COMMERCIAL IN CONFIDENCE

FINAL REPORT

# CitiPower and Powercor maximum demand forecasts

*Prepared for*
*CitiPower and Powercor*

*12 March 2019*

**THE CENTRE FOR INTERNATIONAL ECONOMICS**
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**CANBERRA**

Centre for International Economics
Ground Floor, 11 Lancaster Place
Majura Park

Canberra ACT 2609
GPO Box 2203
Canberra ACT Australia 2601

Telephone +61 2 6245 7800
Facsimile +61 2 6245 7888
Email cie@TheCIE.com.au

Website www.TheCIE.com.au

**SYDNEY**

Centre for International Economics
Level 7, 8 Spring Street
Sydney NSW 2000

Telephone +61 2 9250 0800
Email ciesyd@TheCIE.com.au

Website www.TheCIE.com.au

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# Summary

The CIE has been asked to prepare updated forecasts of maximum electricity demand for 17 Powercor[1] and 8 CitiPower terminal station areas, previously prepared in July 2015.

- Forecasts are produced for actual demand for the relevant spatial area. This demand can be served through the terminal station or through embedded generation.[2]
- Forecasts are also produced for demand served by the terminal station, which removes the demand that can be served by major embedded generators and changes in small-scale solar embedded generation.

The overall approach is broadly unchanged from that used in the previous forecasts prepared by the CIE and is consistent with the best practice methodology described by ACIL Allen in their 2013 Report to the Australian Energy Market Operator (AEMO) for connection point forecasting.[3] Our methodology is a two-step process; first, estimating a model of average demand and second, estimating a model of distributional demand, dependent on calendar effects (time of day and week) and climatic effects. This approach is similar to the approach used be AEMO to produce the National Energy Forecast Insights and Electricity Statement of Opportunities.[4]

Chart 1 illustrates the forecasting process, highlighting the combination of the average demand model and distributional demand model in producing per capita forecasts of electricity demand for a terminal station.

The key differences between our 2015 and the 2018 forecasts presented in this report are as follows.

- The average demand model has been re-estimated, incorporating electricity demand data up to Summer 2017/18 from Powercor and CitiPower.
- Installed solar PV capacity installed has been included as a variable in average demand estimates.
- Where estimated income or price elasticities are implausible, we use an assumed elasticity.

1 Not including the KTS total forecasts, which are forecasts of maximum demand in the pooled demand of KTS East and West.

2 In practice we are only able to measure demand served by a terminal station plus demand served by major embedded generators. Demand served from solar, for example, is not measured at sufficient frequency for our analysis.

3 ACIL Allen 2013, *Connection Point Forecasting: A Nationally Consistent Methodology for Forecasting Maximum Electricity Demand*

4 AEMO 2018, *Demand Forecasting Methodology Information Paper, for the 2018 Electricity Statement of Opportunities for the National Electricity Market*.

- Where requirements for the statistical error correction model are not met for a given terminal station, we forecast average demand using a long run relationship.
- Drivers of average demand have been updated with the most recent projections.
- We have incorporated updated block load forecasts from Powercor and CitiPower.
- Updated forecasts of disruptive technologies prepared by Oakley Greenwood have been included in post-modelling adjustments.

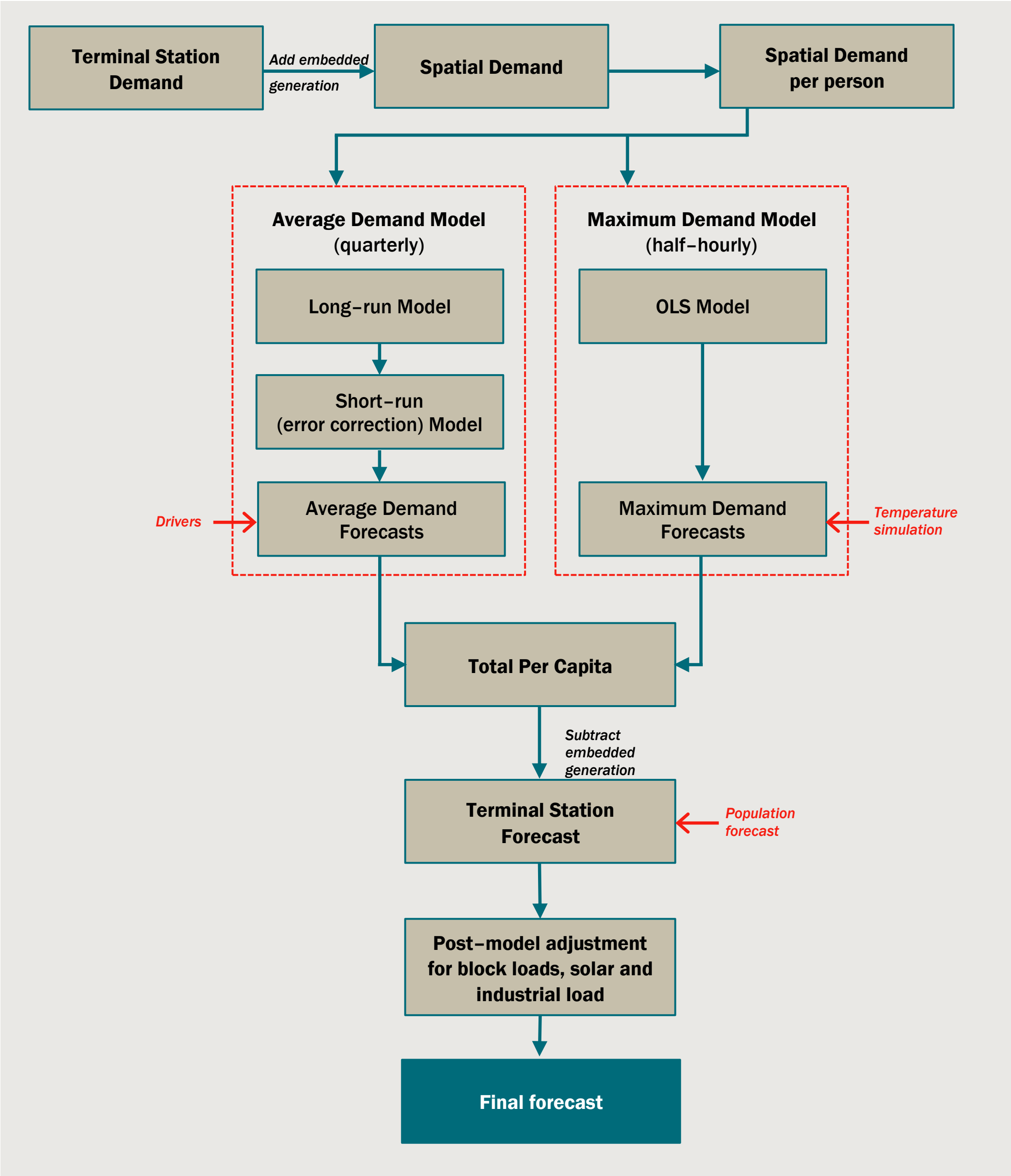
Our forecasts are based on a statistical model, which estimates the historic relationship between demand drivers (such as income and electricity prices in the average demand model and temperature in the maximum demand model). We find that in general our model performs well in out-of-sample forecasting, with predicted average and maximum demand generally tracking actual demand.

In any forecasting exercise there will be forecast errors and these forecasts are subject to some uncertainty. Forecast errors arise because:[5]

- of errors in the data used to build the historical model
- of errors in the estimation technique and model used
- the relationship between a driver of demand (such as price) and demand may change over time
- of errors in forecasts of drivers (such as population growth), and
- of errors in post modelling adjustments such as solar PV forecasts.

5 See Hendry, D. and M. Clements 2001, "Economic forecasting: some lessons from recent research", *Economic modelling*, vol. 20(2), pages 301-329, March for a full taxonomy of forecast errors.

### 1 Forecasting process




Data source: The CIE.

## *Forecasting quarterly average electricity demand*

Demand forecasting has two components:

1. Establishing quantitative, historical relationships between demand drivers and demand
2. Projecting the driver variables and calculating estimates of demand based on the historical relationships.

In putting these components together to forecast average demand, we use an approach consistent with the best practice methodology described by ACIL Allen in their 2013 Report to AEMO. This involves:

- using quarterly average electricity demand;
- estimating econometric models to quantify the relationship between average quarterly electricity demand and certain economic, demographic and temperature variables; and
- applying future values for these variables to generate forecasts.

There are a number of differences between our approach and AEMO's current connection point forecasting methodology. The main difference between our approach and AEMO's is that we estimate demand based on forecast drivers, whereas AEMO's approach is to forecast based on observed trends in the data which is then reconciled to regional forecasts which incorporate some drivers.  This assumes that at the terminal station level, that historical trends will be repeated into the future.  Therefore, we are able to account for changes in drivers at the terminal station level.

Our econometric approach combines long-run relationships and short-run relationships through using an Error Correction Model (ECM).

Forecasting average electricity demand depends on projections of driver variables, and our specification of the model is limited to variables for which independent projections are available. There is little value in including demand drivers, which are subject to as much or greater forecast difficulties as electricity demand.

Additionally, to reflect the uncertainty of projections of drivers, we forecast average demand under different economic scenarios reflecting different long-term paths of driver variables.

## *Forecasting summer, winter and annual maximum electricity demand*

Maximum electricity demand is the highest demand (in megawatts) experienced by the system in any half hour period. Our modelling of maximum demand uses 96 separate half-hourly models (48 each for summer and winter) to predict demand at different times of the day, which is expressed as the deviation from average demand in the relevant quarter (maximum demand is a combination of average demand and estimates from the maximum demand model). This allows for relationships between the temperature and calendar variables to vary throughout the day and between seasons. This follows the approach of Hyndman and Fan that has previously been used by AEMO.[6]

There is a larger sample size available for the maximum demand models than the average demand models by virtue of the fact that observations are more frequent (half hourly). The maximum demand model for each half hour period uses daily observations of

6 Hyndman, R. and S. Fan 2009, *Density forecasting for long term peak electricity demand*, IEEE Transactions on Power Systems, 25(2).

demand for a given season over the 10 years of available historical demand. This gives considerably greater scope to the maximum demand model to include more variables compared to average demand model, which are estimated with around 45 quarterly observations.

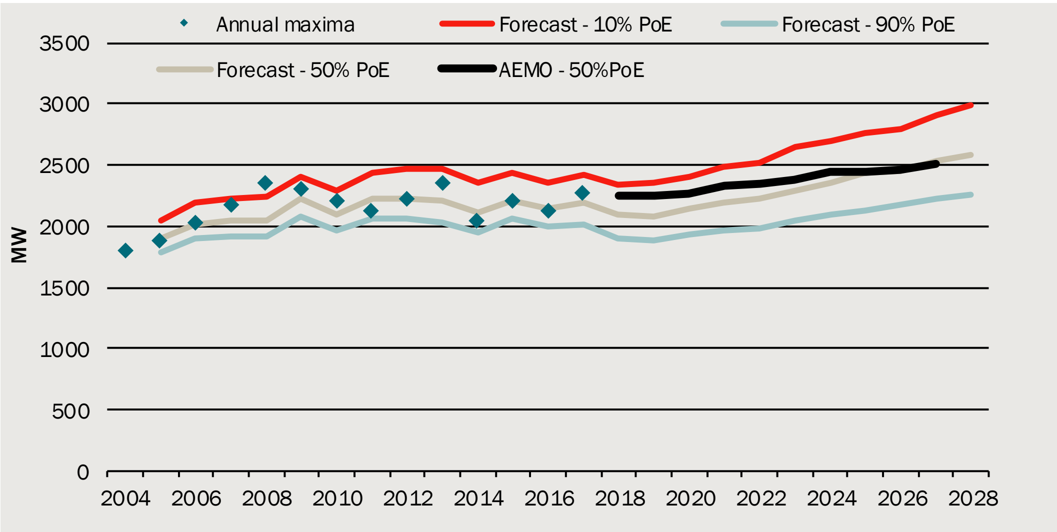
In order to forecast maximum demand, we project the variables used in models of historical demand into the future. Weather, however, cannot be accurately forecasted over the time horizon required so instead is simulated.[7]

This approach involves simulating future weather, sampling for historical weather data, to obtain predicted maximum demand (expressed as a deviation from average demand) for 1000 summers and winters for each forecast year. We then combine the results of the simulation with our forecasts of average quarterly electricity demand, which gives a distribution of maximum demand for each year of the forecast period. From the distribution of weather outcomes for a given year, we can predict maximum demand through Probability of Exceedance (PoE) forecasts. This process is implemented in Microsoft Excel.

## *Summary results, including post-modelling adjustments*

CIE maximum demand forecasts, including post-modelling adjustments, are a little stronger than AEMO's forecasts (charts 2 and 3). Future demand is expected to be driven by population growth, higher incomes, moderating prices and the increasing temperature sensitivity of demand. AEMO's Powercor forecast has a higher starting point and similar end point to the CIE's, resulting in CIE maximum demand growing at a slightly faster rate. A similar pattern is evident with the CitiPower network forecasts, although starting points are similar and diverge slightly overtime, with the CIE end point above AEMO's.

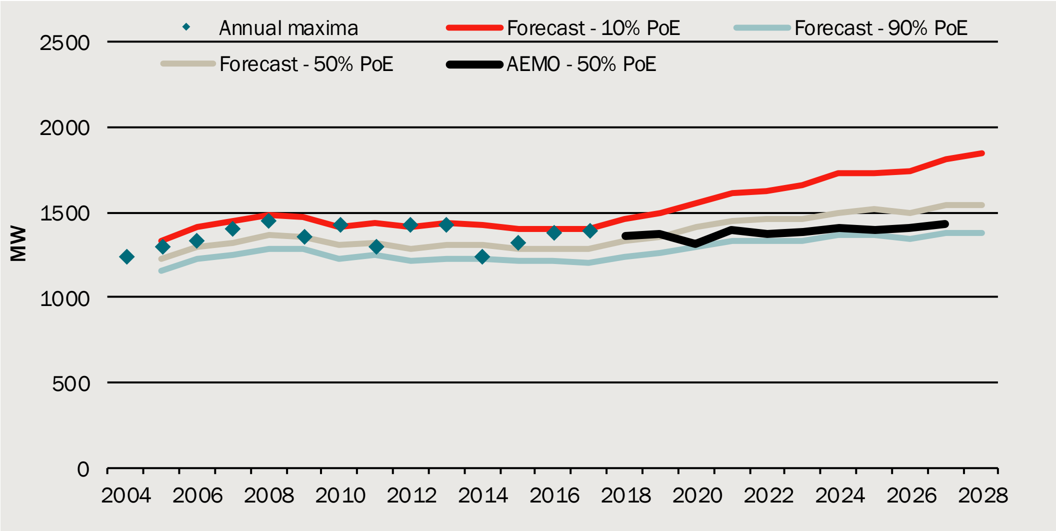
**2 Total Powercor annual maximum demand forecasts**




*Note:* Includes post modelling adjustments. Actuals maxima do not include embedded generators.
*Data source:* AEMO, The CIE.

7 Ibid.

## 3 Total CitiPower annual maximum demand forecasts



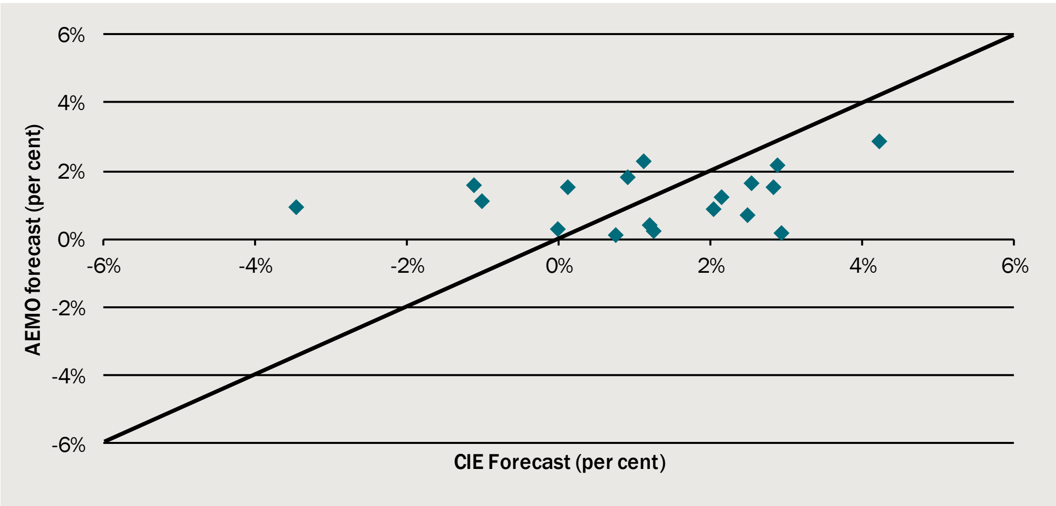

*Note:* Includes post modelling adjustments. Actuals maxima do not include embedded generators.

