2016 AEMO TRANSMISSION CONNECTION POINT FORECASTING REPORT

FOR QUEENSLAND

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AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

IMPORTANT NOTICE

Purpose

AEMO has prepared this document to provide information about its 2016 transmission connection point forecasts for Queensland, as at the date of publication.

AEMO publishes these connection point forecasts as requested by the Council of Australian Governments' energy market reform implementation plan.

This publication is based on information available to AEMO as at 20 July 2016, although AEMO has endeavoured to incorporate more recent information where practical.

Disclaimer

AEMO has made every effort to ensure the quality of the information in this publication but cannot guarantee that information, forecasts and assumptions are accurate, complete or appropriate for your circumstances.

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Acknowledgement

AEMO acknowledges Queensland network service providers' support, co-operation and contribution in providing data and information used in this publication.

Version control

Version	Release date	Changes
1	29/7/2016	

EXECUTIVE SUMMARY

AEMO has developed Maximum Demand (MD) transmission connection point forecasts for Queensland to provide insights to local changes and trends in MD from 2016 to 2025–26.

Together with the regional-level MD forecasts published in AEMO's *National Electricity Forecasting Report* (NEFR)[1], the forecasts provide an independent and transparent view of electricity demand in the National Electricity Market (NEM). This increased transparency is intended to lead to more efficient network investment decisions, and ultimately provide long-term benefits to energy consumers.

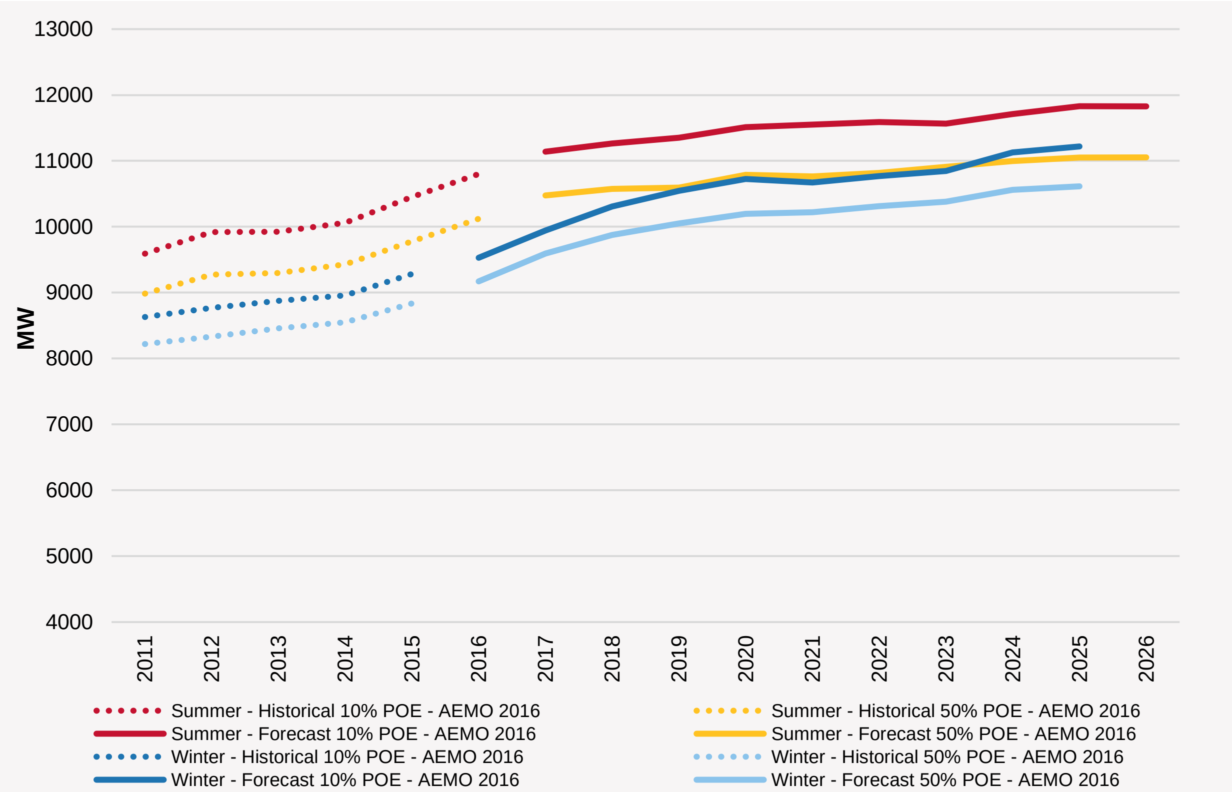
This report provides 10% and 50% probability of exceedance (POE)[2] MD forecasts, for both summer (2016–17 to 2025–26) and winter (2016 to 2025).

AEMO's forecasts of Queensland connection point MD show:

- Maximum demand is forecast to increase over the outlook period for both summer and winter.
- The growth rate is higher in winter than in summer.

