

Appendix L: Energy and customer number forecasts

Regulatory proposal for the ACT electricity distribution network 2024–29



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1. Introduction

The regulatory proposal for the 2024–29 period is supported by the following forecasts which are discussed in this attachment.

- Energy consumption
- Customer numbers

The above forecasts are referenced in various parts of the regulatory proposal, including proposed capital and operating expenditure, and pricing. For example, energy consumption and customer numbers are a key input into the Proposed Tariff Structure Statement, including formulating the indicative pricing schedule.

1.1. Factors affecting forecasts

This 2024–29 regulatory proposal is being prepared at a time when there are significant changes in external drivers of electricity consumption, including the following.

- The disruptive and unplanned effects of the COVID-19 pandemic which have affected residential and low voltage (LV) commercial customer numbers and consumption, as a result of changes in electricity usage patterns and ACT population growth.
- Gas-to-electric switching resulting from the ACT Climate Change Strategy which aims to achieve net zero emissions by 2045¹ via phasing out natural gas to make way for full electrification.
- Increasing behind-the-meter (BTM) consumption, including via:
 - o solar photovoltaic (PV) systems; and
 - o BTM batteries.
- Increasing uptake of electric vehicles (EVs) which is potentially hastened by the "ACT's Zero Emissions Vehicle Strategy" released in July 2022,² with a commitment to phase out sales of new light internal combustion engine vehicles by 2035.
- Expected new demand from high voltage (HV) connections.

The forecasts of consumption and customer numbers have been prepared using a methodology and model developed by consultants. The impact of the drivers listed above on the forecasts are captured primarily by statistical models, with post-model adjustments where the statistical models do not fully reflect the most realistic expectation of future consumption patterns.

The sources of this information are reported in Table 1. The forecasts are based on the most recent data available at the time of preparing forecasts and, where possible, input forecasts and assumptions have been informed by public sources.

https://www.climatechoices.act.gov.au/policy-programs/act-climate-change-strategy

² ACT Government, ACT's Zero Emissions Vehicles Strategy 2022 - 30, July 2022.



Table 1 Information sources

	Assumption / data	Source
Historical consumption and customer numbers	Consumption and customer numbers by tariff.	 Evoenergy sales reports (actual data used to June 2022)
Population forecast	Population projection based on Australian Government forecasts for ACT	 Centre for Population 2021, 2021 Population statement, December 2021 Centre for Population 2021, Budget 2022-23: population projections, states and territories, March 2022
Accounting for COVID-19	Included dummy variables in the seasonal Autoregressive Integrated Moving Average (ARIMA) models for residential and LV commercial consumption per consumer.	Dummy variable values based on the declaration of a public health emergency in the ACT in March 2020 and analysis of ongoing impacts
Gas to electricity switching	Gas switching volumes from the AER's decision on Evoenergy's 2021-26 gas Access Arrangement were converted to additional electricity consumption based on a coefficient of performance of 92.6 kWh per GJ of gas	 AER 2021. Final decision. Evoenergy Access Arrangement 2021 to 2026. Attachment 12: Demand, April 2021. Coefficient of performance based on ClimateWorks Australia 2016, Gas-electricity substitution projections to 2050, prepared for CSIRO, p. 30. (assumes 3 units of heating output per unit of energy input for electric heating, ventilation, and cooling (HVAC) from 2015 to 2030) Evoenergy calculation
Behind the meter consumption (solar PV and batteries)	Forecasts based on 'realistic adhoc electrification' scenario from Evoenergy's net zero model.	Evoenergy
Electric vehicle uptake	 Forecasts provided by Evoenergy based on 'realistic adhoc electrification'³ scenario from internal net zero model. Public bus charging accounted for in HV block loads 	Evoenergy
HV block load adjustments	Forecasts prepared by Evoenergy based on information on planned and expected future connections.	Evoenergy

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 $^{^3}$ The 'realistic adhoc electrification' scenario is based on 2022 ACT Government policy announcements with regard to the ACT gas/electricity network and EV uptake.



Impacts of the COVID-19 pandemic

The COVID-19 pandemic has affected electricity consumption in different ways, primarily affecting residential and LV commercial customers.