*Data source:* AEMO, The CIE.

Across terminal stations there is a similar pattern, with CIE maximum demand forecasts by terminal station generally higher than AEMO's (lying to the right of the 45° line in charts 4 and 5).

There are, however, several outliers. The CIE forecast predicts annual growth of -3.5 percent for WETS, compared to 0.9 per cent by AEMO. The CIE's negative growth forecast is due to an adjustment for two committed embedded generators expected to impact on WETS from 2018 onwards (Bannerton Solar Farm and Wemen Solar Farm); this does not appear to have been accounted for in AEMO's forecasts.

## 4 AEMO vs CIE maximum demand annual growth rate 2017/18 to 2027/28, Powercor terminal stations

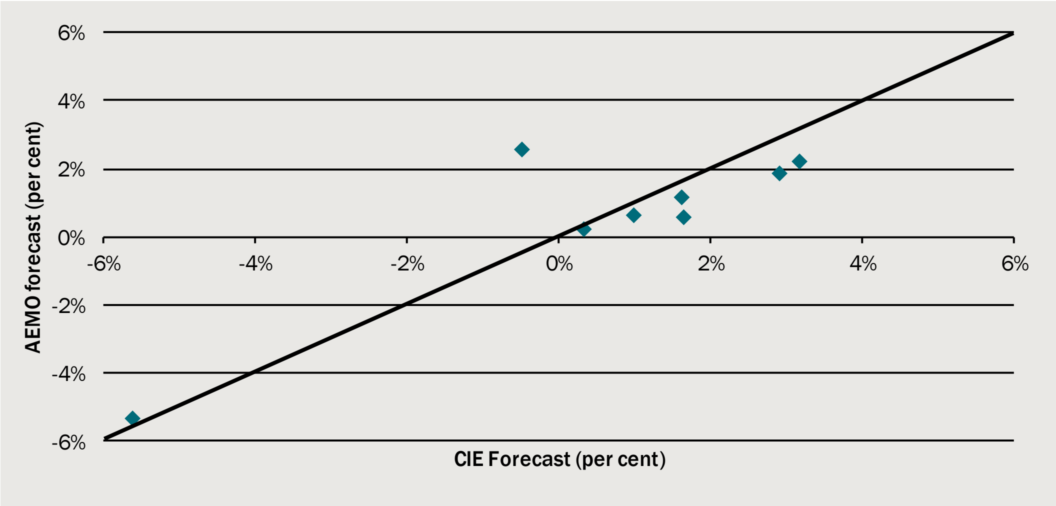



*Note:* CIE forecasts include post-modelling adjustments.

*Data source:* AEMO, The CIE.

For CitiPower, AEMO predicts BTS22 maximum demand will grow at over 2 per cent per annum, while CIE forecasts predict demand remaining flat due to the large expected uptake of solar PV in the terminal station area. In 2028, the solar PV adjustment is expected to be around 30 per cent of maximum demand estimated before post modelling adjustments.

### 5 AEMO vs CIE maximum demand annual growth rate 2017/18 to 2027/28, CitiPower terminal stations



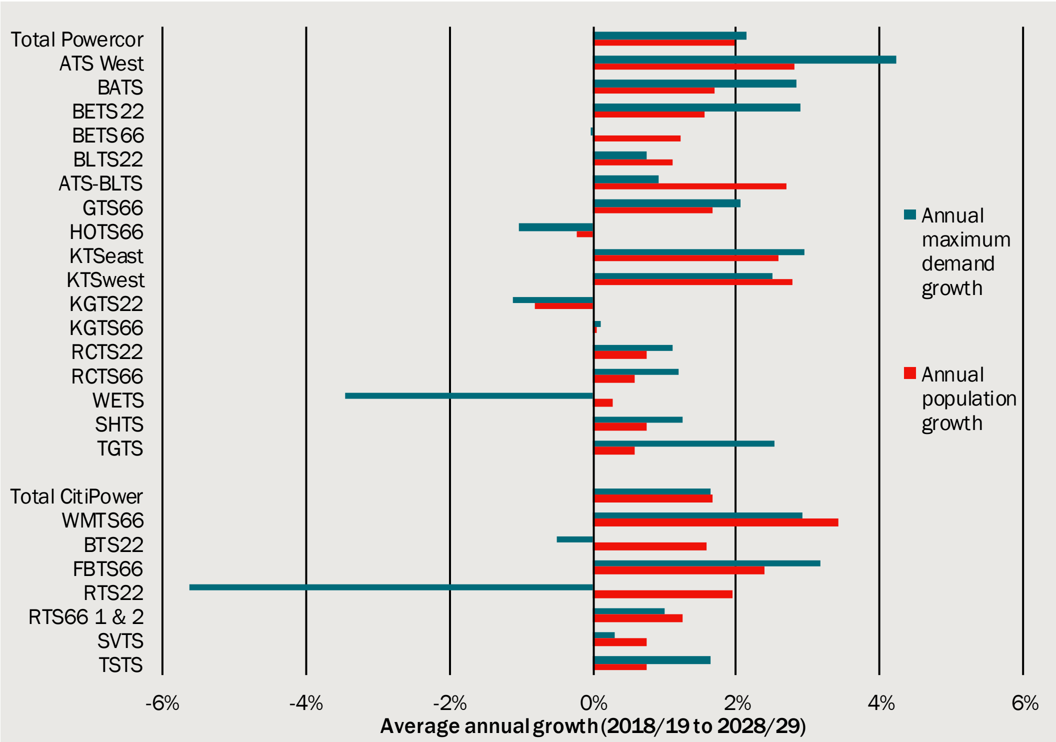

*Note:* CIE forecasts include post-modelling adjustments. RTS66 3 4 was excluded from this graph for presentation; CIE and AEMO expect maximum demand to fall by 15 an 11 per cent respectively.

*Data source:* AEMO, The CIE.

Per capita average demand is expected to remain relatively flat across terminal stations. Accordingly, average demand growth tends to reflect population growth (terminal stations with higher population growth tend to have higher average demand growth, chart 6).

Some of the AEMO forecasts do not appear to align with expected population growth patterns. CIE forecasts predict maximum demand for HOTS66 and KGTS22 will fall by around 1 per cent per annum consistent with falling population in those terminals station areas, but AEMO has demand increasing by between 1 and 1.6 per cent. It is unclear what is causing this difference. Similarly, AEMO expects maximum demand to be flat for KTS East while CIE forecasts predict annual growth of 2.9 per cent, which is consistent with annual population growth of around 2.6 per cent over the forecast horizon.

### 6 Maximum demand growth vs population growth




*Note:* CIE forecasts include post-modelling adjustments. RTS66 3 4 was excluded from this graph for presentation; CIE and AEMO expect maximum demand to fall by 15 an 11 per cent respectively.

*Data source:* The CIE, Victorian Department of Environment, Land, Water and Planning.

The difference between CIE and AEMO maximum demand forecasts are likely due to two key factors:

- CIE forecasts are based on a statistical model, which estimates the historic relationship between demand drivers such as income, population, electricity prices and temperature. Forecasts can be considerably higher than the historical trend, as they reflect expected changes in demand drivers, which may be expected to grow at rates different to their historic growth rate. AEMO's connection point forecasts in contrast relies on extrapolating historical trends in demand into the future and then reconciling the data to regional forecasts which account for actual drivers. AEMO's forecasts are based on trends from a period of high price growth and flat demand, which may not account for future conditions.
- CIE estimates are also likely to be stronger than AEMO's due to our methodology allowing for peak and average demand to grow at different rates, which is consistent with the historical relationship where maximum demand has grown at a faster rate than average demand. AEMO has previously indicated that this trend is not statistically significant, which is at odds with results from our model.[8]

[8] AEMO 2014, *Forecasting Methodology Information Paper*, p.19

# 1 Average demand model

## Structural form

The long-run relationships between average quarterly demand and economic, demographic and temperature variables are estimated using ordinary least squares.

$$y_t = c_0 + c_1 X_t + u_t$$

Where y is quarterly demand and X is a set of explanatory variables.

Price and income variables are integrated of order one (I(1)), which is verified using the Dickey-Fuller unit root test. At the 5 per cent level of significance, we reject the null hypothesis that the variable is stationary for both the natural log of price and of income. However, we fail to reject the null hypothesis for the first differences of the natural logs of price and income and thus conclude that the variables are I(1).

We take the natural log of the demand, income and price variables to make interpretation easier (income and price have a multiplicative effect on demand).

## Variable selection

Table 1.1 presents the variables inlcuded in the model. In additon to the variables which were included in the 2015 model, we have added solar PV capacity. The data and sources are discussed further in the following section.

Variable selection is consistent across the four-hour models and for different terminal stations in the interests of automating the modelling process.[9]

9 We estimate 162 separate average demand models (for 27 terminal stations across six periods) so there is significant practical benefit to automation. Variables have been selected based on the strength of fit with the dataset initially available (Ballarat Terminal Station – BATS) and is consistent with the approach used by AEMO, Monash and other modellers. We have not sought to tailor the structure of the model for each four-hour period or for different terminal stations.

### 1.1 Electricity demand drivers

| Variable | Data | Spatial disaggregation |
|---|---|---|
| Population | ▪ Resident population | ▪ Local Government Area |
| Real income per capita | ▪ Average nominal personal income per capita<br>▪ CPI | ▪ Local Government Area<br>▪ Capital city (Melbourne) |
| Real electricity prices | ▪ Origin retail tariff prices (average, marginal and time of use)<br>▪ CPI<br>▪ Share of customers on time of use tariffs<br>▪ Share of demand by customer type | ▪ Part of state (Victoria)<br>▪ Capital city (Melbourne)<br>▪ Terminal station area<br>▪ Terminal station area |
| Temperature | ▪ CDDs (Cooling degree days)<br>▪ HDDs (Heating degree days) | ▪ Weather station area |
| Air conditioning index | ▪ Penetration rate | ▪ State (Victoria) |
| Solar PV capacity | ▪ Solar PV capacity | ▪ Terminal station area |

*Source:* The CIE.

## *Population or household size and formation*

We use resident population data for local government areas to convert spatial demand into spatial demand per capita. Population is not a standalone variable in the regression models. We selected resident population data to be consistent with AEMO and because of the availability of reliable data and projections.

Resident population data is taken from the ABS.Stat[10], which provides estimated residential population from 2001 until 2017 for each local government area in Australia. The annual observations have been interpolated to obtain quarterly data points.

Annual forecasts of population in local government areas have been obtained from the Victorian Department of Environment, Land, Water and Planning.[11] High and low scenarios are constructed using the difference in growth rates in ABS population projections for Victoria.[12]

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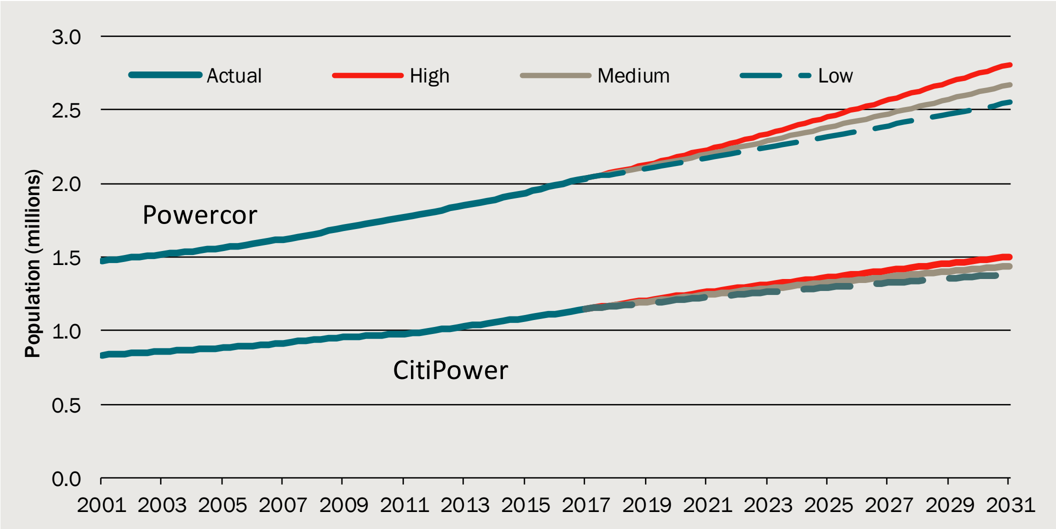
10 http://stat.data.abs.gov.au/Index.aspx?DataSetCode=ABS_ERP_LGA2017.This data is consistent with 3218.0 - Regional Population Growth, Australia published by the ABS.

11 Data table of estimated residential population by LGA for individual year: *Victoria in Future 2016 – Population and Household projections to 2051*, Victorian Department of Environment, Land, Water and Planning, available at: https://www.planning.vic.gov.au/__data/assets/excel_doc/0027/96264/VIF2016_LGAs_VIFSAs_ERP_2011_2031.xlsx

12 Australian Bureau of Statistics 2013, *Population Projections, Australia, 2012 (base) to 2101*, cat. No. 3222.0, ABS, Canberra.

Chart 1.2 illustrates the growth of population in LGAs within the Powercor and CitiPower network areas. The population level and growth rate is lower for the CitiPower network area compared to the Powercor network area. Powercor covers almost all western Victoria, including the fast-growing greenfield areas to the west and north west of Melbourne's CBD, while CitiPower services a much smaller area covering Melbourne's CBD and inner suburbs.

**1.2 Population historical data and projections for the Powercor and CitiPower network areas network area**




*Data source:* The CIE based on population projections by the Victorian Department of Environment, Land, Water and Planning.

## *Economic activity and income*

We have used average personal wage and salary income per person as a variable in our models of average demand. This series is available at the local government area level, which allows for greater flexibility in estimating regional models, for demand at the sub-state level. In their estimates of regional residential and connection point demand, AEMO do no use a measure of economic activity, while in their business estimate they variously use Gross State Product (GSP) and household disposable income in levels.[13] [14] Neither GSP nor household disposable income are available at a regional level. Over time, income and GSP have achieved very similar growth rates, although they can diverge from time-to-time.[15] We have measured electricity demand as consumption per capita, in which case a per capita measure of activity is appropriate in our forecast.

13 AEMO 2018, *Demand Forecasting Methodology Information Paper, for the 2018 Electricity Statement of Opportunities for the National Electricity Market*.

14 The 2014 and 2015 NEFRs used Gross State Product per capita and did not differentiate between residential and business consumption in undertaking estimates.

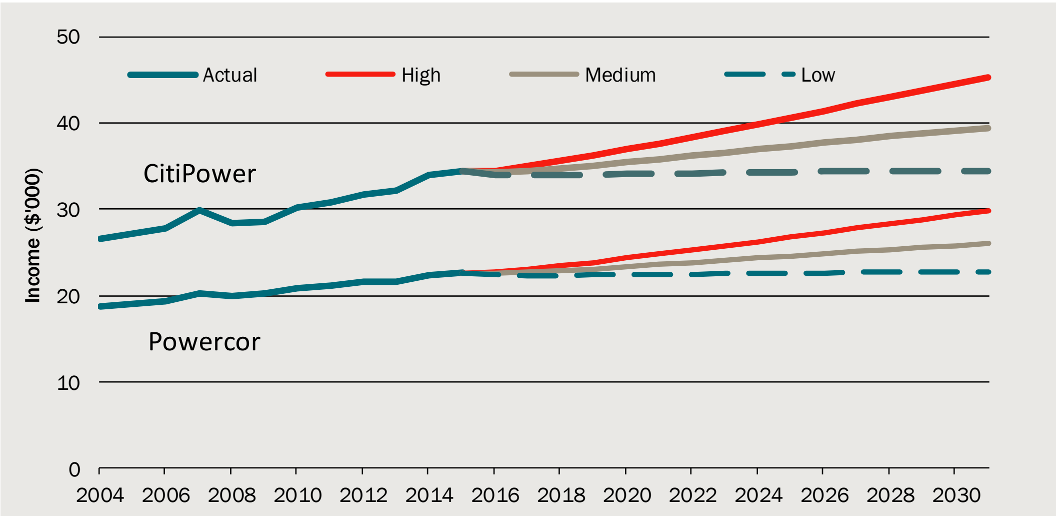
15 A measure of employment was omitted due to poor statistical fit.