Figure 1 shows the summer and winter MD forecasts. Table 1 summarises the average annual forecast rates of change and main drivers of the forecasts, and compares these 2016 forecasts to those published last year.[3]

Figure 1 AEMO summer and winter non-coincident forecasts for 10% POE and 50% POE



[1] AEMO. *2016 National Electricity Forecasting Report*. Available at: http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/National-Electricity-Forecasting-Report.

[2] Probability of exceedance (POE) is the likelihood that a maximum demand forecast will be met or exceeded. A 10% POE MD forecast is expected to be exceeded, on average, one year in 10. A 50% POE projection is expected to be exceeded, on average, one year in two.

[3] AEMO. *2015 AEMO Transmission Connection Point Forecasting Report for Queensland*. Available at: http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Transmission-Connection-Point-Forecasting.

Table 1 AEMO 2016 connection point forecast average annual rates of change, 10% POE

Category	Summer	Winter
Total connection point MD	0.7%	1.8%
Typical range of individual growth rates	-4% to 14.8%	-4.4% to 18.1%

Key features:

- **Overall transmission connection point MD in Queensland is expected to increase during the outlook period.**
- **Winter MD is forecast to grow at a faster rate than summer MD, due to lower energy efficiency impacts for heating compared to cooling appliances, as well as customers switching from using gas appliances to electric, primarily for space and water heating.**
- **Increased generation from new installations of solar photovoltaic (PV) systems and improvements in appliance energy efficiency are forecast to partially offset growth in consumer demand.**
- **Electricity consumption from Liquefied Natural Gas (LNG) export operations to continue growing until 2018.**
- **Increased electricity use forecast in the services/commercial sector as a result of growth in population and income.**

Compared to the 2015 forecasts[3]:

- **The AEMO 2016 summer forecast (10% POE) is 175 MW (2.2%) higher than AEMO's 2015 forecast at 2024–25, and the AEMO 2016 winter forecast (10% POE) is 260 MW (3.5%) higher than AEMO's 2015 forecast at 2024.**
- **This is attributed mainly to the collective effect of differences in energy efficiency impacts modelled in the 2016 NEFR MD forecast, compared to the 2015 NEFR. These impacts were included in the connection point forecasts through reconciliation to the 2016 NEFR**

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TABLES

FIGURES

1. INTRODUCTION

In its role as independent market and system operator, AEMO develops maximum demand (MD) forecasts for each transmission connection point, to provide a higher level of detail than AEMO's *National Electricity Forecasting Report* (NEFR) about changes in demand and observations on local trends.

Together with the regional level MD forecasts published in the NEFR, the transmission connection point forecasts provide an independent and transparent view of electricity demand in the National Electricity Market (NEM), supporting efficient network investment and policy decisions for the long-term benefit of consumers.

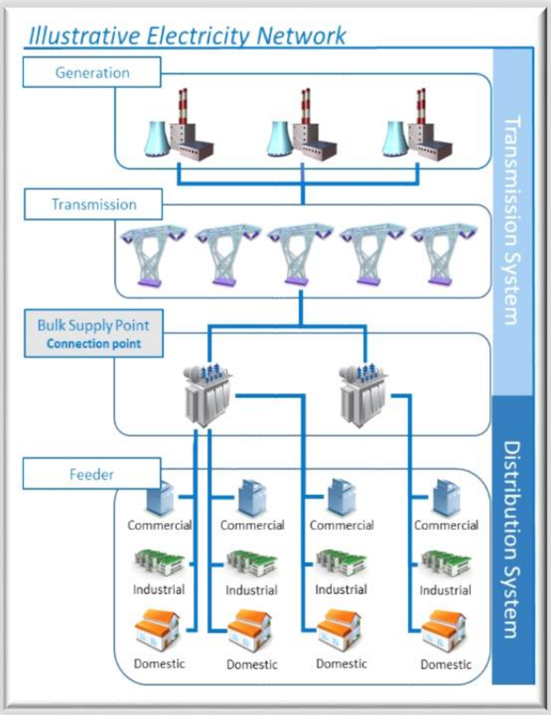
AEMO provides non-coincident forecasts in this report, because they represent the MD required for connection asset planning and also affect network planning. Non-coincident forecasts are the MD forecasts of a connection point, regardless of when the system peak occurs. Coincident forecasts are the MD forecasts of a connection point at the time system peak occurs.

1.1 Connection point definition

AEMO's connection point forecasting methodology[4] defines a transmission connection point as the physical point at which the assets owned by a transmission network service provider (TNSP) meet the assets owned by a distribution network service provider (DNSP), as illustrated (right).

These may also be known as bulk supply points (BSPs), terminal stations, or exit points, and in the NEM's market metering and settlements processes they are called transmission node identities (TNIs).[5]

Connection points may be connected to one another at the distribution network level. In situations where this interconnectivity is extensive, AEMO develops a forecast for the aggregated load.



1.2 Forecast scope

The forecasts in this report:

- Apply to active power in megawatts (MW) at each connection point (see Section 1.3 for information about accessing reactive power estimates).
- Exclude transmission system losses and power station auxiliary loads.

Embedded generators, which are mentioned in the dynamic interface (see Section 1.3), are assumed to be off at the time of forecast MD.

