability data from the DNSP in Lithgow was unable to be presented in a comparable format and so information on reliability (minutes of supply interruptions) is not available.

Figure 100: Forecast Lithgow Substation capacity





6 Central NSW Electricity Demand – Forecast LGA Deep Dive

LGA Deep Dive: Oberon

Oberon overview

Oberon Council was consulted on 13 July 2023 to understand the council's views on current energy constraints, priorities, and their plans for the future. Some of the key insights that informed our analysis include:

- There is the potential for wind farms to be built in state forest.
- There is state forest covering the majority of the LGA.
- There are no present export constraints.
- Borg is a heavy gas customer in the LGA, and explored a bio-digester to which there were community objections. The lack of information to the community was considered to be the key barrier.
- Oberon is at a higher fire risk than other councils in Central NSW due to the state forest.

Figure 101: FY50 Oberon snapshot

5,390
People ▼ 0.9% decrease from FY23

2,314
Households ▲ 2.2% increase from FY23

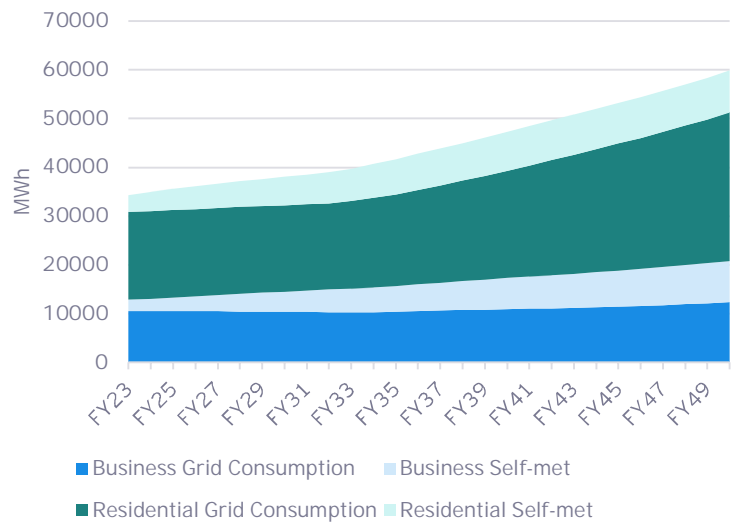
Source: DPE

Electricity consumption

Total electricity consumption is forecast to grow over the assessment period from FY23 to FY50. Similar to the majority of the LGAs in the Central NSW region, this is forecast to be driven by increases in residential consumption per household and number of households.

Total consumption is forecast to grow from 34,349 MWh in FY23 by 2.0% CAGR to a final total of 59,795 MWh in FY50. Much like Lithgow, in spite of the marginal increase in households, the effects of electrification and EV adoption are expected to increase consumption from residential customers substantially. As such, residential consumption is forecast to grow faster than business consumption (2.1% and 1.7% respectively). Both of which are below the trend of Central NSW more broadly (2.4% and 1.9%, excluding impacts of industrial customers).

Figure 102: Oberon Forecast Consumption

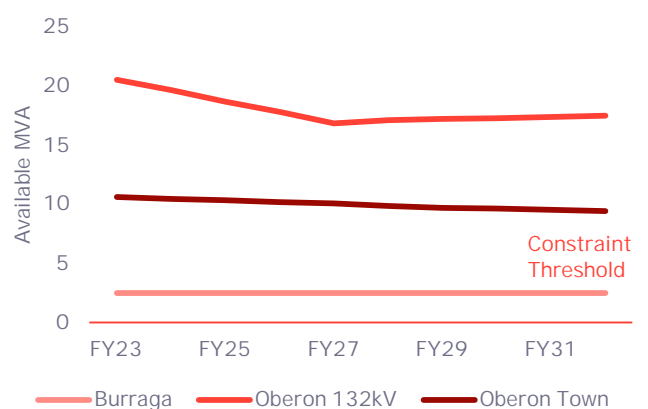


Source: EY analysis of DNSP and AEMO data

Network constraints

There are three zone substations in Oberon that were assessed for network constraints, none of which met the criteria to be deemed constrained. This assessment is not forecast to change over the assessment period.

Figure 103: Forecast Oberon substation capacity



Source: EY analysis of DNSP and AEMO data



Orange overview

Orange City Council was consulted on 28 June 2023 to understand the council’s views on current energy constraints, priorities, and their plans for the future. Some of the key insights from that discussion that informed our analysis include:

- There is interest in Virtual Power Plants, as there is already high solar penetration in the LGA. There is also interest in community batteries in affordable housing precincts.
- Network constraints with respect to Orange Airport have been noted as a result of voltage regulation on the feeder.
- There are large employers from the health sector and the NSW Department of Primary Industries.
- There has been a favourable shift in public perception towards renewable energy in the past decade.
- Housing affordability, water security, and environmental sustainability are key priorities in the region.