Income data was taken from *Estimates of Personal Income for Small Areas* dataset produced by the ABS.[16] Data is available each financial year between 2005-06 and 2015-16, and a quarterly series has been interpolated by applying a quarterly compounding growth rate between observations. The data has been converted to real income using the CPI for Melbourne.[17] Because the dataset does not cover the entire demand period, we have extrapolated the data to the December 2003 quarter using the growth rate between the first and last years of available data. Data for the period after 2015-16 (including the forecast period and part of the historical demand period) are projections based on the growth rate in GSP per capita in each quarter based on AEMO GSP forecasts from the 2018 Electricity Statement of Opportunities and population projections from the Victorian Department of Environment, Land, Water and Planning.

By using real GSP growth per capita to forecast real income per capita, we are assuming that these measures will have similar rates of growth in the future, which has been the case historically.

Chart 1.3 shows the growth in income over time and includes both the historical data and projections. The same pattern is evident for all terminal stations over the forecast period, as the income growth rate is the same for each terminal station over the forecast period.

### 1.3 Real income historical data and real GSP per capita growth projections for the Powercor network area




*Note:* Real income per capita is calculated as the total employment income divided by the estimated resident population. Given not all individuals are engaged in paid employment, real income per capita is lower than real income per worker.

*Data source:* The CIE based on AEMO GSP per capita projections for Victoria and Australian Bureau of Statistics 2012, *Estimates of Personal Income for Small Areas*, cat. No. 6524.0, ABS, Canberra.

*Data source:* ABS, AEMO, The CIE.

16 Australian Bureau of Statistics 2013 and 2018, *Estimates of Personal Income for Small Areas*, cat. No. 6524.0, ABS, Canberra.

17 Australian Bureau of Statistics 2018, *Consumer Price Index, Australia*, cat. No. 6401.0, ABS, Canberra, June.

### *Electricity Prices*

We include electricity prices in the average demand models through a single real price variable, which varies between the six four-hour blocks estimated in the day and between terminal stations. It combines the tariff rates for different types of customers and includes time of use tariffs.

The price comprises:

- a weighted average of prices (from standing offers) for high voltage, business and residential customers. The weights for each customer type reflect the amount of energy demanded and are constant across time for each terminal station;
- the residential price is a weighted average of the time of use price and standard price. The weights change through time as more residential customers use time of use tariffs. This means that prices increase more rapidly in peak periods and less rapidly in off-peak periods.

More specifically, for each quarter q and four hour time period f:

$$\begin{aligned} Price_{f,q} = & \left(HV\ balance_{f,q} \times \overline{HV\ share}\right) \\ & + \left(bus\ balance_{f,q} \times \left(\overline{low\ voltage\ share} + \overline{non\text{-}res\ share}\right)\right) \\ & + \left(res\ balance_{f,q} \times \overline{res\ share} \times \left(1 - ToU\ share_q\right)\right) \\ & + \left(res\ ToU\ offpeak_{f,q} \times offpeak_f \right. \\ & \left. + res\ ToU\ firstrate_{f,q} \times \left(1 - offpeak_f\right)\right) \times ToU\ share_q \times \overline{res\ share} \end{aligned}$$

Where: HV balance, bus balance and res balance are the standard per kWh prices for high voltage, business and residential customers; share variables are the share of demand from each customer type; ToU share is the share of residential customers on time of use tariffs; resToUoffpeak and resToUfirstrate are the off-peak and peak tariffs; and offpeak is the amount of share of the four hour period that is in off-peak tariffs.

Prices are deflated by the Melbourne CPI.

Price data is sourced from Victorian Government Special Gazettes, which publish electricity tariffs for various retailers. These are standing offers — many customers access lower tariffs than these. The tariffs which are components in our price variable are those for Origin Electricity Limited, which is within the Powercor network. Table 1.4 provides a description of the tariffs in our price variable. It is difficult to consistently measure tariffs overtime due to changes in the composition and structure of tariffs. Some customers will pay a daily supply charge in addition to consumption tariffs which may vary for different levels of consumption (i.e. customers may pay a lower rate for the first block of consumption). Where there is a discontinuity in the tariff structure we have used the growth rate of the electricity component of the CPI for that quarter and then using the growth rate in the tariff structure for future growth.

Information on customer shares (including HV share, LV share, residential share, non-residential share and time of use share) was provided by Powercor and CitiPower.

## 1.4 Selected gazette price types

| Customer type | Tariff name | Price type | Description [a] |
|---|---|---|---|
| Residential | ▪ GD/GR and Y6/YT<br>▪ 5 day time of use GH/GL<br>▪ 5 day time of use GH/GL | ▪ Balance<br>▪ First rate<br>▪ Offpeak | ▪ Consumption above 1000kWh/quarter<br>▪ First 1000kWh/quarter<br>▪ 11pm to 7am |
| Low voltage non-residential (business) | ▪ Business peak anytime (Tariff E) | ▪ Balance | ▪ Above 333kWh/month |
| High voltage | ▪ General purpose E5 | ▪ Balance | ▪ Above 5500kWh/month |

[a] The levels of consumption above which customers pay the first rate or the balance rate occasionally change over time and so the description given only corresponds to the Victoria Government Gazette No. S 439 Monday 17 December 2012.
*Source:* Victoria Government (Special) Gazettes containing tariffs for Origin Electricity Limited per the *Electricity Industry Act 2000*.

The Victorian government publishes a Gazette to enact a change in prices pursuant to the *Electricity Industry Act 2000*, and prices remain at the level set in the most recent prior Gazette until they are changed. Therefore, nominal electricity prices rise in jumps rather than smoothly.

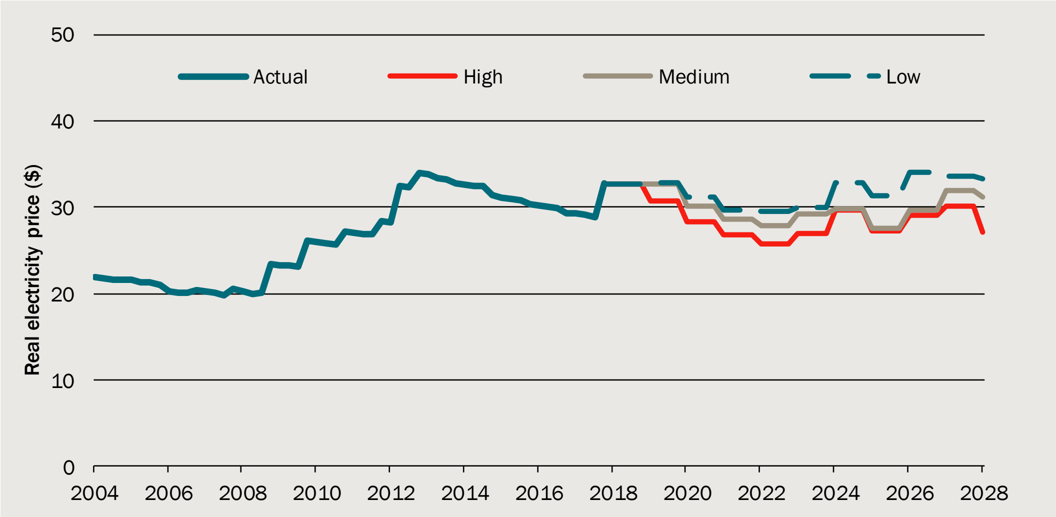
Electricity prices for a given quarter are the prices in the most recent Gazette (for each different tariff) at the beginning of the quarter. In some cases, there is a price change in the middle of the quarter, however this price change is only reflected in the model for the quarter where that price is the prevailing price at the beginning of the quarter. Price effects would be lagged slightly, and thus accounting for a price change part way through a quarter is unlikely to reflect behaviour.

We use AEMO low, medium and high demand scenario forecasts of the real electricity residential price index to project electricity prices. This provides 3 demand scenarios: low medium and high demand which corresponds to high medium and low prices respectively. This index is used to escalate underlying prices, with a forecast of the share of customers on time of use tariffs (ToUshare) also forming a component of the projections of the price variable for different four-hours.

Powercor and CitiPower indicated that the number of customers on time of use tariffs has remained largely unchanged for the past 10 years and are not expecting significant changes in uptake through 2020. Tariff structures over 2021 through 2025 have not been determined, however if the Victorian Government mandate that time of use tariffs continue to be optional, the share of customers on these tariffs is likely to remain unchanged. Our central forecasts assume that the share of customers on time of use tariffs remains unchanged over the forecast horizon (19.6 and 12.7 per cent for the Powercor and CitiPower networks respectively). This is significantly lower than the assumption used in CIE's 2015 forecasts of a 50 per cent share of residential customers on time of use tariffs by 2025, however this has a relatively minor impact on prices used in the model and average demand.

The evolution of our price variable throughout the historical demand and forecast period is shown in chart 1.5. It illustrates the variability of and net increase in prices during the historical period. The low, medium and high demand scenarios lead to high, medium and low price levels respectively. High prices correspond to low demand scenario as the price elasticity is normally negative (as prices increase consumptions falls).

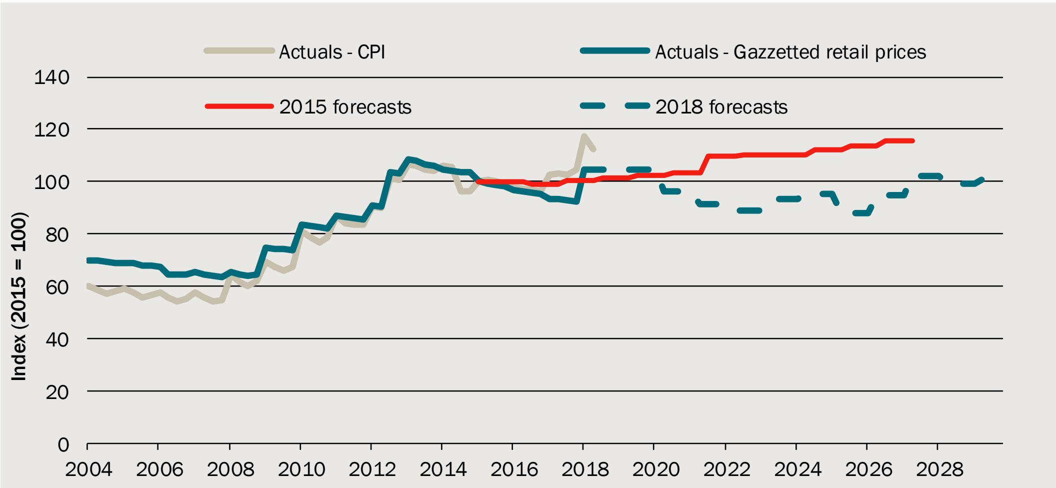
### 1.5 Real electricity prices for the total Powercor network area – 4-8pm




*Data source:* The CIE, AEMO, Victorian Government Gazette.

Projected price growth is expected to be lower than the 2015 forecasts, with prices expected to track sideways at current levels, before falling from 2020 (chart 1.6). The price series is based on gazetted prices and differs somewhat from actual electricity prices observed from the CPI. Since 2016 the CPI has indicated that prices have been increasing, while gazetted prices have been falling. This is likely due to changes in discounting from gazetted prices. Retailers may offer discounts to customers, such that prices actually paid differ from standing offers; a reduction in discounting would be consistent with price growth in the CPI observed since 2016.

### 1.6 Real electricity prices for the total Powercor network area – 4-8pm

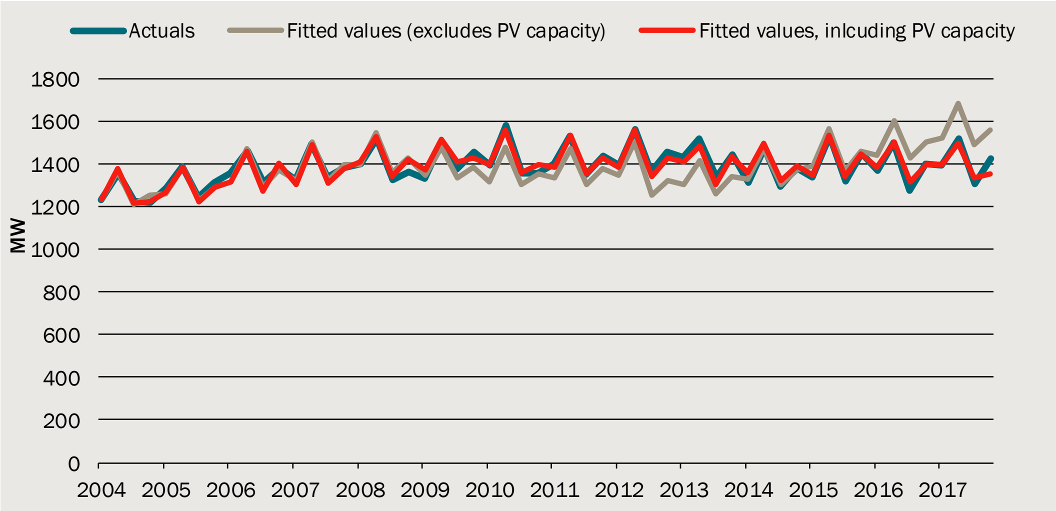



*Data source:* ABS, AEMO, The CIE, Victorian Government Gazette.

### *Solar PV capacity*

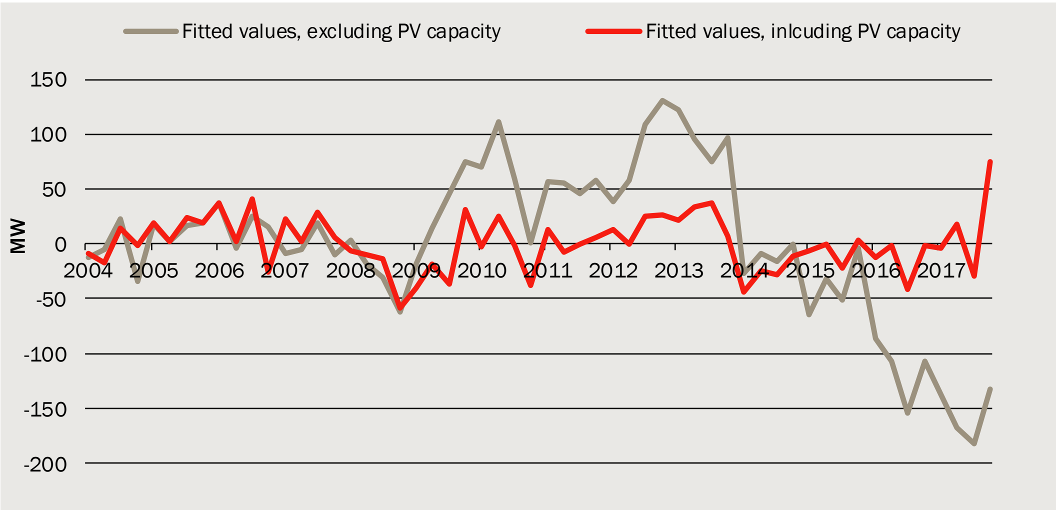
We have included solar PV capacity in the average demand model to account for the growing wedge between estimated and observed average demand. Since 2015, there has been an increasing gap between observed and fitted values from the model (charts 1.7 and 1.9, see appendix B for further discussion of 2015 forecast performance). The fitted values have been overpredicting average demand consistently across terminal stations in both the Powercor and CitiPower network areas, resulting in persistence in the residuals (charts 1.8 and 1.10).