Where there is just one customer at a connection point, AEMO has only published forecasts if the customer has given permission.

[4] AEMO, *Transmission Connection Point Forecasting Methodology 2016*. Available at: http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Transmission-Connection-Point-Forecasting.

[5] For a complete list of TNIs, refer to *List of Regional Boundaries and Marginal Loss Factors for the 2016-17 Financial Year*. Available at: http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/Loss-factor-and-regional-boundaries.

1.3 Supplementary information on AEMO's website

Supplementary information to this report is available on AEMO's website.[6]

Resource	Description
Dynamic interface **http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Transmission-Connection-Point-Forecasting**	An Excel workbook with the following information for each transmission connection point: • Historical and forecast MD, including 10% POE and 50% POE, for active power. • Coincident and non-coincident values. • High-level commentary. • The option to export all forecast and historical data.
Reactive power system forecast spreadsheet **http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Transmission-Connection-Point-Forecasting**	Separate spreadsheet for reactive power forecasts at each transmission connection point, providing complementary information for power system studies.
Interactive planning map **http://www.aemo.com.au/aemo/apps/nem_map/index.php**	The interactive map complements AEMO's planning publications to enhance readability and clarity. The map contains various layers, including layers displaying forecasts and planning information.
Transmission Connection Point Forecasting Methodology 2016 **http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Transmission-Connection-Point-Forecasting**	The current AEMO transmission connection point forecasting methodology outlines the process through which the forecasts were developed.

1.4 Improvements to the forecasting methodology

Since publishing the 2015 forecasts, AEMO has completed process improvements focussed on data management and improved analytical capability. These will set the foundation for the next program of modelling and methodological improvements.

AEMO's *Transmission Connection Point Forecasting Methodology 2016*[4] represents the current state of AEMO's transmission connection point forecasting methodology, and was employed to develop the forecasts presented in this report.

The key changes implemented in the 2016 forecast compared to 2015 are summarised in Table 2.

Table 2 Improvements implemented for Queensland connection point forecasts, since 2015 forecast

Improvement description	Approach	Benefit	Implemented
Investigate opportunities to improve the reconciliation process.	Reconcile the non-coincident forecasts to the general rate of change of the system forecast, rather than derive them from coincident forecasts using diversity factors.	Regional-level drivers of growth are included by reconciling to the growth rate.	Yes

[6] Supplementary information is available at http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Transmission-Connection-Point-Forecasting.

2. RESULTS

2.1 Background

Historically, in Queensland:

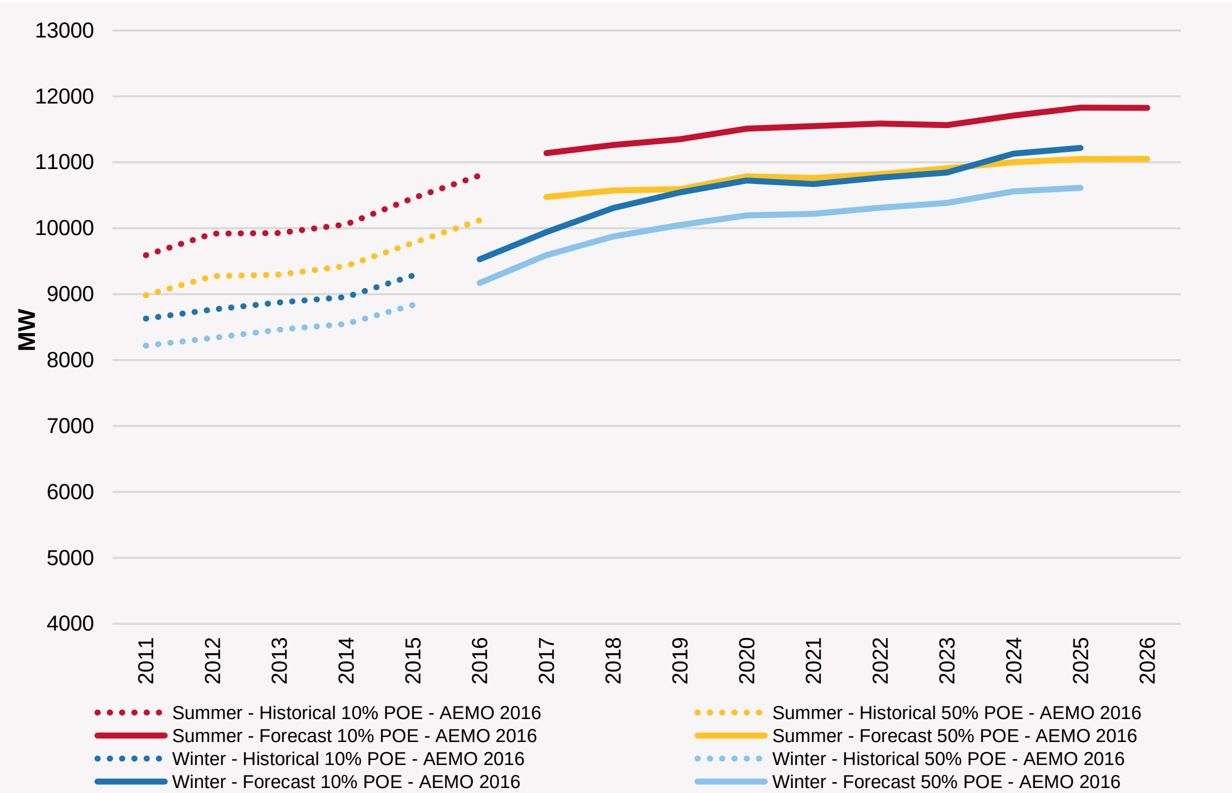
- Summer and winter MD increased, with a period of lower demand from 2012 to 2014.
- Queensland has historically exhibited higher MD in summer than in winter, due to widespread use of cooling appliances.
- Recent increase due to ramp up in Liquefied Natural Gas (LNG) exports.