- Residential consumption per customer increased during the COVID-19 pandemic while customer number growth reduced due to weaker population growth.
- LV commercial consumption decreased during the COVID-19 pandemic and customer number growth reduced due to weaker population growth.

These effects were driven by restrictions applied by the ACT Government at various times since the emergence of COVID-19. They included restrictions on non-essential activities and requirements for many ACT residents to work-from-home. These restrictions reduced LV commercial consumption due to closed office and other commercial spaces. At the same time, residential electricity consumption increased due to work-from-home requirements.

These behavioural changes look set to continue in the longer-run. Although restrictions have been removed and risks or consequences of COVID-19 infection have changed over time, there have been persistent behavioural changes, as many workplaces continue to operate under hybrid working arrangements⁴. This is likely to have long-term effects on electricity consumption, but to an uncertain degree.

Restrictions on movement during the COVID-19 pandemic also affected population growth in the ACT, which in turn affected the number of residential and LV commercial connections. Lower population growth due to COVID-19 may also have indirectly affected HV commercial consumption.

The impact of COVID-19 is incorporated into the forecast in several respects.

- It affects the starting point of forecasts. Forecasts are based on the most recent observation and so take into account the historical impacts of COVID-19.
- Population forecasts reflect the historical impacts of COVID-19 and incorporate the Australian Government's view, at the time of preparing the forecasts, relating to future population growth.
- It affects modelling of historical relationships which are used to forecast future consumption.
 To account for this, the ARIMA models for residential and LV commercial consumption have included dummy variables to account for the impact of COVID-19.
 - For residential consumption, this is captured in a dummy variable which is equal to 1 from March 2020. This changes the level of the forecast and is assumed to persist over the forecast horizon, (which assumes the behavioural changes related to working-from-home persist).
 - For LV commercial consumption, this is captured in a dummy variable which interacts with heating degree days (HDD) from March 2020 to March 2022. This period was chosen based on analysis by a consultant which identified it as a period of sustained decreased consumption. The dummy was interacted with HDD to reflect the expectation that for LV commercial customers, COVID-19 changed how consumption reacted to changes in weather. The impacts on LV commercial consumption due to COVID-19 are assumed to be transitory.⁶

Due to the proximity to COVID-19, there is little information to inform forecasts of persistent, longer run impacts. For example, it is not clear to what extent and for how long people will continue to workfrom-home.

⁴ Hybrid working arrangements refer to situations in which employees undertake their work from a combination of locations including their residential home and commercial office.

⁵ This was when the ACT Government declared a Public Health Emergency.

⁶ COVID-19 impacts are expected to be more persistent for residential consumption as working from home is expected to continue. In contrast, impacts on LV commercial are expected to have been transitory and although working-from-home is expected to continue, electricity consumption is expected to continue changing.



Population growth

Population forecasts are used as an input to forecast residential and LV commercial customer numbers over time. These are based on the Australian Government Centre for Population's population projections for the ACT (Figure 1). Based on this, residential and LV commercial customer numbers are forecast to grow at an average annual rate of 1.1 per cent from 2021/22 to 2028/29. This is slightly lower than customer number growth over the past five years, which has averaged 2.1 and 1.2 per cent for residential and LV commercial customers, respectively. The forecast reflects expectations that population growth will remain below the particularly strong rates seen over the past five years.



Figure 1 ACT population annual growth

Source: Centre for Population 2021, 2021 Population statement, December 2021; Centre for Population 2021, Budget 2022-23: population projections, states and territories, March 2022; Evoenergy calculations.

Note: Yellow highlighted period represents the 2024-29 regulatory control period.

Gas-to-electricity switching

During in the 2024–29 regulatory period, gas-to-electricity switching is expected to increase above historically-observed rates. The ACT Government announced in August 2022 the phase out of fossil fuel gas use by 2045 and a suite of policies including:

- no new gas infrastructure in new suburbs⁷
- no new gas connections in suburban infill developments from 2023⁸
- providing rebates for eligible households for installing electric appliances,⁹ and
- zero interest loans to finance to buying energy-efficient electric appliances.