**1.7 Actuals vs model fitted Powercor average demand**



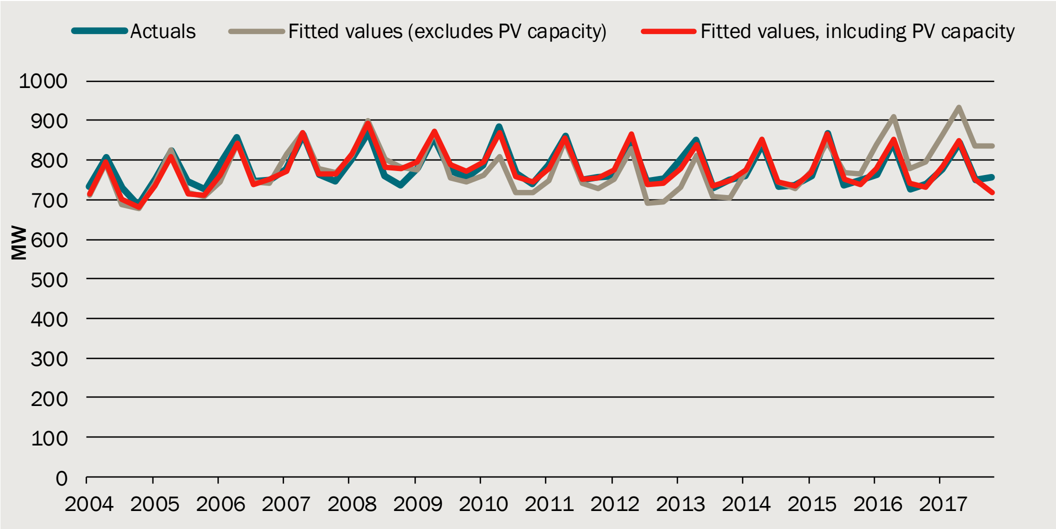

*Data source:* Powercor, Citipower, The CIE.

**1.8 Powercor average demand residual fitted values, with and without PV capacity**



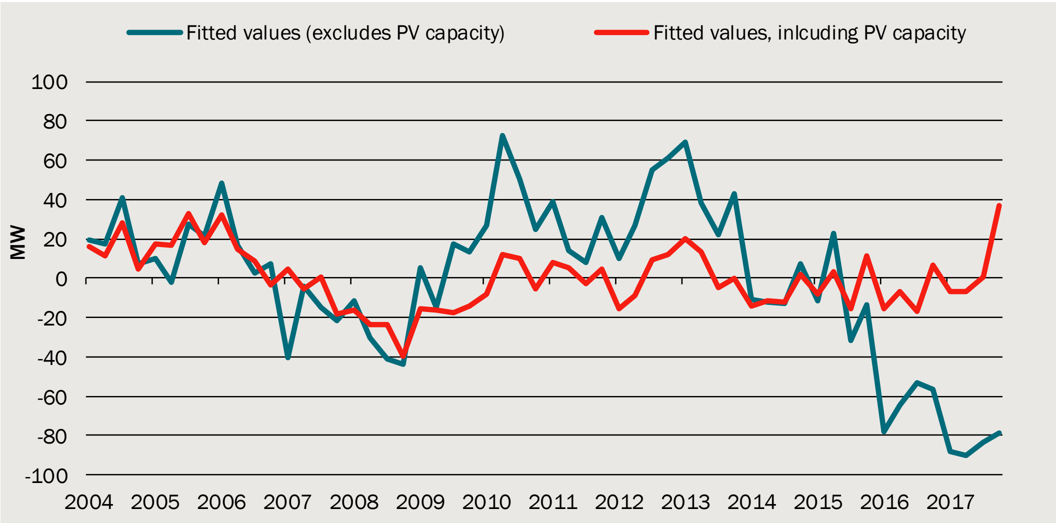

*Data source:* Powercor, CitiPower, The CIE.

### 1.9 Actuals vs model fitted Powercor average demand




*Data source:* Powercor, Citipower, The CIE.

### 1.10 CitiPower average demand residual fitted values, with and without PV capacity




*Data source:* Powercor, CitiPower, The CIE.

This could be due to a range of factors, including:

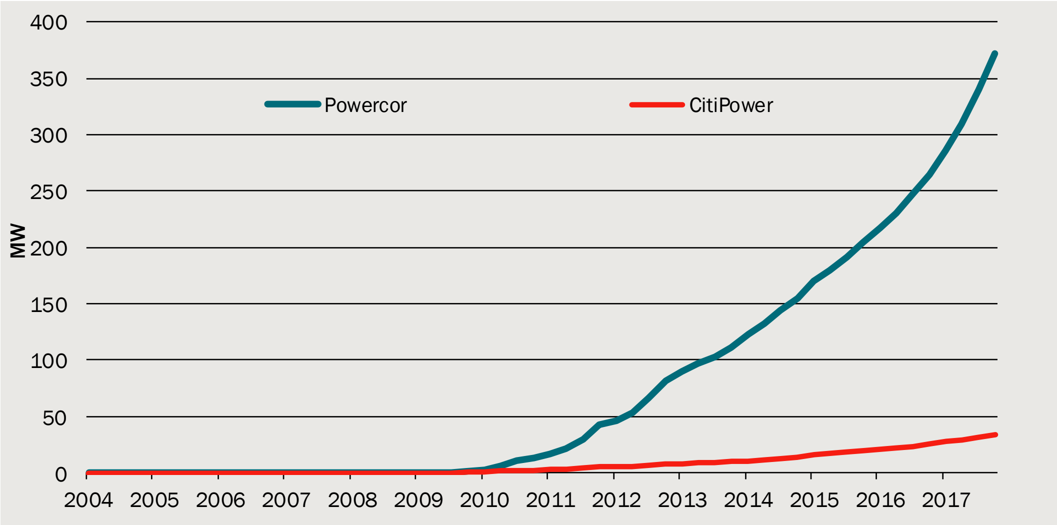
- Increased uptake of solar PV. In the 2015 forecasts, solar PV was not included directly in the average demand model, rather being incorporated into maximum demand forecasts as a post modelling adjustment (with historical trends in solar PV captured by other coefficients in the average demand model). A sharp increase in solar PV uptake in recent years would result in fitted values being greater than actual average demand.
- Improvements in energy efficiency. In the 2015 forecasts, energy efficiency was not included directly in the average demand model, rather being incorporated into maximum demand forecasts as a post modelling adjustment (with historical trends in energy efficiency captured by other coefficients in the average demand model). Where

improvements in energy efficiency have accelerated, this could result in fitted values exceeding actual average demand.

- Measurement error in either dependent or explanatory variables.

Solar PV and energy efficiency are the most likely causes of this problem. We therefore incorporate solar PV capacity into the regression using solar PV capacity per capita for each terminal station provided by Powercor and CitiPower. This is measured as the cumulative solar PV capacity installed for each terminal station since 2003, when data is first available (chart 1.11).

**1.11 Cumulative solar PV capacity**




*Data source:* Powercor, CitiPower The CIE.

We do not take logs of the series because of the linear relationship between average demand per capita and solar PV capacity per capita. For a given increase in solar capacity, there is likely to be a proportional decrease in average electricity demand, with that proportion determined by solar PV capacity factors. Taking logarithms would reinterpret the parameter on PV capacity as the percentage change in average demand for a one per cent increase in solar capacity would decrease. Using a log transformed series would therefore underestimate the impact of solar PV on demand for low levels of capacity and underestimate the impact at higher PV capacity levels. Given solar PV increases from a very low level at the beginning of the estimation period to relatively high levels more recently, a log transformed series would result in misspecification of the model.

Including solar PV capacity significantly improves performance of the model and reduces the persistence in the residuals. Energy efficiency was not included as there is no reliable measure of historical energy efficiency available for the required time period and geographic level. Insofar as energy efficiency is an important factor in driving average demand, the model will suffer from omitted variable bias and the solar PV capacity coefficient will be biased.

To check whether our estimates are picking up solar PV capacity, we compare coefficient estimates for solar PV per capita to solar PV capacity factors. A capacity factor is the share of solar PV capacity which is generated at a given time of day given to typical climatic conditions. Periods with high capacity get a larger proportion of electricity demand met by solar PV; if the impact of solar PV is being measured correctly by the model, solar PV capacity coefficients should be more negative during periods with high solar capacity factors. We find that this is the case, with the most negative coefficient for the Powercor and CitiPower average demand models observed between 8am and 3:30 pm, which solar capacity factors are highest (table 1.12). However, the large coefficients when there is no solar PV (overnight) implies that these coefficients are also picking up the effect of other factors such as energy efficiency.

### 1.12 Solar PV capacity per capita coefficients and solar capacity factors

| Time period | Powercor | CitiPower | Summer solar PV capacity factor (50% PoE) | Summer solar PV capacity factor (50% PoE) |
|---|---|---|---|---|
| | Solar PV capacity per capita coefficient | Solar PV capacity per capita coefficient | Per cent | Per cent |
| 0:00 – 3:30 | -1.1 | -7.2 | 0% | 0% |
| 4:00 – 7:30 | -1.3 | -7.9 | 6% | 1% |
| 8:00 – 11:30 | -1.9 | -8.6 | 46% | 32% |
| 12:00 – 15:30 | -2.0 | -8.3 | 58% | 41% |
| 16:00 – 19:30 | -1.3 | -6.9 | 14% | 3% |
| 20:00 – 23:30 | -1.0 | -6.5 | 0% | 0% |

*Source:* The CIE, Oakley Greenwood.

We also tried including season interaction dummies to estimate the impact of solar PV capacity on demand. Solar capacity factors are known to vary across seasons due to changes in the hours of sunlight and the position of the sun in sky. These seasonal interaction dummies were generally not statistically significant, likely due to the relatively small number of observations over which to estimate these parameters were omitted.

To forecast average demand, we do not use a forecast of solar PV per capita, rather we hold this fixed at 2018 levels over the forecast horizon and then adjust for additional solar PV capacity in post modelling adjustments. We take this approach because of the evidence of omitted variable bias in the solar PV capacity coefficient. Where there is omitted variable bias from energy efficiency the coefficient will be biased downwards (i.e. will be more negative). If we use this coefficient and future solar PV capacity to estimate future demand, we will overstate the impact of solar PV and understate average demand. This approach means that our projected average demand is likely to be greater than actual average demand, as it holds solar PV constant into the future, which is then corrected for in post modelling adjustments, for both solar PV and energy efficiency which are applied to maximum demand.

### *Temperature*

Cooling degree days (CDD) and heating degree days (HDD) are both drivers of electricity demand. These measures account for the effect of temperature on demand, which is largely due to air-conditioner and heater usage.

We define cooling degrees for a particular day as the number of degrees the mean daily temperature is in excess of 18.5 degrees. Heating degrees is the number of degrees that the mean temperature is less than 16.5 degrees.[18] In the 2018 Electricity Statement of Opportunities, AEMO use 18°C as the threshold for CDD and 16.5°C for HDD[19]; this small difference will not have a material impact on results. If either cooling degrees or heating degrees is negative, it is set to 0 for that day. Cooling degree days and heating degree days for a quarter is the sum of cooling and heating degrees respectively for all days within the quarter.

For forecasting cooling degree days and heating degree days we use the simulations of temperature discussed in the next chapter. For each simulation we construct a quarterly CDD and HDD. The average demand projection therefore has variation from climatic conditions.

Note that when we present charts for average demand we use an average over the historical CDD and HDD period, rather than presenting average demand under alternative climatic conditions.

We have projected temperatures using forecasts of the average annual temperature change per year. These have been sourced from CSIRO projections of a trend increase of 0.035°C per year.[20] This estimate is consistent with more recent projections prepared by the Bureau of Meteorology and CSIRO, with warming across emissions scenarios projected to be between 0.5°C and 1.2°C above the climate of 1986-2005.[21] The midpoint of this range corresponds to a 0.034°C increase per year. The temperature trend has been applied to temperature records drawn from history.

We multiply the annual change estimate by the number of years between when the temperature observation was taken and the year for which we are simulating temperatures. Therefore, to simulate temperature in 2020, if we sample temperature from 1990, we increase the temperature observed by 0.7°C to account for the warming during that time.

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[18] Frontier Economics 2013, *Review of AEMO's 2013 National Electricity Forecasts* states that these critical temperatures are typically between 18.5-22°C for CDD and 16-18.5°C for HDD.

[19] AEMO 2018, *Demand Forecasting Methodology Information Paper, for the 2018 Electricity Statement of Opportunities for the National Electricity Market*.

[20] Projected changes in temperature and heating degree-days for Melbourne, 2012- 2017, R. Suppiah and P. H. Whetton, CSIRO, Marine and Atmospheric Research, PMB No. 1, Aspendale, Vic. 3195, p. 8

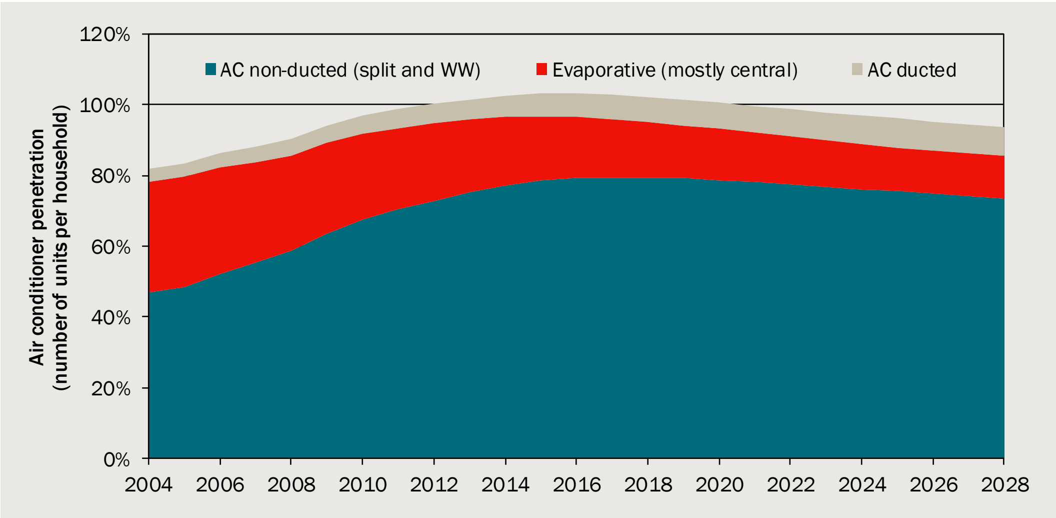
[21] CSIRO and Bureau of Meteorology, *Climate Change in Australia website*, http://www.climatechangeinaustralia.gov.au/, cited 3 September 2018.

### *Air conditioning and heating load*

Market penetration and ownership levels of air conditioners drive electricity demand, particularly residential demand.

Air conditioner market penetration measures the number of units per household, while air conditioning ownership is the total number of units. The Department of Industry, Innovation and Science (formerly the Department of Industry and Science) produces estimates of electricity appliance ownership, including air conditioners, by state.[22] The stock of appliances is forecast from 2000 to 2030.

**1.13 Air conditioning penetration rates**




*Data source:* EnergyConsult.

Our model uses air conditioning as a modifier on the coefficient of CDD, given that air conditioning is relevant to demand when cooling is expected to occur (indicated by cooling degree days). Therefore, the CDD variable including air conditioning is:

$$= \left(1 + AC_q\right) \times CDD_q$$

This is the same approach that was used in the 2014 and 2015 NEFRs. Since the 2016 NEFR, AEMO has adopted an alternative methodology which estimates historical base and temperature sensitive electricity load and then adjusts for the estimated impact of appliance uptake on demand (in addition to other factors, such as gas to electricity switching, solar PV rebound effect, price changes, energy efficiency climate change). which accounts for appliance uptake as a post modelling adjustment. AEMO's methodology is discussed briefly in appendix A.

22 EnergyConsult 2015, *Residential Energy Baseline Study: Australia*, prepared for Department of Industry, Innovation and Science for Department.

### *Terminal Station matching to Local Government Areas and Weather Stations*

Our demand forecasts use demand drivers that correspond to the terminal station area. The more closely the data resembles the actual characteristics of customers of the network, the greater the expected accuracy of the model.