Figure 104: FY50 Orange snapshot

54,809
People ▲ 25.2% increase from FY23

23,877
Households ▲ 34.3% increase from FY23

Source: DPE

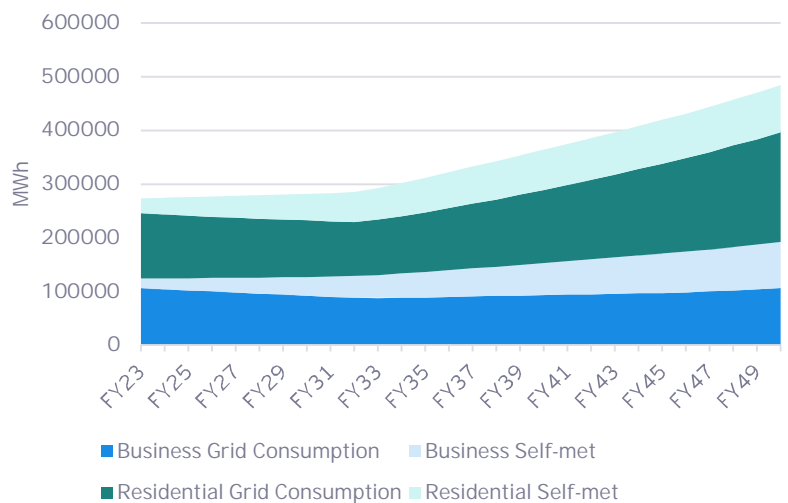
Electricity consumption

From FY23 to FY50 the total electricity consumption in Orange is forecast to grow by 2.1% CAGR, with consumption starting at 273,335 MWh in FY23 and growing to an eventual total of 483,952 MWh in FY50.

As in majority of the Central NSW region, the key driver of consumption growth will be growth in households and consumption per household. However, total electricity consumption growth in Orange (at 2.1%) is behind that of similarly populous towns in the region like Lithgow (2.3%) and Bathurst (2.7%). Business consumption is forecast to grow at 1.6% CAGR.

Residential consumption is forecast to grow at 2.4% CAGR over the forecast period.

Figure 105: Orange Forecast Consumption



Source: EY analysis of DNSP and AEMO data

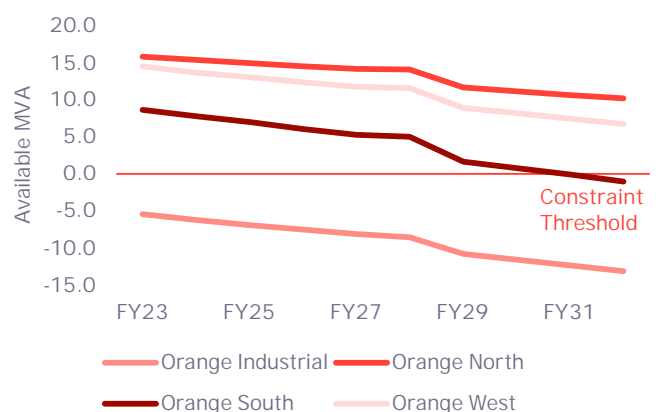
Network constraints

Of the four zone substations in Orange, two are expected to experience network constraint issues.

The Orange Industrial substation has been identified as currently constrained, which is forecast to decline further over the short-term. The industrial zone substation would continue to decline under higher peak demand. Though the graph shows the substation continues to decline into the negative, this is unlikely to reflect reality as at a certain point the location could not handle more demand and curtailment of exports or supply interruptions would likely occur.

Based upon forecast analysis, Orange South substation is also expected to become constrained under peak demand, declining into negative available capacity in FY31.

Figure 106: Forecast Orange Substation capacity



Source: EY analysis of DNSP and AEMO data

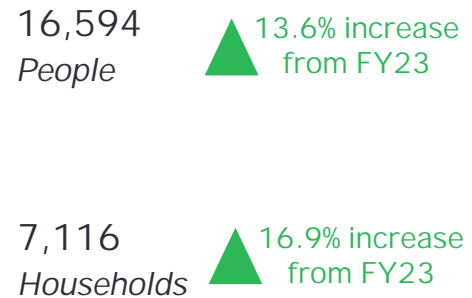


Parkes overview

Parkes Shire Council was consulted on 21 July 2023 to understand the council’s views on current energy constraints, priorities, and their plans for the future. Some of the key insights that informed our analysis include:

- The council has concerns about future-proofing energy demand to accommodate future growth and ongoing concerns about water security.
- There are significant emissions from the current waste landfill, which takes around 20,000 tonnes per year of landfill.
- There is an community opposition towards large renewable projects.
- Some businesses with high energy requirements are concerned with the future energy supply of the Parkes SAP.