Over time this is expected to result in increased electricity consumption as gas appliances are gradually replaced with electric alternatives. Post-model adjustments accounting for this electrification were included by the AER in its decision on Evoenergy's gas network access arrangement 2021-26.¹¹

⁷ https://<u>www.climatechoices.act.gov.au/energy/switching-from-gas</u>

⁸ Ibid

⁹ Home Energy Support: Rebates for Homeowners, see https://www.climatechoices.act.gov.au/policy-programs/home-energy-support-rebates-for-homeowners.

¹⁰ Sustainable Household Scheme, see https://www.climatechoices.act.gov.au/policy-programs/sustainable-household-scheme

¹¹ AER 2021. Final decision. Evoenergy Access Arrangement 2021 to 2026. Attachment 12: Demand, April.



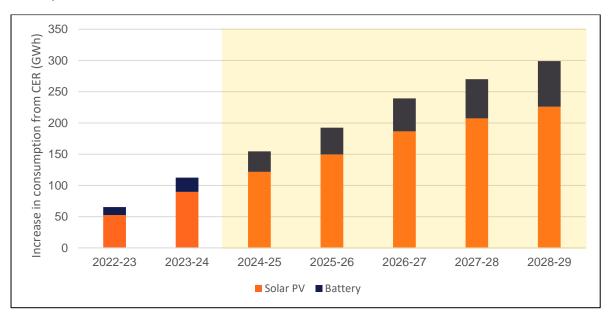
Electricity consumption in 2028/29 is expected to be approximately three per cent higher (equivalent to around 190 kWh per connection per year) due to the increase in gas switching alone, compared to the baseline electricity consumption forecasts (i.e. before post-model adjustments).

Behind-the-meter consumption (solar PV and batteries)

BTM solar PV and batteries have been forecast on the Australian Energy Market Operator (AEMO) Integrated System Plan (ISP) 'Step Change' scenario with the influence of ACT government incentives for battery storage. The ACT Government is making available a \$825/kW subsidy, targeting deployment of 36MW of battery storage under its Next Generation Energy Storage scheme. The forecast assumes this rapid growth will continue.

Impacts from solar PV and batteries are expected to reduce consumption by around 12 per cent in 2028/29 (equivalent to around 850 kWh per connection per year).

Figure 2 Projected increase solar PV and battery BTM consumption from current levels, GWh



Source: Evoenergy's volume forecasting model.

¹² Rattenbury, S. 2021. Six battery providers powering Next Gen program. Media Release. 19 February 2021. Available here:

https://www.cmtedd.act.gov.au/open_government/inform/act_government_media_releases/rattenbury/2021/six-battery-providers-powering-next-gen-program



Electric vehicle uptake

The ACT government recently announced new Transport Policies. 13

- Zero Emission Vehicles (ZEV) sales target (light vehicles) for the ACT of 80-90% by 2030.
- Cease registration of new light non-ZEVs by 2035.

The ACT already provides substantial incentives for ZEV take up with no stamp duty, two years free registration and an interest free loan of up to \$15,000 for eligible ZEVs.

In effect, the ACT Government has moved from the Conservative target for ZEVs in the ACT (previously indicated as the pathway for decarbonisation of the transport sector) to an Optimistic target. The charging profiles are in accordance with AEMO ISP projections. The assumption is that ZEV charging will gradually move from convenience charging (charging in the evening peak) in the early years of the period to increased daytime charging in the latter part of the period due to increased incentives to shift charging away from peak demand in the evening.

Forecasts of EV uptake in the ACT were prepared using an internal net zero emissions model, based on the ACT Government's optimistic scenario. The model forecasts electricity consumption in 2028/29 to be approximately seven per cent higher (equivalent to around 400 kWh per connection per year) due to EV uptake compared to the consumption forecast prior to post-model adjustments (Figure 3).

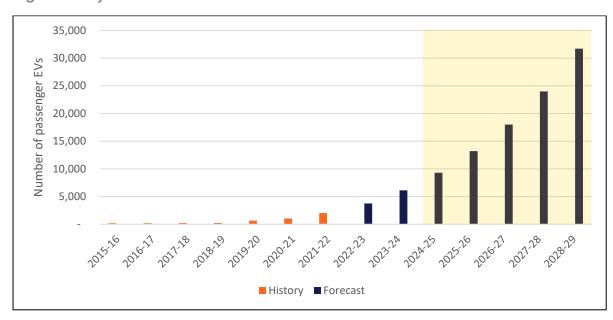


Figure 3 Projected stock of EV vehicles ACT

Source: Evoenergy's volume forecasting model.