2.2 Aggregated AEMO 2016 connection point forecasts

AEMO's aggregated forecasts of Queensland connection point MD (see Figure 2) show:

- Both winter and summer connection point MD for Queensland to continue to grow over the outlook period, with winter having a higher rate of growth than summer.
- Regional average annual growth over the summer outlook period is increasing at 0.7% and 0.6% for the 10% and 50% POE forecasts respectively, and at 1.8% and 1.6% for the 10% and 50% POE forecasts respectively in winter.

Figure 2 AEMO's aggregated, non-coincident 2016 forecasts



The forecasts are reconciled to AEMO's 2016 NEFR, which incorporates the effects of forecast population growth, increases in electricity prices, fuel switching, appliance usage, manufacturing, rooftop solar photovoltaic (PV) systems, and energy efficiency in appliances and buildings.

Key insights from the aggregate-level forecasts are:

- Electricity consumption from LNG export operations in Queensland is forecast to continue growing until 2018.
- Improvements in appliance and building energy efficiency, as well as increasing generation from new installations of PV systems, are forecast to offset growth in consumer demand.
- Population growth is seen as the key driver in consumer demand at the power point, with increased uptake and usage of electric appliances also playing an important role.
- Increased electricity use forecast in the services/commercial sector, due to increases in population and income.
- Energy efficiency savings for air-conditioners are forecast to be higher than for many other appliances, thereby lessening the impact of increasing uptake in space cooling on summer MD. Older, less-efficient air-conditioners are expected to be replaced with newer types so less electricity is required for cooling on hot, high demand days. The savings are forecast to impact residential and commercial MD to a greater extent than industrial MD.
- Energy efficiency impacts are more prevalent in cooling loads in summer than in heating loads in winter. Due to the penetration of reverse-cycle air-conditioning, majority of homes have the ability to use electricity for space heating. Gas to electric appliance switching is expected to occur as consumers begin to pursue this option for heating, primarily for space and water heating leading to a projected growth in winter MD in the outlook period.
- Increasing generation from PV is forecast to both reduce MD and move the time that the peak occurs to later in the day.
- The difference between 10% and 50% POE levels in summer is slightly higher than that of winter, demonstrating that summer MD exhibits greater year-to-year variability than winter MD.

2.3 Individual AEMO 2016 connection point results and insights

While aggregated demand for both summer and winter is forecast to increase, individual connection point forecasts[7] increase at some locations, and decrease at others, due to various drivers.

Table 3 shows connection points with average annual increases or decreases of more than 3%, as well as the drivers of demand. Appendix A shows plotted individual 10% POE rates of change for each connection point in Queensland.

Key features of the summer forecasts are:

- Forecast average annual rates of change for 10% POE are between -4% (Runcorn) and +14.8% (Nebo). Drivers are listed in Table 3.
- 81% of connection points show positive growth or no growth over the outlook period for their 10% POE average annual rates, with 52% of these having small growth rates between 0.0% and 1.0%.
- Of the four connection points with summer growth above 3%, all have either new loads connected or transferred over the outlook period.

Key features of the winter forecasts are:

- Forecast average annual rates of change for 10% POE are between –4.4% (Pioneer Valley) and +18.1% (Nebo) and. Drivers are listed in Table 3.
- 91% of connection points are forecast to have positive growth or no growth for their 10% POE average annual rates. Of these, 13% have a growth rate between 0.0% and 1.0%.

[7] Refer to the dynamic interface for detailed information on individual connection points. Available at: http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Transmission-Connection-Point-Forecasting.

- Of the 20 connection points with growth rates above 3%, 10 have either new loads connected or transfers from other connection points over the outlook period.