Figure 107: FY50 Parkes snapshot



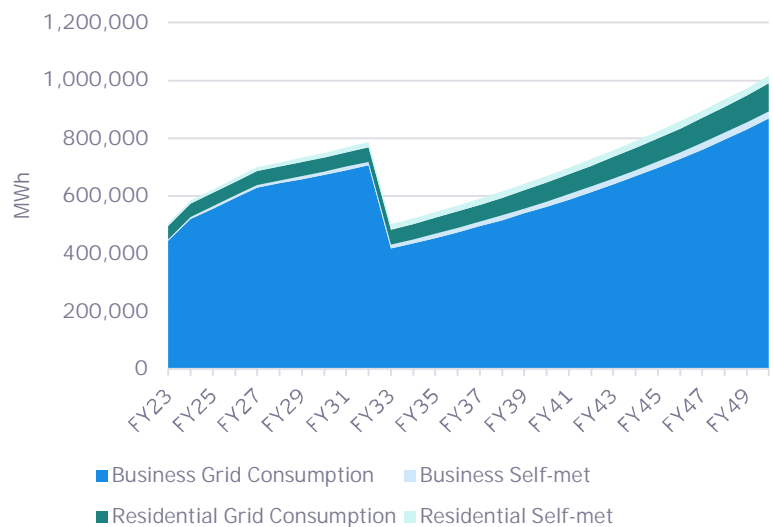
Source: DPE

Electricity consumption

From FY23 to FY50 the total electricity consumption in Parkes is forecast to grow by 2.5% CAGR, with consumption starting at 505,143 MWh in FY23 and growing to an eventual total of 1,015,917 MWh in FY50.

The sharp growth in consumption will be driven by industrial customers in the region, including those located within the Parkes SAP and Northparkes Mine operated by CMOC. Consumption is forecast to decline sharply in FY33 with the expected closure of Northparkes Mine, as mining operating growth forecasts are assumed to be flat due to the historically stable operations and outputs of the mine. Growth will be substantially driven by new operations starting in Parkes SAP, with electricity consumption for the site forecast to grow at a CAGR of 7.6% from FY23 to FY50.

Figure 108: Parkes forecast consumption



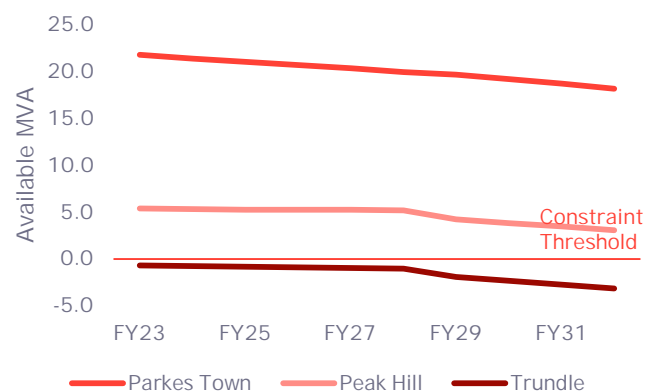
Source: EY analysis of DNSP and AEMO data

Network constraints

There are three zone substations in Parkes, located in the central town, in addition to Peak Hill and Trundle. Trundle has been identified as an area currently experiencing network constraints and this trend is expected to continue over the forecast period, without intervention.

Parkes Town is also forecast to decline in capacity, by 7% over the next 5 years, likely as a result of population growth. The analysis does not factor in the impacts of Northparkes Mine or Parkes SAP, which are expected to be connected to the grid via substations not included within available data.