¹³ ACT Government, ACT's Zero Emissions Vehicles Strategy 2022–30. Available here: https://www.climatechoices.act.gov.au/__data/assets/pdf_file/0006/2038497/2022_ZEV_Strategy.pdf



2. Energy consumption

In 2021, Evoenergy engaged consultants to identify key factors influencing electricity consumption in the ACT and to prepare a customised model to forecast electricity consumption. This methodology was used by Evoenergy, with some modifications, to develop electricity consumption forecasts for the 2024–29 regulatory control period.

This section provides a summary of the consumption forecasts and the approach used to derive it.

2.1. Methodology

Electricity consumption has been forecast for each tariff class, with unmetered loads separately forecast. This reflects the different drivers of consumption and reflects the best information available.

- Consumption forecasts are estimated by multiplying customer number forecasts by consumption per customer forecasts.
- Residential and LV commercial consumption are forecast using seasonal auto-regressive integrated moving average (seasonal ARIMA (SARIMA)) models of consumption per customer combined with the forecast of customer numbers. Separate models were prepared for residential and LV commercial customers. The process of developing the SARIMA models consisted of:
 - o inspection and cleaning of historic data
 - o selection of best performing model
 - collecting forecast inputs for consumption drivers
 - developing forecasts
 - making post modelling adjustments to account for solar PV, BTM battery and EV uptake (only for residential), gas to electricity switching and other adjustments.
- HV commercial consumption is forecast based on historical trends and supplemented with information on planned and expected future connections.
 - consumption from existing connections is forecast using the average consumption from the same month of the past three years.
 - new connections and disconnection of existing customers are based on information provided by HV commercial customers to Evoenergy. This includes the timing and expected capacity of the connection/disconnection.
 - new connections are assumed to have a load factor (ratio of consumption to connection capacity) equal to the average of existing HV connections.
- <u>Unmetered consumption</u> (including consumption by streetlights) is forecast based on the average consumption from the same month of the past three years.
 - post modelling adjustments are made for streetlighting to reflect the expected end date of a program to replace Compact Fluorescent Lamps (CFLs) with Light Emitting Diodes (LEDs).

2.2. Consumption forecasts

Total electricity network consumption¹⁴ is forecast to increase from 2,905 GWh in 2021/22 to 3,109 GWh in 2028/29 (Figure 4). This represents an annual average growth rate of around one per cent within the 2024–29 regulatory period. The increase in consumption is expected to be primarily driven

¹⁴ Total electricity network consumption excludes consumption which is met by solar PV or behind the meter batteries.



by HV commercial connections, which is forecast to account for around 68 per cent of consumption growth to 2028/29. Residential and LV commercial are expected to account for 22 and 11 per cent of growth in consumption over the forecast horizon, respectively.

The increase in HV commercial consumption is expected to be driven by an increase in the number of connections, which are forecast to increase from 37 in 2021/22 to 52 by 2028/29. Of the additional 22 GWh of HV consumption expected by 2028/29, around 55 per cent is due to data centres and around six per cent due to the electrification of the bus fleet and expansion of the Canberra's light rail.

Total residential and LV commercial consumption is expected to increase over the forecast horizon due to expected population growth. Increased consumption is also expected due to gas-to-electricity switching and electric vehicle (EV) uptake (for residential connections). These increases are expected to be partially offset by continued improvements in energy efficiency, and self-generation via solar PV.

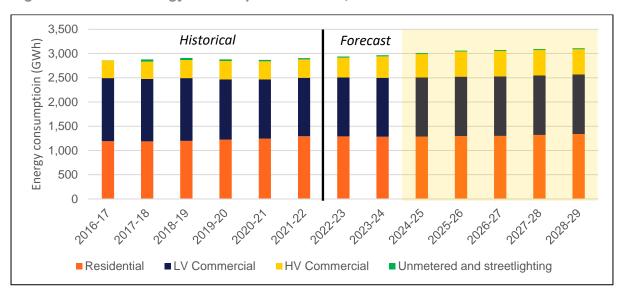


Figure 4 Forecast energy consumption volumes, GWh

Source: Evoenergy's volume forecasting model.