Table 3 Drivers at connection points with average annual increase or decrease greater than 3%[a]

Season	Forecast MD increase greater than 3%	Forecast MD decrease greater than 3%
Summer MD	**Biloela:** Due to block load being connected. **Collinsville Load:** Due to block load being connected. **Moranbah (Town):** Load transfer from Moranbah (Mine) **Nebo:** Due to block load being connected.	**Runcorn:** Due to historical decline in demand.
Winter MD	**Bulli Creek (Waggamba):** Due to population and economic growth. **Richlands:** Due to population and economic growth. **Bundambda:** Due to population and economic growth. **Goodna:** Due to population and economic growth. **Edmonton:** Due to population and economic growth. **Chinchilla:** Due to population and economic growth. **Calliope River:** Due to block load being connected. **Alan Sherriff:** Due to population and economic growth. **Proserpine:** Due to block load being connected. **Tully:** Due to population and economic growth. **Rockhampton Loop:** Due to population and economic growth. **Turkinje:** Due to block loads being connected. **Abermain – Middle Ridge Loop:** Due to population and economic growth. **Tangkam (Dalby):** Due to block load being connected **Biloela:** Due to block load being connected. **Kamerunga:** Due to block load being connected **Collinsville Load:** Due to block load being connected. **Moranbah (Town):** Load transfer from Moranbah (Mine). **Bowen North:** Due to block load being connected. **Nebo:** Due to block load being connected.	**Pioneer Valley:** Due to block load being disconnected. **Runcorn:** Due to historical decline in demand.

[a] 3% is set to capture extreme rates. Major industrial loads are excluded due to confidentiality.

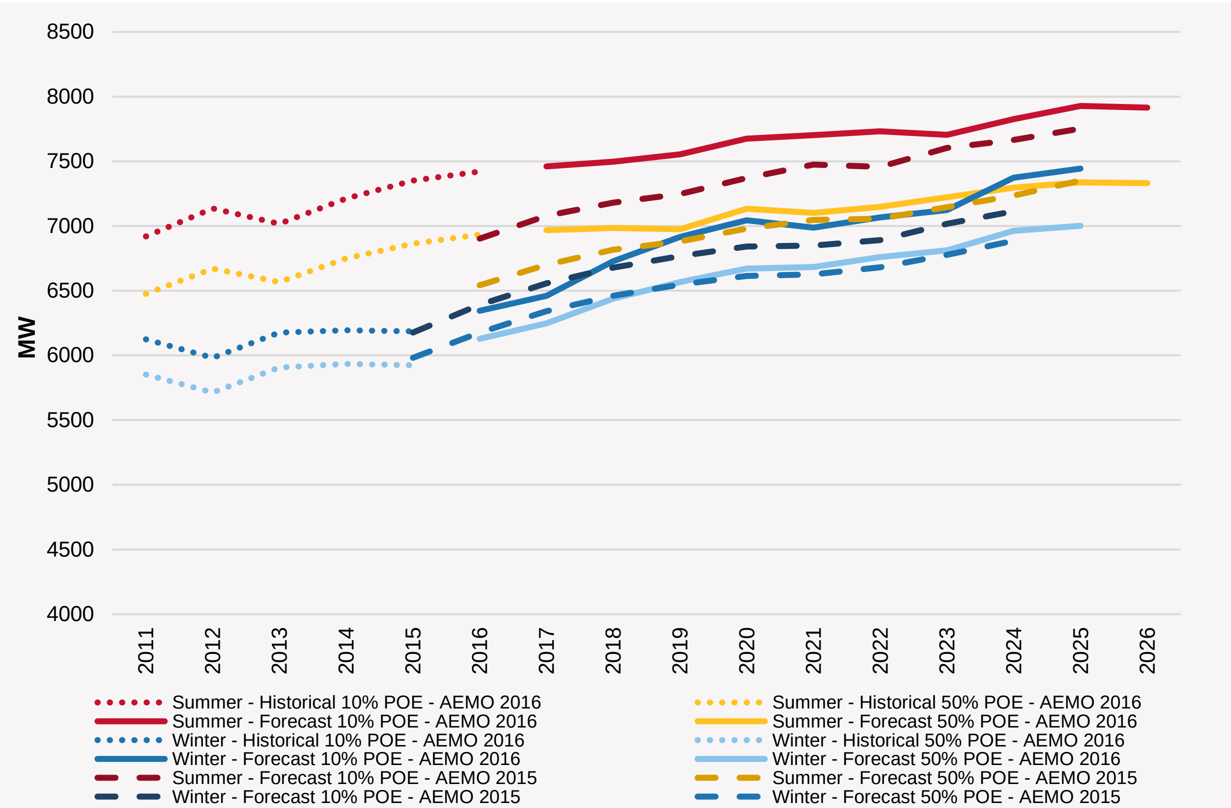
2.4 Comparison of AEMO's 2015 and 2016 forecasts

AEMO's aggregated 2015 and 2016 connection point MD forecasts for Queensland are plotted in Figure 3, and the growth rates are compared in Table 4.

- Summer 10% POE MD forecasts are 2.2% higher compared to 2015 forecast at 2024–25.
- Winter 10% POE MD forecasts are 3.5% higher compared to 2015 forecast at 2025.

Reasons for these changes are summarised in Table 5.

Figure 3 AEMO 2015 and 2016 (10% and 50% POE) non-coincident connection point MD forecasts (excluding direct-connect loads) [a]



[a] The figure excludes direct transmission-connected customer load forecasts which are not distribution-connected and not included in DNSP distribution network forecasts. Connection point forecasts by DNSPs are used as the basis for comparison in both Figure 3 and Figure 4.