Terminal stations are matched to local government areas so that economic and demographic data (which is commonly available at the Local Government Area level) will correspond to certain terminal stations. Note that because terminal stations distribute electricity across LGA boundaries, there will be overlap in the coverage of LGAs by terminal stations.

This matching is presented in table 1.14 for the Powercor network and table 1.15 for the CitiPower network.

Note there are a number of LGAs that cross multiple terminal station areas. In general, we use all LGAs that have any part located in a terminal station area. Since we model average demand per capita, and then produce total demand forecasts (not per capita), if a different population level is used, the forecasts will be unaffected. However, if the approach of using all LGAs that have any part within a terminal station area leads to different population growth for a terminal station, that could create slight bias in the results, where there is an LGA with a substantially different growth rate than others around it.

The lack of precise population data for terminal station areas (and even a lack of precise annual population data for LGAs) means that there is no ideal solution to this issue.

The growth rate of the Melbourne LGA (61.9 per cent growth between 2005 and 2014) was substantially higher than the average growth in all CitiPower LGAs (18.6 per cent growth between 2005 and 2014). Therefore, Melbourne is the only LGA for which population has been split between terminal stations rather than simply being allocated entirely to each.[23]

#### 1.14 Terminal Station to Local Government Area Match-up – Powercor network

| Terminal Station | LGA 1 | LGA 2 | LGA 3 | LGA 4 | LGA 5 | LGA 6 | LGA 7 |
|---|---|---|---|---|---|---|---|
| RCTS 22kV | Mildura | | | | | | |
| RCTS 66kV | Mildura | Swan Hill | | | | | |
| WETS 66kV | Mildura | Swan Hill | Buloke | Yarriambiak | Hindmarsh | | |
| KGTS 22kV | Ganawarra | | | | | | |
| KGTS 66kV | Ganawarra | Swan Hill | Loddon | Campaspe | | | |
| HOTS 66kV | Hindmarsh | Yarriambiak | Horsham | West Wimmera | Southern Grampians | Northern Grampians | Ararat |
| BETS 22kV | Greater Bendigo | Mount Alexander | Loddon | | | | |

23 The allocations were: WMTS66 – 30 per cent, FBTS66 – 30 per cent, RTS66 transformers 3 & 4 – 20 per cent and RTS22 – 20 per cent. WMTS22 and BTS66 are considered to be entirely within the Melbourne LGA, and therefore it's population growth rate is entirely dependent on the growth of the Melbourne LGA.

| Terminal Station | LGA 1 | LGA 2 | LGA 3 | LGA 4 | LGA 5 | LGA 6 | LGA 7 |
|---|---|---|---|---|---|---|---|
| BETS 66kV | Buloke | Ganawarra | Loddon | Greater Bendigo | Mount Alexander | Central Goldfields | Pyrenees |
| SHTS/GNTS | Moira | Greater Shepparton | Campaspe | | | | |
| HYTS + TGTS + APD | Glenelg | Moyne | Warrnambool | Southern Grampians | Corangamite | Colac Otway | Surf Coast |
| BATS + ELTS | Pyrenees | Corangamite | Moorabool | Ballarat | Hepburn | | |
| MLTS + GTS + PTH | Golden Plains | Surf Coast | Greater Geelong | Borough of Queenscliffe | | | |
| ATS West | Hobsons Bay | Wyndham | | | | | |
| ATS-BLTS | Hobsons Bay | Brimbank | Melton | Wyndham | Moorabool | | |
| BLTS 22kV | Hobsons Bay | | | | | | |
| KTS East | Brimbank | Melton | | | | | |
| KTS West | Brimbank | Macedon Ranges | Melton | Mitchell | | | |
| DPTS [a] | Brimbank | Melton | Wyndham | | | | |

[a] DPTS demand forecasts are based on load transfers from other terminal stations. Terminal station level demand drivers are not used to estimate demand for DPTS.

*Source:* Powercor terminal station area and Local Government Area maps, The CIE analysis.

### 1.15 Terminal Station to Local Government Area Match-up – CitiPower network

| Terminal Station | LGA 1 | LGA 2 | LGA 3 | LGA 4 | LGA 5 |
|---|---|---|---|---|---|
| WMTS 66kV | Darebin | Moreland | Melbourne | Yarra | |
| WMTS 22kV | Melbourne | | | | |
| BTS 22kV | Moreland | Yarra | Darebin | | |
| BTS 66kV [a] | Melbourne | | | | |
| FBTS 66kV | Port Phillip | Melbourne | | | |
| RTS 66kV transformers 1&4 | Stonnington | Yarra | Boroondara | Port Phillip | Glen Eira |
| RTS 66kV transformers 2&3 | Port Phillip | Stonnington | Melbourne | | |
| RTS 22kV | Stonnington | Yarra | Melbourne | | |
| SVTS 66kV | Boroondara | | | | |
| TSTS 66kV | Boroondara | | | | |

[a] BTS 66kV demand forecasts are based on load transfers from other terminal stations. Terminal station level demand drivers are not used to estimate demand for BTS 66kV.

*Source:* CitiPower terminal station area and Local Government Area maps, The CIE analysis.

Terminal stations have also been matched to weather stations, which provide temperature data for both the average demand model (cooling degree days and heating degree days) and the maximum demand model (many temperature variables).

The Powercor network terminal station to weather station match is shown in table 1.16. All CitiPower terminal stations were matched to the Melbourne Regional Office weather station until January 2015, when the weather station was closed, and Melbourne Olympic Park for subsequent periods.[24] Both terminal; stations were used as Melbourne Olympic Park weather station was only opened in May 2013 resulting in neither weather station covering the entire period. The closest weather station covering the entire estimation period, Melbourne Airport, was not chosen because of its distance from the distribution area.

### 1.16 Terminal Station to Weather Station Match-up – Powercor network

| Terminal Station | Weather station |
|---|---|
| RCTS 22kV | Mildura Airport |
| RCTS 66kV | Mildura Airport |
| WETS 66kV | Mildura Airport |
| KGTS 22kV | Swan Hill Aerodrome |
| KGTS 66kV | Swan Hill Aerodrome |
| HOTS 66kV | Horsham Aerodrome |
| BETS 22kV | Bendigo Airport |
| BETS 66kV | Bendigo Airport |
| SHTS + GNTS | Shepparton Airport |
| HYTS + TGTS + APD | Hamilton/Warrnambool |
| BATS/ELTS | Ballarat Aerodrome |
| MLTS + GTS + PTH | Geelong Racecourse/Geelong Airport |
| ATS West | Laverton |
| ATS-BLTS | Laverton |
| BLTS 22kV | Laverton |
| KTS East | Melbourne Airport |
| KTS West | Melbourne Airport |

*Source:* Powercor terminal station area maps, The CIE analysis.

## *Model fitting*

The long-run model that we fit to historical demand has the specification shown below. It calculates

24 The BOM has indicated that these weather stations have similar temperatures in most weather conditions, following a 12 month period of the two weather stations operating in tandem (http://www.bom.gov.au/weather-services/announcements/vic/latrobe-site-closure.shtml).

$$\ln(mWh_{f,q}) = \beta_{\ln income} . \ln income_q + \beta_{\ln price} . \ln price_{f,q} + \beta_{CDD} . (1 + AC_q) . CDD_q + \beta_{HDD} . HDD_q + \beta_{summer} . summer_q + \beta_{autumn} . autumn_q + \beta_{winter} . winter_q + \beta_{solarPV} solarPV + \varepsilon_{f,q}$$

Dummy variables (summer, autumn and winter) indicating the season are included to account for residual seasonality.

Our model of average demand also incorporates an error-correction model to account for dynamics. The seasonal error-correction model we use to incorporate short-run fluctuations in demand and a return path to equilibrium. This approach was previously used by AEMO, however AEMO now use a "growth model" for regional forecasts which is described briefly in appendix A.

This model predicts the annual difference (i.e. the difference between the current quarter demand and demand four quarters ago) by using the annual differences of the independent variables and the fourth lag of the residual from the long-run model. The term "S(4).*variable*" is the annual difference of a *variable*. *EC* (the error correction term) is the residual of the long-run model lagged four quarters.

$$\mathrm{S(4)ln}mWh_{f,q} = \beta_{s(4)\ln income} . \mathrm{S(4)} . \ln income_q + \beta_{s(4)\ln price} . \mathrm{S(4)} . \ln price_{f,q} + \beta_{s(4)CDD} . \mathrm{S(4)} . ((1 + AC_q) . CDD_q) + \beta_{s(4)HDD} . \mathrm{S(4)} . \mathrm{HDD}_q + \beta_{Lag(4)EC} . Lag(4) . EC_{f,q} + u_{f,q}$$

This is a variation on a seasonal error correction model. It estimates the path of return to equilibrium with the coefficient of $Lag(4).EC_{f,q}$.

Where the conditions for error correction were not met, such as if the variable *EC* (the error correction term) is not stationary or the coefficient on $Lag(4).EC_{f,q}$ is implausible, we estimate average demand using the long run relationship.[25] This assumption has little impact on forecasting, as both approaches share the same long run relationship and the error correction model will follow the same long run trend described by the long run relationship.

The coefficients estimated by the model for the Powercor network as a whole are presented in tables 1.17 and 1.18 for the long-run average demand model and Integrated Dynamic Model respectively.

[25] For the model to be valid $0 < |\beta_{Lag(4)EC}| < 1$, so that a deviation from the long run relationship will wash out over time. If this condition is not met, shocks to the system, which result in a deviation from the long run relationship will be persistent and the long run relationship will not be the equilibrium of the model.

### 1.17 Long-run average demand model estimated coefficients

| Period | Price | Income | CDDac | HDD | summer | autumn | winter | Solar PV capacity | Constant |
|---|---|---|---|---|---|---|---|---|---|
| 1 | -0.15 | -0.83 | 0.0002 | 0.0003 | -0.04 | 0.00 | 0.05 | -1.12 | 0.76 |
| 2 | -0.11 | -0.18 | 0.0002 | 0.0003 | 0.00 | -0.02 | -0.03 | -1.30 | -5.86 |
| 3 | -0.15 | 0.25 | 0.0002 | 0.0003 | 0.02 | 0.02 | 0.04 | -1.94 | -9.94 |
| 4 | -0.14 | 0.20 | 0.0004 | 0.0002 | 0.03 | 0.02 | 0.03 | -2.04 | -9.53 |
| 5 | -0.10 | 0.08 | 0.0004 | 0.0002 | -0.02 | 0.03 | 0.08 | -1.30 | -8.39 |
| 6 | -0.05 | -0.15 | 0.0002 | 0.0002 | -0.04 | 0.01 | 0.08 | -1.02 | -6.33 |

*Source:* Total Powercor demand data, The CIE analysis.

### 1.18 Error Correction Model estimated coefficients

| Period | S(4).price | S(4).income | S(4).CDDac | S(4).HDD | S(4)Solar PV capacity | S(4).EC | Constant |
|---|---|---|---|---|---|---|---|
| 1 | -0.11 | -0.04 | 0.0002 | 0.0003 | -0.76 | -0.64 | -0.02 |
| 2 | -0.06 | 0.19 | 0.0002 | 0.0003 | -1.12 | -1.00 | -0.01 |
| 3 | -0.10 | 0.30 | 0.0003 | 0.0003 | -1.78 | -0.75 | 0.00 |
| 4 | -0.07 | 0.50 | 0.0005 | 0.0002 | -1.83 | -1.04 | -0.01 |
| 5 | -0.06 | 0.37 | 0.0004 | 0.0002 | -1.12 | -0.95 | -0.01 |
| 6 | -0.05 | 0.28 | 0.0003 | 0.0002 | -0.87 | -0.66 | -0.01 |

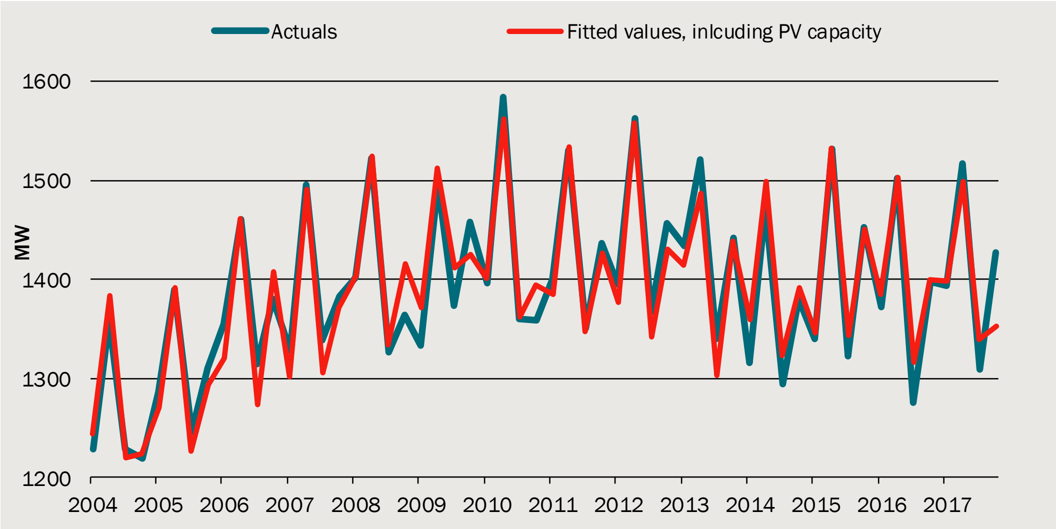
*Note:* S(4).*variable* Is the annual difference of *variable*.

*Source:* Total Powercor demand data, The CIE analysis.

The fourth lag of the error correction term (therefore an annual lag in this case) is included in the model to account for seasonality. For total Powercor we exclude the error correction component from the model as the coefficient on *EC* (the error correcting term) is smaller than -1, which means the model is unstable and will always overshoot the long run relationship – the average demand model is estimated using only the long-run average model. This issue arises due to misspecification of the model, the short data period or the variables not being cointegrated for the terminal station.

The modelling performance (comparison of predicted and actual demand) for total Powercor demand is shown in chart 1.19. In the last quarter there is large positive residual, which is large relative to historic residuals. This may be due to measurement errors in aggregating network demand or may reflect an unexpected increase in demand.

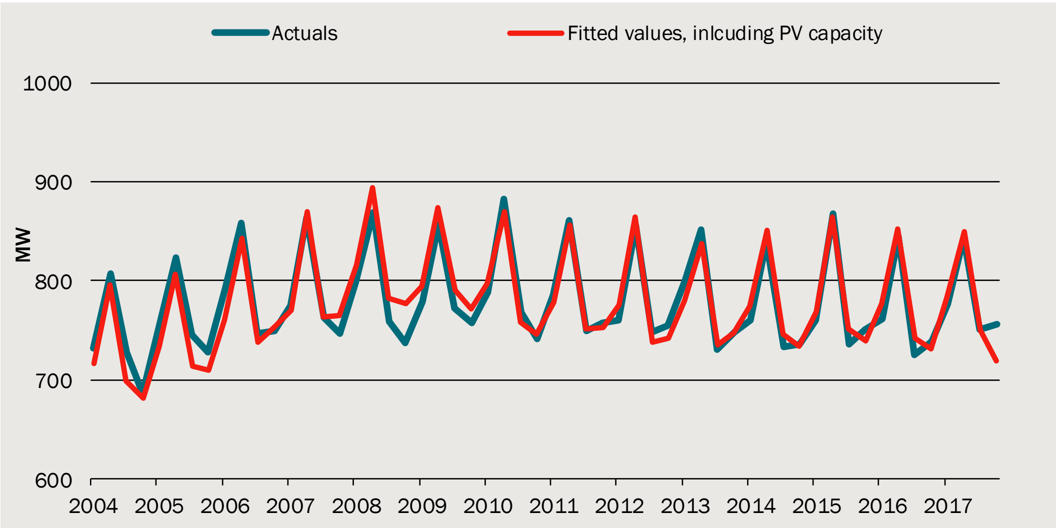
**1.19 Comparison of predicted demand and actual demand — Powercor network area**




*Data source:* Total Powercor demand data, The CIE analysis.

The modelling performance for total CitiPower demand is shown in chart 1.20.

**1.20 Comparison of predicted demand and actual demand – CitiPower network area**




*Data source:* Total CitiPower demand data, The CIE analysis.