Table 2 Forecast consumption (GWh)

	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	% change within regulatory period	
	History	Fore	cast		Forecast - regulatory period					
Residential	1,293	1,290	1,283	1,287	1,299	1,302	1,319	1,339	4%	
% change	4%	0%	-1%	0%	1%	0%	1%	1%		
LV Commercial	1,207	1,216	1,215	1,218	1,224	1,226	1,230	1,230	1%	
% change	-1%	1%	0%	0%	0%	0%	0%	0%		
HV Commercial	379	408	443	483	517	525	522	518	7%	
% change	2%	8%	9%	9%	7%	1%	-1%	-1%		
Unmetered and streetlighting	26	24	23	22	22	22	22	22	1%	
% change	-12%	-8%	-5%	-2%	1%	0%	0%	0%		
Total	2,905	2,938	2,964	3,010	3,063	3,075	3,093	3,109	3%	
% change	1%	1%	1%	2%	2%	0%	1%	1%		



Table 3 Forecast consumption per customer (MWh)

	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	% change within regulatory period
	History	Fore	ecast		Forecas	t - regulator	y period		2024/25- 2028/29
Residential	6.85	6.76	6.67	6.62	6.60	6.53	6.54	6.56	-1%
% change	2%	-1%	-1%	-1%	0%	-1%	0%	0%	
LV Commercial	70.59	71.02	70.28	69.60	68.93	68.06	67.30	66.42	-5%
% change	0%	1%	-1%	-1%	-1%	-1%	-1%	-1%	
HV Commercial	10,230	10,774	10,523	10,384	10,204	10,091	10,032	9,953	-4%
% change	2%	5%	-2%	-1%	-2%	-1%	-1%	-1%	

Residential

Average residential electricity consumption per customer is forecast to be one per cent lower by the end of the next regulatory period (2028/29) compared to 2024/25 (Figure 5). This continues the long run fall in consumption per residential customer due to improved energy efficiency and solar PV. Energy efficiency is implicitly incorporated into the seasonal ARIMA model, reflecting historically observed trends in energy efficiency.



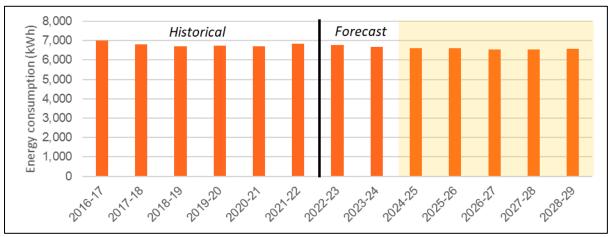


Figure 5 Average annual residential consumption per customer

Note: yellow highlighted period represents the 2024-29 regulatory control period.

LV commercial

The amount of electricity consumed per LV commercial customer is forecast to be five per cent lower by the end of the next regulatory period (2028/29) than in 2024/25 (Figure 6). Like residential consumption, the downward trend in LV commercial consumption per customer is expected to be offset to some extent by gas switching, which is expected to increase electricity consumption by one per cent in 2028/29 compared to the base line (equivalent to around 650 kWh per connection per year) before post modelling adjustments. In contrast Solar PV and improved energy efficiency are expected to reduce consumption by around two per cent in 2028/29 compared to the base line (equivalent to around 1,650 kWh per connection per year).

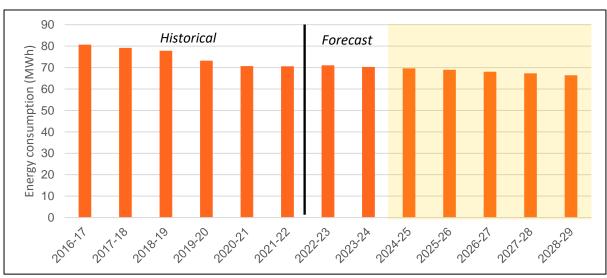


Figure 6 Average annual LV commercial consumption per customer

Source: Evoenergy's volume forecasting model.



HV commercial

The amount of electricity consumed per HV commercial connections is forecast to be three per cent lower by the end of the next regulatory period (2028/29) than in 2021/22 (Figure 7). Consumption per connection is expected to fall as new connections (during the 2024-29 regulatory period) are forecast to have lower consumption (per connection) than the stock of existing connections.