Figure 109: Forecast Parkes Substation capacity



Source: EY analysis of DNSP and AEMO data

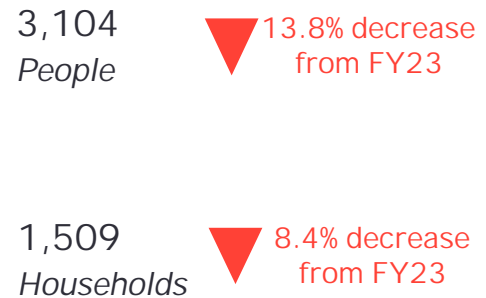


Weddin overview

Weddin Shire Council was consulted on 11 July 2023 to understand the Council’s views on current energy constraints, priorities, and their plans for the future. Some of the key insights that informed our analysis include:

- Weddin is heavily agriculture based, but has one industrial estate, with 14 sites in Grenfell.
- The capacity of the substation is of concern to the council and the community, as consultation raised the impacts of brown-outs in some areas of the Weddin shire.
- There are housing supply pressures, but this may be relieved with population expected to decline.
- As Weddin is a large rural shire, infrastructure in rural areas might need upgrades to facilitate agricultural growth.

Figure 110: FY50 Weddin snapshot



Source: DPE

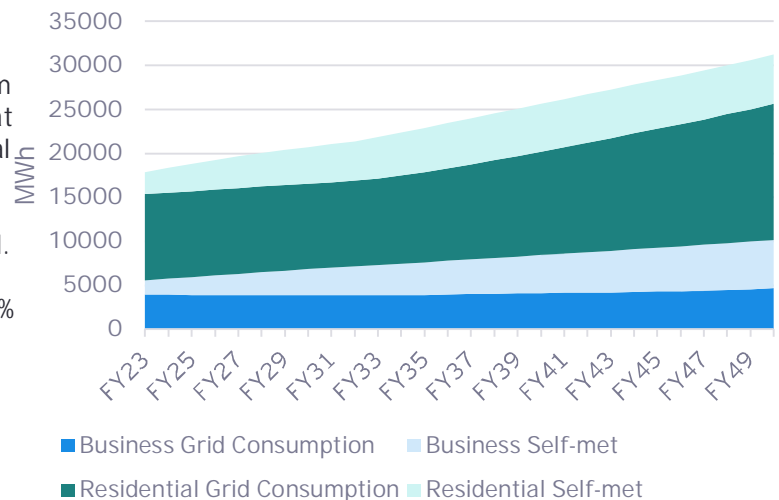
Electricity consumption

Over the forecast period, total electricity consumption in Weddin is expected to grow by 2.0% CAGR, from 20,434 MWh in FY23 to 35,271 MWh in FY50.

In spite of the high percentage of consumption from residential customers (the highest in Central NSW at 68.9% of total consumption coming from residential customers in FY23) moderate population decline (-0.5% CAGR) is expected to partially counteract increases in residential consumption per household. As a result residential consumption increased from 14,881 MWh in FY23 to 25,121 MWh in FY50 (1.9% CAGR).

Consumption growth from business customers is expected to exceed residential growth over the forecast period (2.2% as compared to 1.9% CAGR from FY23 to FY50).

Figure 111: Weddin forecast consumption



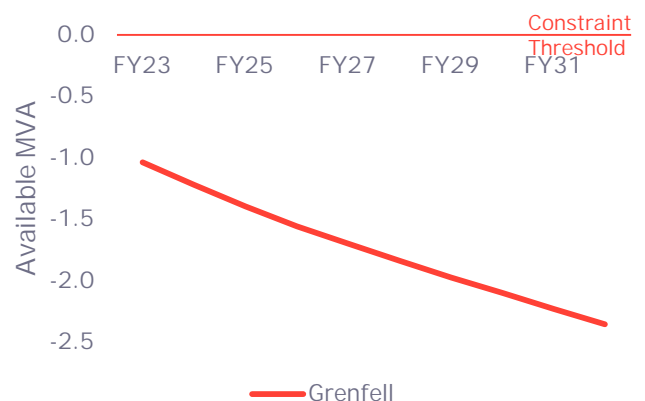
Source: EY analysis of DNSP and AEMO data

Network constraints

Weddin has one zone substation, located in the most populous area of Grenfell.

The substation has been flagged as experiencing present constraints, a situation which could likely further decline over the forecast period. Available substation capacity under peak demand conditions, could continue declining into the negative. However, as previously noted the continual decline presented in Figure 112 may not eventuate as forecast, as the DNSP may take remedial action (if regulatory requirements are satisfied).

Figure 112: Forecast Weddin Substation capacity



Source: EY analysis of DNSP and AEMO data



Report Summary

7 Report Summary

Report summary

Total electricity consumption in Central NSW is expected to grow at a rate of 0.5% per annum from FY23-FY50. Total consumption across the region is heavily influenced by the presence of large industrial businesses. However, many large industrial businesses have their own substation and so have less impact on the capacity at other zone substations.