Table 4 Region-level average change rates (10% POE)

Forecast	2015 Region level average annual change rate	2016 Region level average annual change rate
Summer MD	1.3%	0.7%
Winter MD	1.6%	1.8%

Table 5 Differences between AEMO 2015 and 2016 forecasts (10% POE)

Forecast	Differences between AEMO 2015 and 2016 aggregated MD forecasts (10% POE)
Summer MD	AEMO's 2016 connection point forecast is 2.2% (175 MW) higher than the previous forecast at 2024–25.
Winter MD	AEMO's 2016 connection point forecast is 3.5% (260 MW) higher than the previous forecast at 2025.
Key drivers for change: • Increased impact of energy efficiency in buildings and new appliances, in the 2016 NEFR, in contrast to the impacts modelled in the 2015 NEFR. These differences are attributed to changes in NEFR forecasting methodology. • The growth rate projection for the manufacturing sector was lower in the 2016 NEFR when compared to the previous report, reflecting the results of additional industry analysis over the past year. • Continued growth in electricity consumption from Liquefied Natural Gas until 2018. • Forecast increase in electricity use in the service/commercial sector due to growth in population and income. • Methodology changes in the connection point forecasting process, as outlined in Table 2 above.	

2.5 Comparison of AEMO 2016 forecasts and DNSP 2016 forecasts

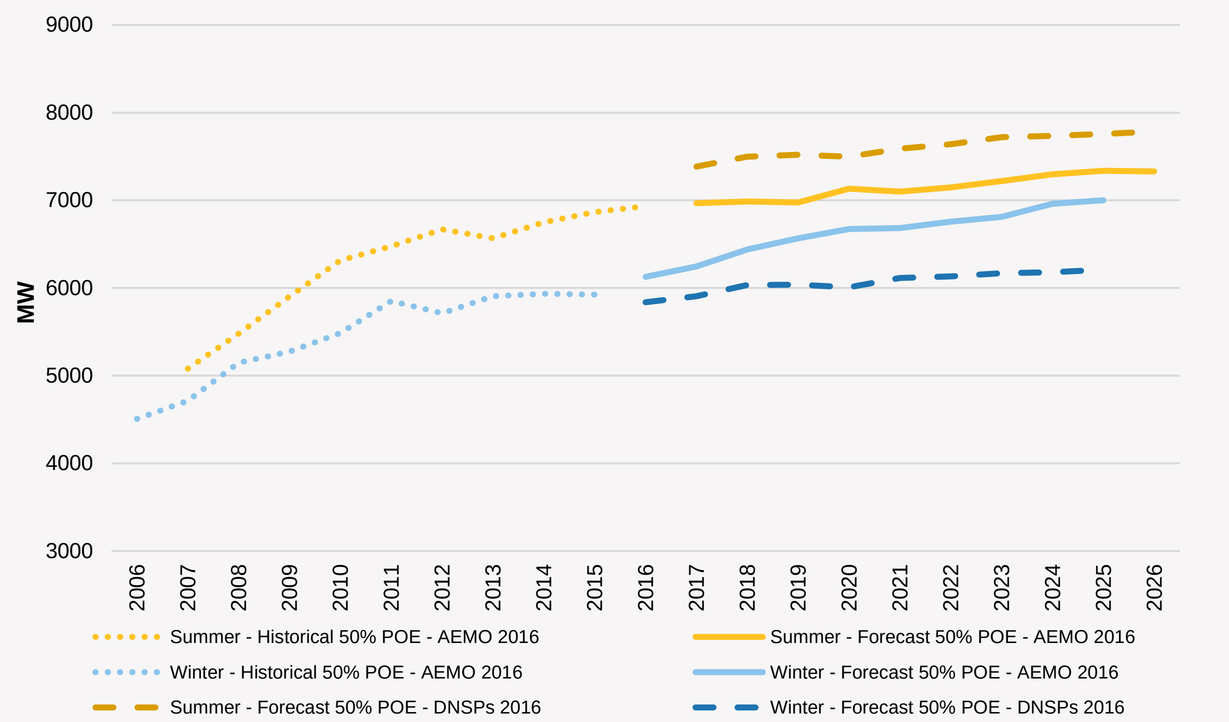
Comparisons are made against the DNSP forecasts from the 2016 transmission annual planning report published by Powerlink.

At the end of the outlook period:

- AEMO's Queensland summer connection point MD forecasts are 6.2% lower than that of the DNSP (50% POE)
- AEMO's forecast is 11.3% higher than the DNSP's winter 50% POE forecast.

Figure 4 plots the comparison. It shows that the DNSP 50% POE forecast for summer is higher than AEMOs summer 50% POE forecast. Compared to AEMO, the DNSP has a higher starting point but has a similar growth rate over the forecast period. This is attributed to AEMO forecasting higher energy efficiency gains in cooling loads. The DNSP 50% POE forecast for winter is much lower than AEMO's 50% POE winter forecast due to AEMO forecasting a higher growth rate over the forecast period. This higher growth rate is attributed to AEMO projecting lower energy efficiency gains for heating loads, and fuel-switching from gas to electricity.