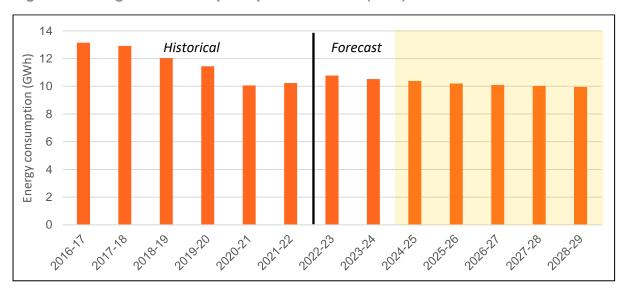


Figure 7 Average HV consumption per connection (kWh)

Source: Evoenergy's volume forecasting model.

Note: yellow highlighted period represents the 2024-29 regulatory control period.

Unmetered and streetlighting

The amount of electricity consumed per unmetered connection is forecast to stabilise following completion of a program converting ACT streetlights from incandescent to LED bulbs. Unmetered load consumption is forecast to grow by one per cent over the next regulatory period (2024/25 to 2028/29) (Figure 8).

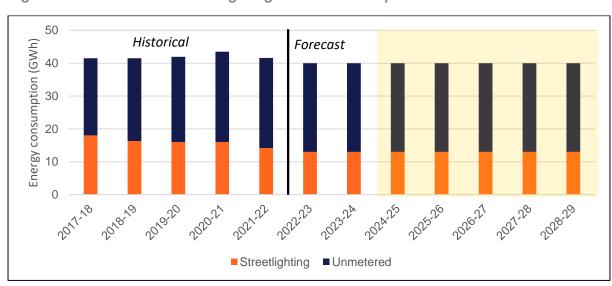


Figure 8 Unmetered and streetlighting annual consumption

Source: Evoenergy's volume forecasting model.



3. Customer numbers

Evoenergy engaged a consultant to also prepare a forecast of the number of customers connected to the ACT electricity network for the 2024–29 regulatory control period. The customer number forecasts have been separated into the three tariff classes: Residential, LV commercial and HV commercial.

This section provides a summary of the methodology used to derive the forecasts (section 3.1), followed by a description of the customer number forecasts (section 3.2).

3.1. Methodology

Two approaches have been used to forecast customer numbers for each tariff class.

- Residential and LV commercial customer numbers are forecast based on population growth projections. Customer numbers in both these categories have historically moved with population growth.
 - Forecasts are based on ACT population projections prepared by the Australian Government Centre for Population.¹⁵
 - Residential customer numbers are forecast by applying the linear relationship between population and customer numbers from historical data (2014 to 2021) to population projections. This approach assumes that future average household size and dwelling vacancy rates will be similar to the averages over this historical period.
 - LV commercial customer numbers are assumed to grow at the same rate as population.
- <u>HV commercial connections</u> are forecast based on historical trends and supplemented with information on planned and expected future connections. New connections and disconnection of existing customers are based on information provided by HV commercial customers to Evoenergy. This includes the timing and capacity of the connection/disconnection.

3.2. Forecasts

The total number of customers connected to the ACT electricity network is forecast to be around eight per cent higher by the end of the next regulatory period (2028/29) compared to 2021/22, which is the most recent full financial year of customer number data (Table 4). Residential customer growth is expected to account for the majority of the change in customers (around 91 per cent of growth to 2028/29), and remain the largest tariff class accounting for 92 per cent of Evoenergy's customers. An additional 14 HV commercial connections are expected between 2021/22 and 2028/29, which is a significant increase on the current number of HV commercial connections (which is 38).

¹⁵ Budget 2022-23: population projections, states and territories, 2021-22 to 2025-26, were used in the forecast which were the most up to date projections at the time of undertaking the analysis. For later forecast years, the model uses Budget 2022-23: population projections, Australia, 2021-22 to 2032-33, with an assumption around the ACT share of population growth.