Our analysis has identified 10 locations around Central NSW where present limitations are expected to impact either energy security or network reliability:

- Available substation capacity in the region, under peak demand conditions, varies from a top of 41 MVA at Russell Street substation in Bathurst to a low of -5.5 MVA at Orange Industrial Substation.
- Additionally, three substations were identified as having reliability issues materially above that of the Central NSW average.
- Reliability is measured in lost minutes, or minutes where customer supply is interrupted. The Central NSW average was 241,069 lost minutes, whereas Lake Cargelligo substation was more than three times higher with 772,743 lost minutes.
- Network constraints have been forecast to FY32 to identify likely future areas of energy insecurity. Three additional locations are forecast to cross the threshold into negative available capacity under peak demand conditions, Raglan and Stewart in FY27 (Bathurst), and Orange South in FY31. Resulting in a total of 13 areas across Central NSW that are expected to be impacted by energy security constraints over the FY23-FY50 period.

The results of this analysis will be used to inform options development and the analysis and discussion in the Business Case.

A summary of each LGA is outlined below.

Bathurst

Business electricity consumption from the grid in Bathurst has been declining over the last nine years, despite only a modest decline in business customer connections. Businesses are using less electricity from the grid that they have done historically. Business consumption is forecast to slowly increase in future though, at a modest rate of 2.0% CAGR. Whereas residential consumption has been increasing over the last nine years and is forecast to continue that trend over the forecast period (at 3.4% CAGR), driven in part by a 41% forecast increase in population by FY50. In total, Bathurst is forecast to increase its electricity consumption the most compared to other LGAs in Central NSW, with total electricity consumption more than doubling from FY23 to FY50 at 110.4% growth. While there is currently no evidence of network constraints in Bathurst, zone substations at Raglan and Stewart are forecast to become constrained by FY27 under current projections. Therefore, due to forecast network constraints and the substantial anticipated growth in electricity consumption, Bathurst may be suited to exploring non-network solutions in centres of residential and business consumption, particularly rooftop solar PV given the relatively lower uptake of the technology in the LGA.

Blayney

Over the last nine years, both business consumption and residential consumption have increased in Blayney. Over the forecast period, total commercial electricity consumption (excluding industrial customers) is forecast to remain as the largest source of electricity consumption by FY50, growing at 1.0% CAGR.²⁸ Residential consumption is forecast to grow faster at 2.4% CAGR, but does not surpass business consumption in total quantity. Only the Mandurama zone substation is currently experiencing network constraints, and this is forecast to continue without intervention. Blayney is also forecast to include two major customers of electricity over the forecast period: Cadia Mine and King's Plain Mine. However, as they are connected directly to the transmission network, interventions to address their consumption are not likely to impact customers connected to the distribution network. Therefore, opportunities to improve energy security in Blayney is more likely focus on residential customers connected to the Mandurama zone substation, electricity intensive local businesses connected to the distribution network, or a combination thereof. The uptake of rooftop solar PV is relatively lower in Blayney compared to other LGAs in the region, and so there may be an opportunity for Blayney to increase the penetration of rooftop solar PV and batteries, particularly for customers connected to the Mandurama substation.

28. Growth rates quoted exclude the impacts of large industrial customers

Cabonne

Residential consumption per connection from the grid increased in Cabonne over the last nine years, whereas business consumption from the grid declined moderately over the same period. Over the forecast period, total residential consumption continues to grow at 2.4% CAGR, while business consumption grows at a slower rate of 1.6%. As a result, total consumption from residential sources remains the dominant driver of electricity consumption, at 1.9x the volume of business consumption by FY50. Three of the four substations in the LGA were identified as currently constrained, and are forecast to continue to be constrained without intervention. As the majority of consumption is driven by residential customers, the opportunity to improve electricity security is in supporting residential customers around Canowindra and Molong (as the most populous towns), followed by Cumnock.

Cowra

Residential electricity consumption in Cowra increased faster than that of customer connections over the last nine years, largely due to the trend in increased consumption per residential connection. Over the same time period, business consumption declined, contrary to the trend in customer connections, which grew (although only by 0.1%). This reflects the broader trend of lower consumption by business customers over time. Over the forecast to FY50, Cowra's total electricity consumption from residential customers is expected to grow faster than historically, at 2.6% CAGR. However, total business consumption is forecast to diverge from the historical trend and grow by 1.8% CAGR. No network constraints were identified in current data or forecast to appear in the zone substation located within Cowra, but consultation noted that constraints are inhibiting residential growth and business operations. This may be due to network issues between the distribution zone substation and the customer connection point, which is data at a more granular level than is available for analysis. Despite the lack of supporting data to address constraint concerns, Cowra may wish to consider solutions such as microgrids to support new residential or business precincts to enable future growth. For more information on microgrids, see the Opportunities Context Report.