Figure 4 AEMO and DNSP aggregated, non-coincident 50% POE forecasts



[a] The figure excludes direct transmission-connected customer load forecasts which are not distribution-connected and not included in DNSP distribution network forecasts. Connection point forecasts by DNSPs are used as the basis for comparison in both Figure 3 and Figure 4.

The key differences between the 2016 AEMO forecasts and the DNSP forecasts are summarised in Table 6. Table 7 summarises key areas contributing to these differences.

Table 6 Differences between AEMO and Queensland DNSP forecasts

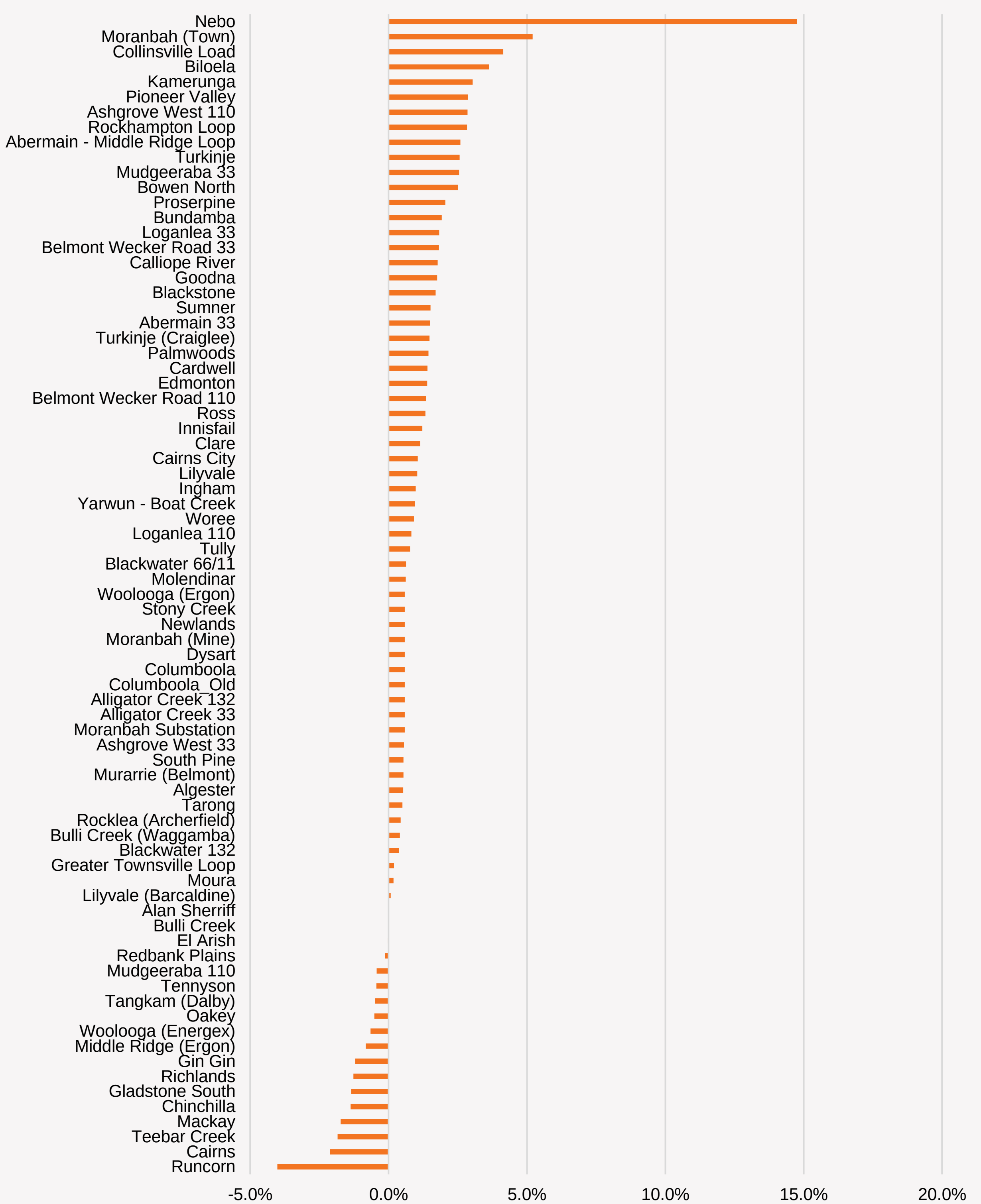
Forecast	Differences between AEMO and DNSP aggregated MD forecasts (50% POE)
Summer MD	AEMO's connection point forecast is 6.2% (454 MW) lower than the Queensland DNSP forecast at 2025–26.
Winter MD	AEMO's connection point forecast is 11.3% (793 MW) higher than the Queensland DNSP forecast at 2025.