## *Treatment of economically meaningful results*

The estimates of long-run coefficients are calculated for six periods for each terminal station. In some cases, given the relatively short data period and the large number of estimates, the results are not economically meaningful. In particular, this is an issue when:

- The income coefficient is negative, implying higher incomes result in lower demand. Econometrically, this may be interpreted as a negative income elasticity.
- The income coefficient is very larger, implying that a 1 per cent increase in incomes result in increase in demand which is greater than 1 per cent

- The price coefficient is positive, implying that higher prices result in higher demand. Econometrically, this may be interpreted as a positive income elasticity.

In the following sections we outline our treatment of these scenarios.

### *Negative income elasticity*

Negative income elasticities occur because the data period covers a timeline where electricity demand has generally been moderating rather than increasing. We do not consider that forecasts based on a negative income elasticity are reasonable and, in this case, apply an alternative approach. This approach involves restricting the coefficient on income to be equal to the coefficient estimated by AEMO 2014 Forecasting Report for Victoria as a whole.[26]

AEMO most recently published parameters for the 2015 NEFR. This, together with the elasticity from the 2014 NEFR is summarised in table 1.21. We have chosen to use the 2014 NEFR elasticity as this is a more conservative estimate. Although the sign of the elasticities are widely agreed upon, there is some uncertainty as to their magnitude, that is, how responsive demand is to changes in price and income. Using the more conservative of these estimates minimises the risk of overstating the impact of income on demand.

#### 1.21 Income elasticity

| | Income per capital elasticity |
|---|---|
| 2015 NEFR | 0.34837 |
| 2014 NEFR | 0.17361 |

*Source:* AEMO Forecast Methodology 2015 and AEMO Forecast Methodology 2014.

### *Large income elasticity*

Income elasticity estimates were very high for ATS West, BETS 22 and HOTS66, while constraining the income elasticity using AEMO's estimate resulted in positive price elasticities. For these terminal stations, the estimated income elasticity was greater than one, implying that a one percent increase in incomes resulted in a more than one per cent increase in demand. This results in average demand growing strongly into to the future, at a faster rate than for other parts of the transmission networks.

There is little evidence to suggest this demand response is realistic, however there is little information with which to investigate this problem. The high estimated elasticity is likely caused by unobserved load transfers or historical changes in customer composition for these terminal stations, which have increased average demand independently of changes in income over the history.

To account for this, we have estimated the unrestricted and restricted models assuming that the price elasticity is zero and have then selected to use the CIE estimate or

26 AEMO 2014, *Forecasting Methodology Information Paper*, p.14-16.

constrained income elasticity based on its sign. This results in more conservative average demand estimates.

### *Positive price elasticity*

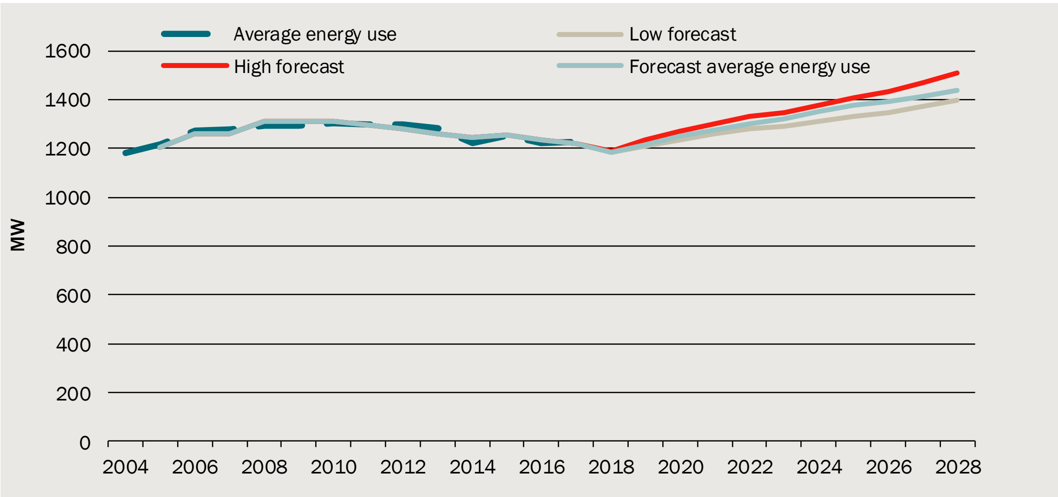
Under both the unconstrained and constrained income elasticities, price elasticities were positive for ATS/BLTS, KGTS22, RCTS66 and WETS and WMTS22. Economic theory would suggest that the price elasticity is likely to take a negative sign, so that consumers respond to high prices by demanding less electricity. There is no reasonable causal interpretation of the positive price elasticities observed, and these are likely due to unobserved load transfers or historical changes in customer composition for these terminal stations.

To account for this, we have estimated the unrestricted and restricted models assuming that the price elasticity is zero and have then selected to use the CIE estimate or constrained income elasticity based on its sign.

## Presentation of results

The average demand modelling produces forecasts of average demand over the forecast period. For each terminal station and network we show charts for predicted and actual values for the historical period and forecasts. An example for the Powercor network is shown in chart 1.22 below.

**1.22 Forecasts of average annual demand — total Powercor**




*Note:* This shows average demand across all four-hour periods for the total Powercor network.

*Data source:* The CIE.

# 2 Maximum demand model

## Structural form

Maximum demand modelling depends on average electricity demand through the process of normalisation. Half-hourly demand is normalised by quarterly average demand. The normalisation equation is shown below. It shows that normalised demand (y*) for day *t* and half-hour period *h* is demand for *t, h* divided by the season average demand for the corresponding four-hour *f*.

$$y^*_{t,h} = \frac{y_{t,h}}{\bar{y}_{i,f}}$$

Therefore, normalised demand represents half-hourly demand as the deviation from quarterly average demand for the four-hour period into which that half-hour falls.

We estimate half-hourly demand using a standard OLS regression, with a model for each half-hour for both summer (including November and March) and winter. The structural form of the half-hourly models is shown below. The calendar variables and temperature variables are shown for each half-hour as $h_h(t)$ and $f_h(w_t)$ respectively.

$$ln\left(y^*_{t,h}\right) = h_h(t) + f_h(w_t) + \varepsilon_t$$

Using the natural log of half-hourly demand as the dependent variable in the half-hourly models allows for easier interpretation of the results. The natural log of half-hourly demand gives the percentage deviation from the quarterly average.

We only construct models of demand for summer (including November and March) and winter, and therefore exclude the months of April, May, September and October. This follows the approach in Hyndman and Fan[27], and the analysis of maximums indicates that there are few points of maximum demand in these excluded months.

We do not engage in any stepwise variable selection procedure for each half hour and/or terminal station. Instead, the same set of regressors is included in each model. This reflects the desirability of automating the entire modelling process into an Excel model. Reproduction of the maximum demand model in Excel (after estimation in Stata) is simpler if the variables used in each half-hourly model are the same.

The initial variable selection is important because we cannot statistically justify the inclusion or exclusion of variables for each terminal station/half-hour.

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27 Hyndman, R. and S. Fan 2009, "Density forecasting for long term peak electricity demand", IEEE Transactions on Power Systems.

## Variable selection

We have used the same variables, which were included in the 2015 report. They are summarised in the following section.

### Weather Variables

We align weather station data from the Bureau of Meteorology with terminal stations to determine the relationship between weather and demand for users in the terminal station service area. Temperature drives electricity demand through space heating and cooling, with maximum demand relating particularly to air conditioning usage.

A range of temperature variables can be used, including:

- ambient temperature (dry bulb temperature)
- apparent temperature (measures of thermal comfort)[28]
  - heat index, including
    - humidity
    - wind chill
    - insolation
  - wet bulb temperature

We focus on ambient temperatures, which is the standard approach.

The selection of weather stations for alignment to terminal stations is a partially subjective process. While ACIL encourages a 30 year time series of weather data for a weather station[29], half-hourly data is only available from the late 90s/early 2000s onwards for most regional terminal stations. There is often a trade-off between minimising the distance from the weather station to the terminal station area (and particularly to the population centres of the terminal station area) and having a longer time available for weather analysis.

Temperature effects were included in the model through a variety of terms including the:

- current temperature and temperatures from the past 2.5 hours – *temp*, *L1temp*, *L2temp* … *L5temp*
- current temperature squared and current temperature cubed – *temp2* and *temp3*
- temperature 24 hours ago and 48 hours ago (i.e. at the same time on the previous two days) – *S48temp* and *S96temp* representing the difference between the current temperature and the temperature 48 and 96 half-hours ago respectively
- difference between the current temperature and the temperature 6 hours ago – *temp6diff*

28 Bureau of Meteorology, *Thermal Comfort*, available at, http://www.bom.gov.au/info/thermal_stress/

29 ACIL Allen 2013, *Connection Point Forecasting: A Nationally Consistent Methodology for Forecasting Maximum Electricity Demand*, p. A-1.

- minimum and maximum temperature of the current day - *mintempspline1*, *mintempspline2*, *maxtempspline1* and *maxtempspline2*
  - modelled using cubic regression splines with 3 evenly spaced knots
- average temperature of the current week (from Monday until Sunday) – *avgwkspline1* and *avgwkspline2*
  - modelled using cubic regression splines with 3 evenly spaced knots

### *Calendar Variables*

Calendar variables are variables reflecting the dependency of maximum demand on the day of the week, the time of summer, etc.

The calendar variables included in the maximum demand model include:

- dummy variables for *Monday*, *Tuesday*, *Wednesday*, *Thursday, Friday* and *Saturday*
- dummy variables for whether it is a *weekday* and whether it is a public holiday (*pubhol*)
- a time trend using the date (*eventdate*), and
- time of summer – a smooth function repeating each year estimated using a cubic regression spline[30] (variables *timeofsummer2, timeofsummer3, timeofsummer4* and *timeofsummer5*)[31] with six evenly spaced knots at:
  - 8 days
  - 35 days
  - 63 days
  - 90 days
  - 117 days, and
  - 144 days.

Likewise, maximum demand never occurs overnight, and thus we have excluded the half-hours that never have demand in the top 0.1 per cent of observations. For example, the Ballarat Terminal Station data indicated that, using this test, only the half-hour periods between 7:30am and 8:30pm should be included.

These variables do not suffer from any forecasting uncertainty because their values are fixed depending on the day in question for which we want to predict maximum demand. There is no need to forecast what day of the week the 1st of August 2014 falls on, given that it is always going to be Friday.

30 This variable was used in Hyndman, R. and S. Fan 2009, "Density forecasting for long-term peak electricity demand", IEEE Transactions on Power Systems.

31 *Timeofsummer1* was consistently a non-significant regressor and therefore we have excluded it from the models.

### *Combination calendar and temperature variable – 'yeartemp30'*

A key issue in forecasting peak demand is deviations between peak to average demand, which is related to the response of demand at extreme temperatures, In particular, overtime the responsiveness of demand to high temperatures may change.[32]

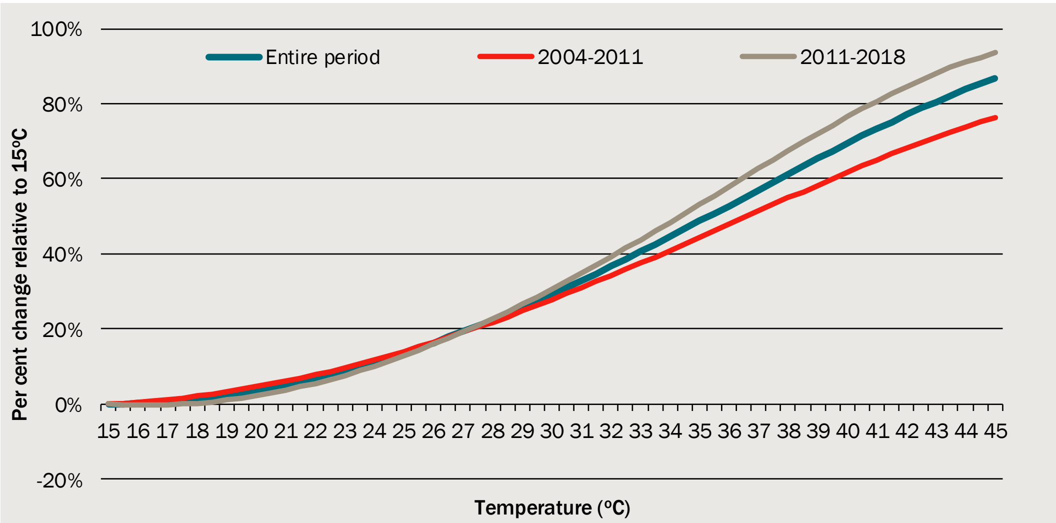
Our models include a variable which combines a calendar effect and a temperature effect to seek to measure these changes through time. This variable (*yeartemp30)*:

- is a multiplication of the number of years since the first year of demand data and the number of degrees above 30 degrees Celsius
- takes the value of 0 where the current temperature is less than 30 degrees and takes the value of years since 2004 multiplied by temperature less 30 degrees when the current temperature is greater than 30 degrees.

Chart 2.1 illustrates the net effect that variation in temperature has on demand through the *temp*, *temp2* and *temp3* variables. The relationships are estimated together with all other temperature and calendar variable except *yeartemp30*.

We compare the effect of the *temp*, *temp2* and *temp3* variables on demand for both the period before 2011 and the period from 2011 onwards (the red and grey series in chart 2.1). More recent years have higher levels of demand for the same temperature with the upper tail of the curve being higher for the 2011-2018 curve than the 2004-2011 curve. Across terminal stations, there is also significant variation in temperature sensitivity (charts 2.2 and 2.3).[33]

**2.1 Relationship between temperature variables and demand between years**




*Note:* This uses Total Powercor network data from 3pm during summer only. The curves have been normalised to show the per cent change relative to 15 degrees. A similar pattern is evident for the CitiPower network.

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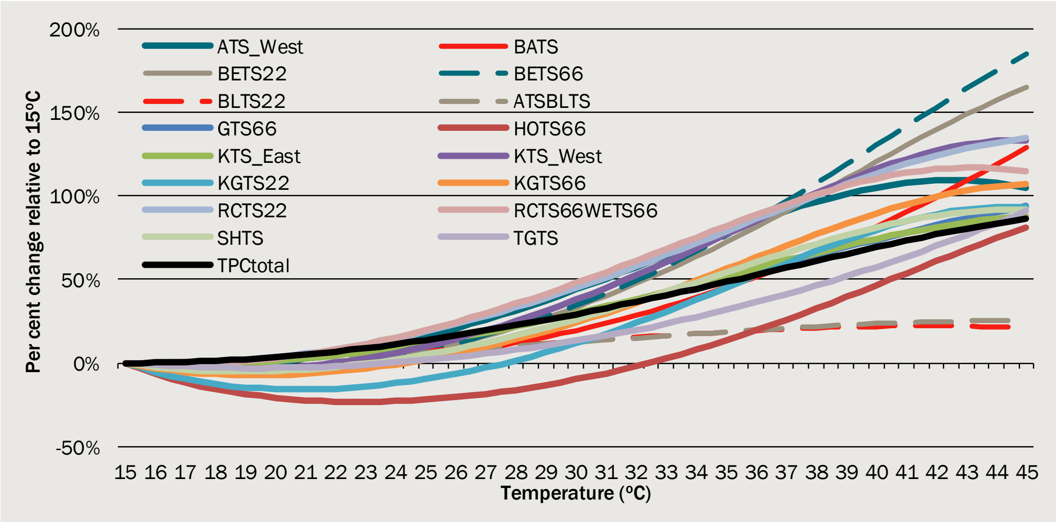
32 The CIE 2011, as reported in Ernst and Young 2011, *Rationale and drivers for demand side participation in the National Electricity Market,* prepared for the AEMC, p. 30.

33 Variation in temperature sensitivity across terminal stations may imply that those differences are related to characteristics of those terminal stations (i.e. incomes in the population serviced by the terminal station). Insofar as those characteristics may change overtime,

*Data source:* Powercor, The CIE.