Forbes

Business electricity consumption from the grid in Forbes has declined over the historical period, with quite a sharp decline between FY19 to FY22 (at 10.9% CAGR), despite a marginal increase in business connections. This could indicate create behind-the-meter generation or improved energy efficiency in that sector. Residential consumption from the grid increased marginally over the same period, at 0.1% CAGR. This lower rate of residential consumption over the historical period compared to the general trend may be a reflection of the decreased population over time. However, Forbes is forecast to experience the highest population growth in the Central NSW region (at 47.9% over FY23-FY50), which is reflected in the substantial increases forecast in total electricity consumption. Total residential electricity consumption is expected to grow at 3.0% CAGR, while business consumption is expected to increase at 1.8% CAGR. Of the three zone substations in Forbes, the Paytens Bridge substation is currently experiencing constraints and is expected to continue being constrained without remedial action. Forbes also has one of the lowest penetrations of residential solar PV across Central NSW at 29.3%, despite having access to considerable solar resources (see the Opportunities Context Report for more details on resource availability). As a result, due to the forecast growth in residential consumption and comparatively lower levels of rooftop solar PV in Forbes, more installations in residential homes complemented by storage solutions, particularly for customers connected to the Paytens Bridge substation, may be an effective solution to address the forecast network constraints.

Lachlan

Overall electricity consumption from the grid declined in Lachlan over the last nine years, largely as a result of lower consumption from the business sector. Forecasts estimate a moderate population decline in Lachlan over the forecast period, falling to a total of 31.8% from FY23-FY50. This forecast decrease in residents has moderated the electricity consumption forecasts, with total electricity consumption expected to grow by only 1.0% CAGR. Analysis of network constraints did not reveal any current or forecast capacity constraints on zone substations in Lachlan. However, there appears to be issues with network reliability in Lachlan, as the substations at Condobolin and Lake Cargelligo have the highest quantity of minutes off supply due to power interruptions in the region. As a result, it may be appropriate to consider solutions that improve reliability in Lachlan, supplying electricity in times of interruption.

Lithgow

Grid consumption from business customers increased moderately over the last nine years, in contrast to the general trend of decreased consumption from the business sector elsewhere. Data regarding business customer connections wasn't available to make any assessment as to whether this increase was a result of increased business customer connections. While consumption from residential customers grew over the same period, it was at half the rate of the average for Central NSW. The trend in total electricity consumption is expected to grow comparatively faster in the forecast period to FY50 than historically for Lithgow. Residential consumption is expected to increase by 2.5% CAGR and business consumption is forecast to grow at 1.9%, despite there being a forecast decline in population over the same period. There is a general trend of increased consumption per customer connection in future, due to electrification of the economy, and so this may be a driver behind the increased consumption forecast compared to a lower population. No network constraints have been identified in Lithgow, nor are any forecast over the next 10 years. In the absence of expected network constraints, Lithgow could consider implementing additional renewable generation assets to meet forecast consumption growth, taking advantage of the relatively strong infrastructure there.

Oberon

Over the last nine years, Oberon defied the broader trend in business consumption from the grid, as consumption increased moderately compared to declines experienced elsewhere. Historical residential electricity consumption from the grid grew faster than any other LGA in Central NSW, at 1.8% CAGR. However, the population in Oberon is forecast to remain relatively unchanged from FY23 to FY50, declining marginally by 44 people. As a result, growth in total electricity consumption from both residential and business customers is expected to be marginally below the Central NSW trend. Residential consumption is expected to grow by 2.1% CAGR, compared to the Central NSW average of 2.7% CAGR. Business consumption is forecast to grow at 1.7% CAGR. None of the three zone substations in Oberon currently experience, or are forecast to experience, constraints.

Orange

Electricity consumption from the grid in Orange has declined marginally at a rate of 0.5% CAGR from FY14 to FY22. This was driven by lower consumption from businesses, which declined at almost twice the broader trend for business consumption in the region. Over the same period there was an increase in consumption from the residential sector, at 1.6% CAGR, as the population in Orange has increased over time and the general trend of increased consumption per residential connection also being reflected. The trend in total electricity consumption from residential sources is expected to remain fairly stable over the forecast period, at 2.4% CAGR. However, total business consumption is expected to grow by 1.6% CAGR, contrary to the historical trend. Some network constraints have been identified in Orange. Currently, Orange Industrial zone substation has been identified as experiencing network constraints, and by FY31, Orange South substation is expected to become constrained also. As such, interventions that address constraints and facilitate growth in areas connected to Orange Industrial and Orange South zone substations are the notable priority. The Orange Airport was also identified by council as requiring additional capacity in future.