Table 4 Forecast customer numbers

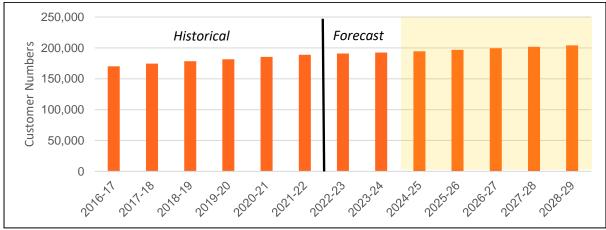
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	% change within regulatory period
	History	Fore	ecast		Forecas	t – regulato	ry period		2024/25- 2028/29
Residential	188,792	190,882	192,417	194,484	196,925	199,348	201,744	204,117	5%
% change	2%	1%	1%	1%	1%	1%	1%	1%	
LV Commercial	17,105	17,127	17,288	17,506	17,762	18,017	18,269	18,518	6%
% change	-1%	0%	1%	1%	1%	1%	1%	1%	
HV Commercial	37	38	42	47	51	52	52	52	12%
% change	0%	2%	11%	10%	9%	3%	0%	0%	
Total	205,935	208,046	209,747	212,037	214,738	217,417	220,065	222,687	5%
% change	2%	1%	1%	1%	1%	1%	1%	1%	



Residential and LV commercial

The number of residential customers is forecast to increase to 204,117 by 2028/29 (Figure 9), while LV commercial customers is forecast to increase to 18,518 (Figure 10), both of which are eight per cent higher than 2021/22.

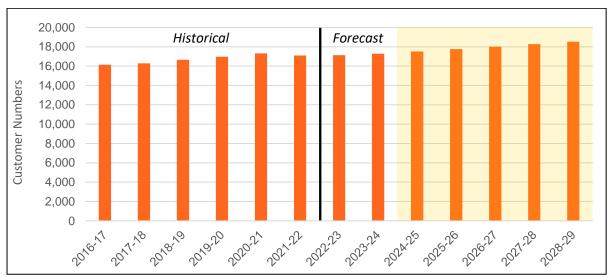
Figure 9 Residential customer numbers



Source: Evoenergy's volume forecasting model.

Note: yellow highlighted period represents the 2024-29 regulatory control period.

Figure 10 LV commercial customer numbers



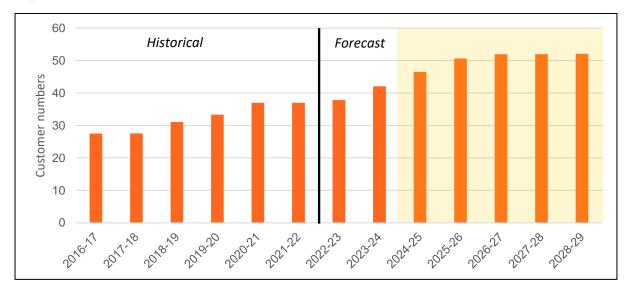
Source: Evoenergy's volume forecasting model.



HV Commercial

HV commercial connections are expected increase considerably to 2026/27, then stabilise (Figure 11). The additional connections are expected to be driven by data centres, water infrastructure, light rail and new government buildings.

Figure 11 HV commercial connection numbers



Source: Evoenergy's volume forecasting model.



4. Forecast exports

Exports from distributed energy resources (DER) are forecast to be around 70 per cent higher by the end of the 2024-29 regulatory period (2028/29) compared to 2021/22. This translates to an annual average growth rate of six per cent within the period. This will be driven by the forecast increase in the capacity of solar PV systems installed by residential customers. Exports were forecast based on historical solar capacity (MW) and generation (GWh) in the ACT. The forecast of net exports (generated by residential customers) to the Evoenergy network is presented in Figure 12 and Table 5.

Figure 12 Residential net export

Source: Evoenergy's volume forecasting model.

Note: yellow highlighted period represents the 2024-29 regulatory control period.

Table 5 Residential export customers and volumes

	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	% change within regulatory period
	History	Fore	ecast		Forecas	st - regulator	y period		2024/25- 2028/29
Export cust. (no)	31,614	40,483	44,660	48,428	51,833	55,218	57,997	60,141	24%
% change	43%	28%	10%	8%	7%	7%	5%	4%	
Export volumes (MWh)	116,132	131,358	145,842	157,963	168,891	181,789	191,595	198,428	26%
% change	37%	13%	11%	8%	7%	8%	5%	4%	

Source: Evoenergy's volume forecasting model.