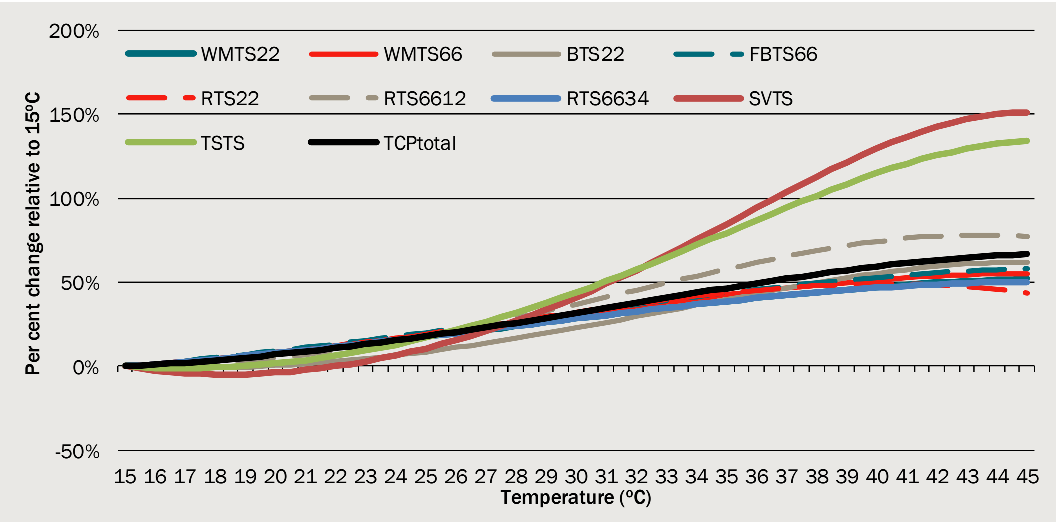
## 2.2 Relationship between temperature and demand – Powercor




*Note:* This uses data from 3pm during summer only. The curves have been normalised to show the per cent change relative to 15 degrees.

*Data source:* Powercor, The CIE.

## 2.3 Relationship between temperature variables and demand – CitiPower

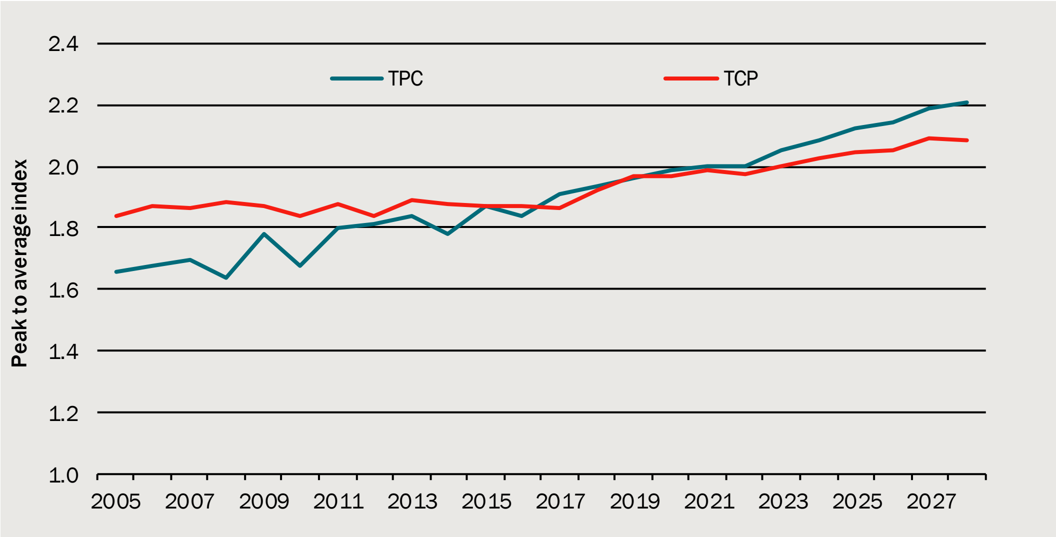



*Note:* This uses data from 3pm during summer only. The curves have been normalised to show the per cent change relative to 15 degrees.

*Data source:* CitiPower, The CIE.

The effect of the *yeartemp* variable is to allow the deviation between average and peak demand to continue to widen over time (following its historic trend). The results of this are demonstrated in Chart 2.4, which show the peak-to-average ratio historically and over the forecast horizon for total Powercor and total CitiPower. Including temperature effects generally improves the fit of the model – *yeartemp30* was found to be significant at the 5 per cent confidence level for all but 5 terminal stations.

## 2.4 Peak-to-average ratio




*Data source:* Total Powercor and CitiPower data, The CIE.

In contrast, AEMO has previously indicated that the change in sensitivity to temperature is not significant and is not included in their modelling methodology.[34] All else equal, this would result in AEMO maximum demand forecasts being lower than The CIE's forecasts. There is however an economic literature which supports changing temperature sensitivity of electricity demand, driven by:

- A rising share of climate control (air conditioners and electric heaters) in electricity consumption. Since 2000, the share of climate control electricity consumption in winter and summer peak demand for Victoria has been steadily increasing and is expected to continue to increase into the future (charts 2.5 and 2.6). The large temperature sensitive share in energy consumption is consistent with an increasing peak to average ratio at low and high temperatures. In the economic literature of electricity demand response to changes in temperature, the response of individuals purchasing additional air conditioners is referred to as the extensive margin.[35] The extensive margin is generally found to account for the majority of changes in electricity demand under different climate change projections.[36] This is affected by climate, type of cooling equipment used, characteristics of the building stock and incomes (cross sectional data shows that electricity demand in richer countries, with a larger stock of air conditioners, tend to be more temperature sensitive[37]). As growth in the stock of air conditioner slows, due to market saturation, changes in temperature sensitivity are also likely to slow.

---

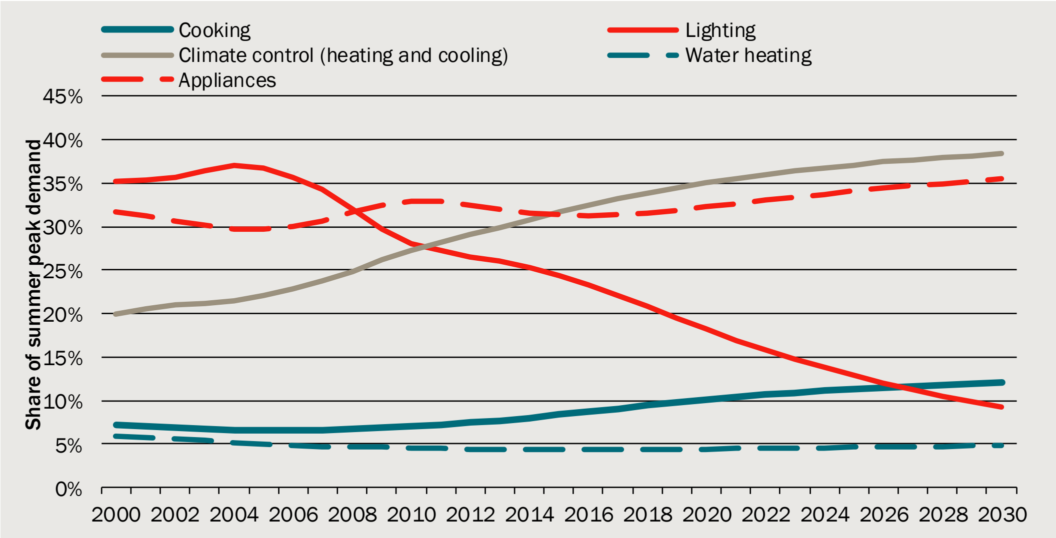
34 AEMO 2014, *Forecasting Methodology Information Paper*.

35 Davis, L. W. and Gertler, P. J. 2015, *Contribution of air conditioning adoption to future energy use under global warming*, PNAS.

36 This is distinct from the intensive margin, which is the change in electricity demand in response to temperature, holding the stock of air conditioning appliances constant.

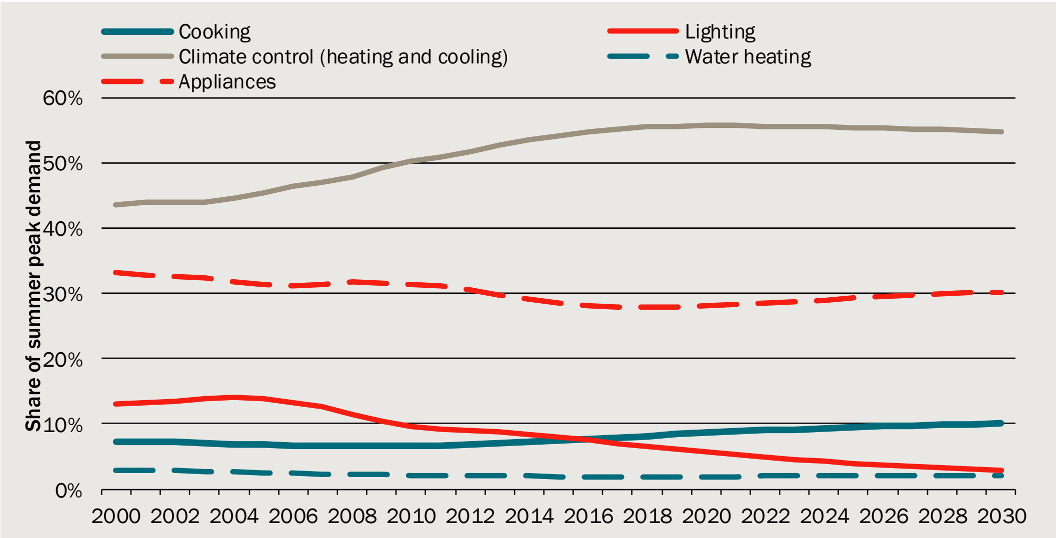
37 International Energy Agency 2018, *The Future of Colling Opportunities for energy -efficient air conditioning*.

### 2.5 Peak electricity demand by end use, Victoria winter peak




*Data source:* Energy Consult (2015) prepared for Department of Industry and Science.

### 2.6 Peak electricity demand by end use, Victoria summer peak

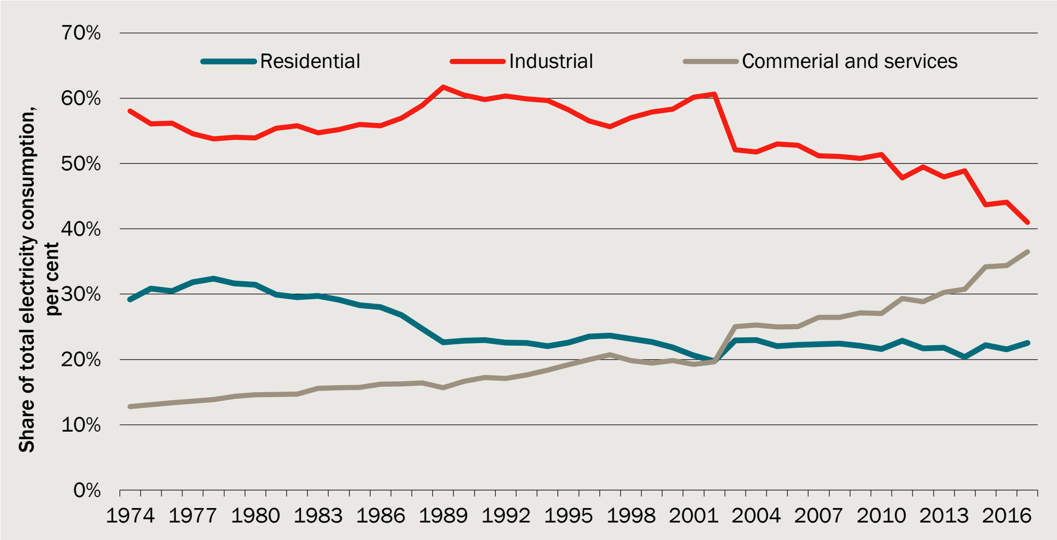



*Data source:* Energy Consult (2015) prepared for Department of Industry and Science.

- Changes in preferences; given the existing stock of air conditioners people may change their behaviour in response to higher temperatures. This is referred to as the intensive margin and is generally found to account for smaller share of changing electricity demand.
- Changes in energy efficiency of electric appliances. Higher energy efficiency of non-temperature sensitive appliances, such as lighting, is likely to reduce average demand but leave peak demand relatively unchanged, given non-temperature sensitive appliances account for a small proportion of electricity demand at this time. This is likely to increase peak to average ratios and observed percentage changes in demand during peak periods. Increased energy efficiency for climate control may operate in the opposite direction (reducing peak to average ratios), however this effect is likely to be much smaller than and increase peak to average ratios.

- Shift away from manufacturing and industrial industries in the economy, which use energy more evenly throughout the year compared to residential and commercial applications.[38] There has been a long run decrease in industrial electricity demand, as a share of total demand, with a particularly large decrease since 2000 (chart 2.7). This has been accompanied by an increase in demand from commercial and services sectors, while the residential share of consumption has remained relatively flat. The decrease in industrial electricity demand is likely due to structural change in the economy away from industrial sectors and towards commercial and services sectors. The fall in industrial demand is largely due to a decrease in electricity consumption for manufacturing.

**2.7 Share of electricity consumption by sector**




*Note:* Commercial and services includes ANZSIC divisions F, G, H, J, K, L, M, N, O, P, Q, R and S. Industrial includes ANSIC divisions A, B, C, D, E and I.

*Data source:* Australian Energy Updated 2018, Department of Environment and Energy.

In addition to these factors, there are other drivers which are likely to operate in the opposite direction.

- Solar PV uptake may reduce temperature sensitivity. Solar PV tends to produce the most electricity during the middle parts of the day, often coinciding with periods of peak demand. As solar PV capacity continue to increase, a greater proportion of this peak demand is likely to be served from power off the electricity grid.
- Increased energy efficiency for air conditioners (as noted in the previous section).

While these have been drivers of historical changes in temperature sensitivity, there is some uncertainty as to whether these drivers will continue into the future. In the table 2.8 we summarise the key drivers and the assumed direction of these trends into the future, these assumptions have been used as the basis of determining the treatment of changing temperature sensitivity across terminal stations.

38 US Energy Information Administration 2014, *Peak-to-average electricity demand ratio rising in New England and many other U.S. regions*, available at, http://www.eia.gov/todayinenergy/detail.cfm?id=15051

## 2.8 Temperature sensitivity trends and drivers

| Driver | Future trends | Impact on temperature sensitivity |
|---|---|---|
| Increasing uptake of air conditioners | ▪ Continued increase in air-conditioned uptake, however growth is likely to slow as projections imply the penetration rate peaked in 2016.<br>▪ Growth in air conditioning share of peak summer demand expected to flatten from 2020. | ↑ |
| Increasing efficiency of air conditioners | ▪ Expected to continue (see post modelling adjustments) | ↓ |
| Increasing efficiency of other electrical appliances | ▪ Expected to continue (see post modelling adjustments) | ↑ |
| Increasing uptake of solar PV | ▪ Expected to continue (see post modelling adjustments) | ↓ |
| Shift away from industrial electricity consumptions | ▪ There has been a long run shift away from industrial sectors towards services. This is expected to continue, however at a slower rate. | ↑ |

*Source:* The CIE.

Given these assumed trends, we have assessed temperature variation across terminals stations to try to assess which terminal stations have been affected by which factors (chart 3.2 and 3.3). This has involved considering the temperature sensitivity and changes in temperature sensitivity for each terminal station, as well as characteristics across terminal stations which are likely to effect changes in temperature sensitivity, including income and industry shares. We assume:

- No changing temperature sensitivity (yeartemp30 excluded) where terminal station demand does not appear to be temperature sensitive (i.e. BLTS22 and ATS/BLTS).
- No changing temperature sensitivity (yeartemp30 excluded) where terminal station temperature sensitivity does not appear to have changed overtime.
- Half of the historic trend in temperature sensitivity (50 per cent of yeartemp30 included) where terminal stations have a high share of industrial and/or agricultural electricity demand. This assumes that there will be a continued shift away from these sectors, but at a slower pace than was historically observed.
- 75 per cent of the historic trend in temperature sensitivity (75 per cent of yeartemp30 included) for the remaining terminals stations. This assumes that there will be a continued increase in temperature sensitivity, however, will be moderated be slower growth in air conditioner penetration.