Parkes

Over the historical period analysed, grid consumption from business sources declined by 1.2% CAGR.²⁹ Whereas, residential grid consumption increased very slightly over the same period (by 0.4% CAGR). The opposing effects of the two trends contributed to an overall 3.0% decrease in consumption in Parkes from FY14 to FY22. Over the forecast period, residential consumption is expected to grow by 2.9% CAGR, while business consumption (excluding industrial customers) is expected to grow at 2.0% CAGR. The presence of Northparkes Mine and Parkes SAP substantially influence the forecast profile. However, as they are, or are forecast to be, connected directly to the transmission network, interventions to address their consumption are not likely to impact customers connected to the distribution network. Analysis of substations in Parkes identified one zone substation at Trundle currently experiencing network constraints, and will continue to do so without remedial action. Parkes has a relatively strong uptake of rooftop solar PV compared to other LGAs in the region, but a relatively lower penetration of batteries. There could be opportunities to increase battery adoption in Parkes to store excess generation from the available rooftop solar PV and in doing so, mitigate the risk of capacity constraints.

29. Growth rates quoted exclude the impacts of large industrial customers

Weddin

Overall grid consumption in Weddin decreased moderately from FY14 to FY22 at a rate of 2.0% CAGR. This moderate increase is as a result of a decline in consumption from the grid from the business sector, which was largely aligned to the broader trend in Central NSW, offset by increases in the residential sector, despite an overall decline in population. The increase in consumption from the residential sector despite a declining population reflects the broader trend of increased consumption per residential customer connection. The trend in population decline is expected to continue in Weddin, at a rate of 0.5% CAGR. As a result, total residential consumption is expected to grow by only 1.9% CAGR over the forecast period, slightly slower than total business consumption at 2.2% CAGR. Grenfell zone substation is the only one located within the Weddin shire, and has been identified as experiencing network constraints. Weddin has a relatively higher uptake of batteries compared to other LGAs in the region but a relatively higher concentration of rooftop solar PV, suggesting that increased battery adoption may be an opportunity to explore, as well as rooftop solar PV that is capable of coordination combined with batteries for other customers connected to the Grenfell substation to alleviate constraints.

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Appendix 1: Assumptions and Data Sources

Appendix 1

Assumptions and Data Sources

Data sources

Data sources utilised as inputs into base case demand modelling and information presented within this report have been detailed below. Data has been gathered from a combination of stakeholders and publicly available sources. Where data was retrieved from public sources, links are provided.

Chapter 3: Historic

Population

- Australian Bureau of Statistics, 'Population estimates and components by LGA, 2021 to 2022', <https://www.abs.gov.au/statistics/people/population/regional-population/latest-release#data-downloads>
- Department of Planning and Environment, 'Population projections', <https://www.planning.nsw.gov.au/research-and-demography/population-projections>

DER Uptake

- Australian Energy Market Operator, 'June 2023 DERR data', <https://aemo.com.au/energy-systems/electricity/der-register/data-der/data-downloads>
- Department of Planning and Environment, 'Population projections', <https://www.planning.nsw.gov.au/research-and-demography/population-projections>

Electricity Consumption from the Grid – Commercial and Residential Customers

- Essential Energy, 'Electricity Consumption Data by Local Government Area', <https://www.google.com.au/url?sa=i&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=0CAIQw7AJahcKEwjQ9qyAlvKAAXUAAAAHQAAAAAQAg&url=https%3A%2F%2Fwww.essentialenergy.com.au%2F%2Fmedia%2FProject%2FessentialEnergy%2FWebsite%2Ffiles%2FOur-Network%2FLGA-consumption-data.xlsx%3F%3Den%26hash%3D47A5BC35201531A9AEC6203C04EA633A0B4B6418&psig=AOvVaw0IzxU45FGPJ6otJR2J-g0I&ust=1692859168376536&opi=89978449>
- Endeavour Energy

Electricity Consumption from the Grid – Industrial Customers

- RGDC
- Newcrest Mining, '2022 Sustainability Report'; '2021 Sustainability Report'; '2020 Sustainability Report'; '2019 Sustainability Report'; '2018 Sustainability Report', https://www.newcrest.com/investor-centre/results-reports?report_type=8
- Energylink Services, 'NorthParkes Mine – Electricity Contract RFI', <https://www.energylinkservices.com.au/post/cmoc-northparkes-mines-electricity-supply-contract-request-for-information#:~:text=About%20Northparkes%20Mines&text=The%20mine%20consumed%20approximately%20260,will%20continue%20into%20the%20future>