Table 7 Identified differences between AEMO and Queensland DNSP methodologies

Description	AEMO	Queensland DNSPs
Reconciliation to state level forecasts	AEMO has reconciled its connection point MD forecast to the 2016 NEFR growth rate. This rate includes the effects of energy efficiency modelled in the NEFR.	Forecasts of the DNSPs are usually reconciled to system-level forecasts of each DNSP network.
Forecast development	AEMO bases its forecasts on the historical trend of weather-normalised MD.	DNSPs employ a similar approach to AEMO however differences exist in variable selection, weather station selection, and historical trending.
Rooftop PV	AEMO calculates post model adjustments based on forecast installed capacity from the NEFR. Forecasts are reconciled to the 2015 NEFR Update forecasts.	DNSPs calculate post model adjustments based on their own forecasts of rooftop PV impact. DNSP reconciles to the distribution level forecasts.

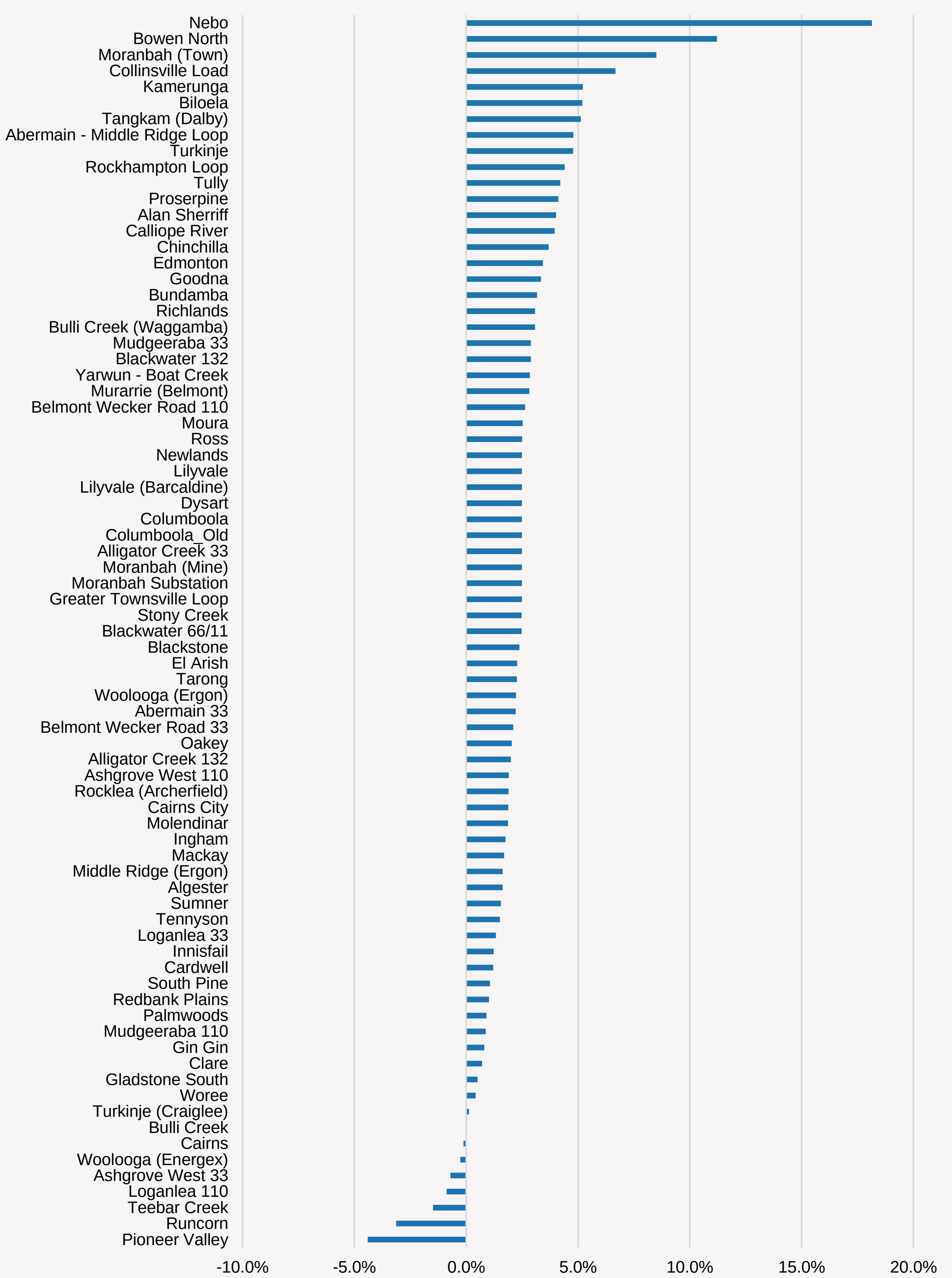
APPENDIX A. GROWTH RATES BY CONNECTION POINT

Figure 5 Queensland 10% POE summer 10-year average annual growth rates, 2016–17 to 2025–26[a]



[a] Some direct-connect industrial loads are excluded due to confidentiality.

Figure 6 Queensland 10% POE winter 10-year average annual growth rates, 2016 to 2025[a]



[a] Some direct-connect industrial loads are excluded due to confidentiality.