Network Constraints

- Essential Energy, 'DAPR 2022 BSP, ZS and Lines Extract Summary', https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fdapr.essentialenergy.com.au%2Fessential_data%2FDAPR%25202022%2520BSP%2C%2520ZS%2520and%2520Lines%2520Extract%2520Summary.xlsx&wdOrigin=BROWSELINK
- Essential Energy

Appendix 1

Assumptions and Data Sources

Data sources

Chapter 4: Forecasts

Electricity Consumption from the Grid – Commercial and Residential Customers

- Essential Energy
- Endeavour Energy
- Department of Planning and Environment, 'Population projections', <https://www.planning.nsw.gov.au/research-and-demography/population-projections>
- Australian Energy Market Operator, 'National Electricity & Gas Forecasting', <https://forecasting.aemo.com.au/>
- Australian Energy Market Operator, 'AEMO's Detailed Electric Vehicle Databook', <https://aemo.com.au/-/media/files/major-publications/isp/2022/iasr/detailed-electric-vehicle-databook.xlsx?la=en>

Electricity Consumption from the Grid – Industrial Customers

- RGDC
- Energylink Services, 'NorthParkes Mine – Electricity Contract RFI', <https://www.energylinkservices.com.au/post/cmoc-northparkes-mines-electricity-supply-contract-request-for-information#:~:text=About%20Northparkes%20Mines&text=The%20mine%20consumed%20approximately%20260,will%20continue%20into%20the%20future>
- Regis Resources, 'McPhillamys Gold Project – Environmental review of proposed power supply to the mine development and pipeline development', <https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-9505%2120200908T223249.649%20GMT>

Electricity Consumption from Self-Met sources – All Customers

- Department of Planning and Environment, 'Population projections', <https://www.planning.nsw.gov.au/research-and-demography/population-projections>
- Australian Energy Market Operator, 'National Electricity & Gas Forecasting', <https://forecasting.aemo.com.au/>

Network Constraints

- Essential Energy, 'DAPR 2022 BSP, ZS and Lines Extract Summary', https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fdapr.essentialenergy.com.au%2Fessential_data%2FDAPR%25202022%2520BSP%2C%2520ZS%2520and%2520Lines%2520Extract%2520Summary.xlsx&wdOrigin=BROWSELINK
- Delta Star Designs, 'Laffing Waters Master Plan Report'

Appendix 1

Assumptions and Data Sources

Assumptions

Assumption	Source
DPE population growth estimates have been extrapolated out holding FY41 growth rates constant.	DPE, '2022 NSW Common Planning Assumption Projections', https://www.planning.nsw.gov.au/research-and-demography/population-projections/explore-the-data
Electricity consumption from the grid utilises growth rates from the 'Step Change' scenario of AEMO's 2022 Integrated System Plan.	AEMO, '2022 Integrated System Plan', https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp
Electricity consumption from 'self-met' sources is forecast for Central NSW assuming it is proportionate to the population.	DPE, '2022 NSW Common Planning Assumption Projections', https://www.planning.nsw.gov.au/research-and-demography/population-projections/explore-the-data And; AEMO, '2022 Integrated System Plan', https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp
Forecast EV related consumption has been allocated in accordance with the quantity split of commercial and residential vehicles forecast by CSIRO.	CSIRO, 'Detailed electric vehicle databook', https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp/2022-isp-inputs-assumptions-and-scenarios
Forecast consumption from the grid for LGAs serviced by Essential Energy utilises growth rates data for Bulk Supply Points provided by Essential Energy.	Essential Energy
Available substation capacity is calculated by summing peak demand and exports, minus the rated substation firm normal cyclic capacity.	Essential Energy
Demand forecasts per zone substation have been estimated utilising a constant ratio of demand to consumption based on FY27 figures.	Essential Energy, 'DAPR 2022 BSP ZS and Lines Extract Summary', https://dapr.essentialenergy.com.au/ Endeavour Energy, 'DAPR', https://dapr.endeavourenergy.com.au/# and; AEMO, '2022 Integrated System Plan', https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp
Exports per zone substation have been estimated by applying growth rates from self-met consumption to FY27 exports.	Essential Energy, 'DAPR 2022 BSP ZS and Lines Extract Summary', https://dapr.essentialenergy.com.au/ Endeavour Energy, 'DAPR', https://dapr.endeavourenergy.com.au/# and; AEMO, '2022 Integrated System Plan', https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp

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