The assumption applied to each terminal station is summarised in table 2.9.

## 2.9 Treatment of trend in temperature sensitivity

| Terminal station | Description | Treatment of yeartemp30 |
|---|---|---|
| ATS West | Assume increasing temperature sensitivity, at rate slightly lower than over the history | 0.75 per cent of yeartemp30 included |
| BATS | Large industrial and/or agricultural share of demand | 50 per cent of yeartemp30 included |
| BETS22 | No observed change in temperature sensitivity | Yeartemp30 excluded |
| BETS66 | No observed change in temperature sensitivity | Yeartemp30 excluded |
| BLTS22 | Not temperature sensitive | Yeartemp30 excluded |
| ATSBLTS | Not temperature sensitive | Yeartemp30 excluded |
| GTS66 | Assume increasing temperature sensitivity, at rate slightly lower than over the history | 0.75 per cent of yeartemp30 included |
| HOTS66 | No observed change in temperature sensitivity | Yeartemp30 excluded |
| KTS East | No observed change in temperature sensitivity | Yeartemp30 excluded |
| KTS West | Assume increasing temperature sensitivity, at rate slightly lower than over the history | 0.75 per cent of yeartemp30 included |
| KGTS22 | Large industrial and/or agricultural share of demand | 50 per cent of yeartemp30 included |
| KGTS26 | Large industrial and/or agricultural share of demand | 50 per cent of yeartemp30 included |
| RCTS22 | Large industrial and/or agricultural share of demand | 50 per cent of yeartemp30 included |
| RCTS66/WETS66 | Large industrial and/or agricultural share of demand | 50 per cent of yeartemp30 included |
| SHTS | Large industrial and/or agricultural share of demand | 50 per cent of yeartemp30 included |
| TGTS | Large industrial and/or agricultural share of demand | 50 per cent of yeartemp30 included |
| Total Powercor | Large industrial and/or agricultural share of demand | 50 per cent of yeartemp30 included |
| | | |
| WMTS22 | No observed change in temperature sensitivity | Yeartemp30 excluded |
| WMTS66 | No observed change in temperature sensitivity | Yeartemp30 excluded |
| BTS22 | Assume increasing temperature sensitivity, at rate slightly lower than over the history | 0.75 per cent of yeartemp30 included |
| FBTS66 | Assume increasing temperature sensitivity, at rate slightly lower than over the history | 0.75 per cent of yeartemp30 included |
| RTS22 | Large industrial and/or agricultural share of demand | 50 per cent of yeartemp30 included |
| RTS6612 | No observed change in temperature sensitivity | Yeartemp30 excluded |
| RTS6634 | No observed change in temperature sensitivity | Yeartemp30 excluded |

| Terminal station | Description | Treatment of yeartemp30 |
|---|---|---|
| SVTS | No observed change in temperature sensitivity | Yeartemp30 excluded |
| TSTS | Assume increasing temperature sensitivity, at rate slightly lower than over the history | 0.75 per cent of yeartemp30 included |
| Total CitiPower | Assume increasing temperature sensitivity, at rate slightly lower than over the history | 0.75 per cent of yeartemp30 included |

*Source:* The CIE.

## Model fitting

The fit of the half-hourly demand models can be illustrated by showing the STATA output for the OLS regression of one half-hourly model (here the 5:30pm model) for the Powercor network. This is presented in figure 2.10. While many variables are not significant at the 5 or 10 per cent level of significance, in the interests of consistency (which allows for automation of the modelling process) variables have been retained if they occasionally are significant.

### 2.10 STATA estimation of half-hourly demand model for 3:00pm (summer)

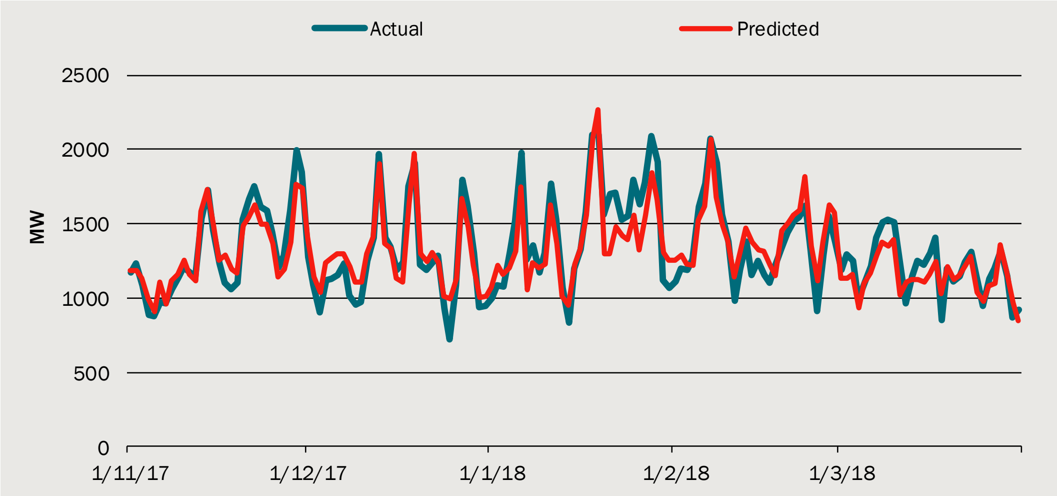
```
      Source |       SS           df       MS      Number of obs   =     1,995
-------------+----------------------------------   F(30, 1964)     =    342.53
       Model |  48.4839278        30  1.61613093   Prob > F        =    0.0000
    Residual |  9.26652735     1,964  .004718191   R-squared       =    0.8395
-------------+----------------------------------   Adj R-squared   =    0.8371
       Total |  57.7504552     1,994  .028962114   Root MSE        =    .06869

---------------------------------------------------------------------------------
            lny |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
----------------+----------------------------------------------------------------
           temp |  -.045074   .0105065    -4.29   0.000     -.065679    -.024469
          temp2 |  .0020922    .000391     5.35   0.000     .0013254    .0028591
          temp3 | -.0000274   4.81e-06    -5.69   0.000    -.0000368   -.0000179
     yeartemp30 |  .0234758   .0032967     7.12   0.000     .0170103    .0299413
 mintempspline1 |  .0040331   .0028875     1.40   0.163    -.0016298    .0096959
 mintempspline2 |  .0028209   .0025899     1.09   0.276    -.0022585    .0079002
 maxtempspline1 | -.0101079   .0032621    -3.10   0.002    -.0165053   -.0037104
 maxtempspline2 |  .0185581    .003713     5.00   0.000     .0112764    .0258399
avewktempspline1 |  -.045644   .0074389    -6.14   0.000    -.0602329   -.0310551
avewktempspline2 |  .0413536   .0061464     6.73   0.000     .0292994    .0534078
         L1temp |  .0009111   .0024429     0.37   0.709    -.0038799    .0057021
         L2temp |  .0026609   .0020862     1.28   0.202    -.0014305    .0067523
         L3temp | -.0023305   .0023135    -1.01   0.314    -.0068676    .0022066
         L4temp |  .0024138   .0023677     1.02   0.308    -.0022296    .0070573
         L5temp |  .0021392   .0018227     1.17   0.241    -.0014355    .0057139
      temp6diff |  -.000089   .0009054    -0.10   0.922    -.0018646    .0016865
         s1temp | -.0025961    .000412    -6.30   0.000    -.0034041   -.0017882
         s2temp | -.0004622   .0003209    -1.44   0.150    -.0010916    .0001671
         monday |  .0205427   .0058053     3.54   0.000     .0091575    .0319279
        tuesday |  .0315029   .0057807     5.45   0.000     .0201659      .04284
      wednesday |  .0254326   .0057817     4.40   0.000     .0140937    .0367716
       thursday |  .0209977    .005775     3.64   0.000     .0096719    .0323234
       saturday |  .0282174   .0057846     4.88   0.000     .0168728     .039562
        weekday |  .1537999   .0057877    26.57   0.000     .1424493    .1651505
         pubhol |  -.170273    .007796   -21.84   0.000    -.1855623   -.1549838
      eventdate | -2.19e-06   1.17e-06    -1.87   0.061    -4.48e-06    1.02e-07
    timeofsummer2 |  -.034932   .0013335   -26.20   0.000    -.0375473   -.0323168
    timeofsummer3 |  .1419315   .0057932    24.50   0.000     .1305699     .153293
    timeofsummer4 | -.2174471   .0109783   -19.81   0.000    -.2389774   -.1959169
    timeofsummer5 |   .163634    .012979    12.61   0.000       .13818     .189088
          _cons |   .816148   .1134143     7.20   0.000      .593723    1.038573
---------------------------------------------------------------------------------
```

*Data source:* Total Powercor demand data for the 5pm half-hourly block during summer months, The CIE analysis.

Our model differs from that of Monash[39] in that the temperature effect is not estimated through a cubic regression spline, but rather the inclusion of temperature, temperature squared and temperature cubed. The statistical performance of the spline specification was poorer than that of the cubic specification for initial terminal stations tested. The use of temperature, temperature squared, and temperature cubed also provides for easier interpretation.

We present the performance of the half-hourly models for selected half-hour periods and both summer and winter in charts 2.11, 2.12, 2.13 and 2.14 below.

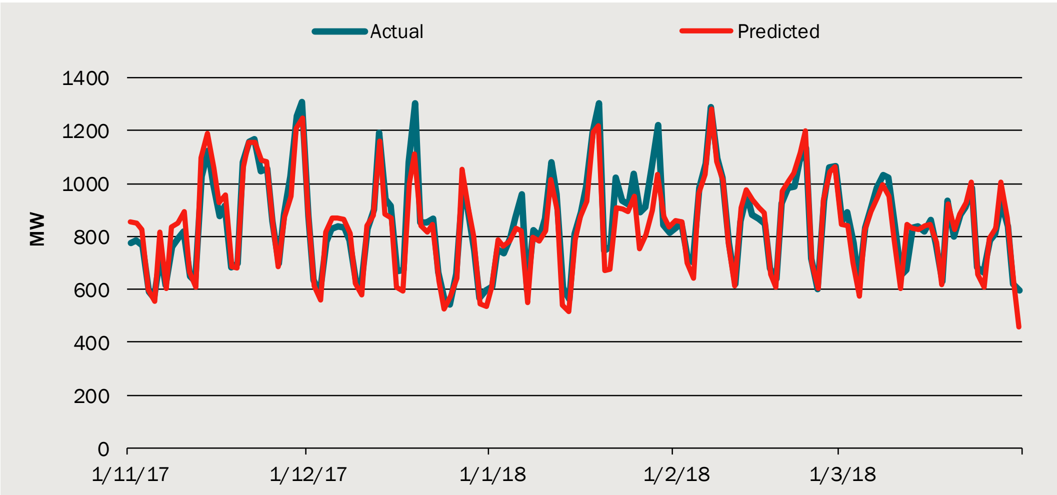
**2.11 Comparison of actual and predicted demand for 3pm (summer) model in 2017/18, Total Powercor**




*Note:* This chart shows the performance of the model in predicted the deviation from the 12pm-4pm quarterly average demand.

*Data source:* Powercor, CIE analysis.

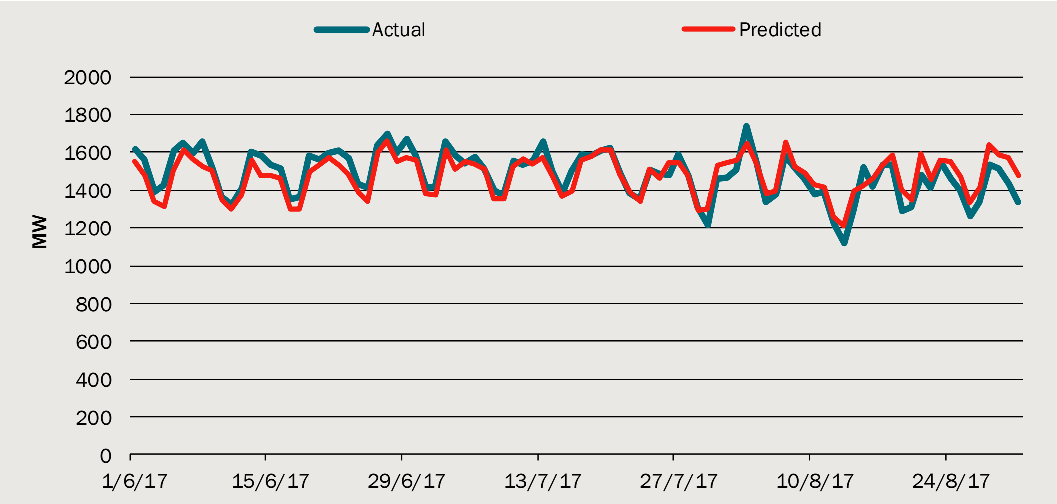
**2.12 Comparison of actual and predicted demand for 3pm (summer) model in 2017/18, Total CitiPower**




*Data source:* CitiPower, CIE analysis.

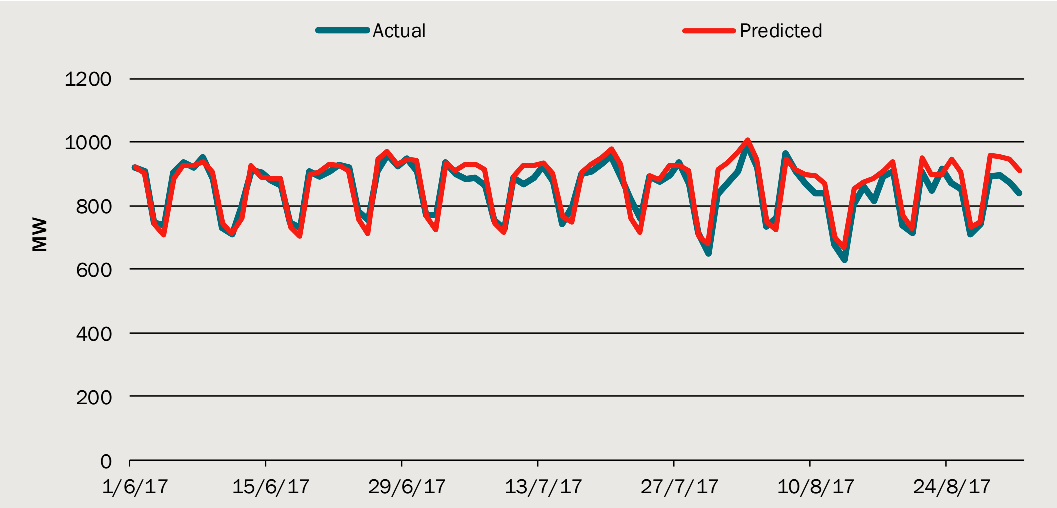
39 Hyndman, R. and S. Fan 2009, "Density forecasting for long-term peak electricity demand", IEEE Transactions on Power Systems.

### 2.13 Comparison of actual and predicted demand for 5pm (winter) model in 2017, Total Powercor




*Note:* This chart shows the performance of the model in predicted the deviation from the 8pm-12pm quarterly average demand.
*Data source:* Powercor, CIE analysis.

### 2.14 Comparison of actual and predicted demand for 5pm (winter) model in 2017, CitiPower




*Note*: This chart shows the performance of the model in predicted the deviation from the 8pm-12pm quarterly average demand.
*Data source:* CitiPower, CIE analysis.

## *Forecasting maximum demand*

The forecasts of maximum demand are a combination of the forecast of average demand and the forecast of the distribution of demand, based on half hourly models. The distribution of demand is about capturing variability and hence involves the following.

- Forecasts are not single forecasts but reflect forecast probability of exceedance — that is, what is the forecast level of demand at which there is a 10 per cent probability that maximum summer demand would be higher.
  - Forecasts are constructed for a 90 per cent probability of exceedance, a 50 per cent probability of exceedance and a 10 per cent probability of exceedance. By definition the probability of exceedance at 10 per cent is higher than 50 per cent, which is then higher than 90 per cent.
- Forecasts require a process of climatic simulation, which is discussed below.
- Forecasts require a process of accounting for non-systematic variation, which is described below.

### *Weather simulation*

Weather conditions are simulated to populate a distribution of forecasts. We use a daily block resampling approach of historical weather to estimate the maximum demand. We only sample temperatures for certain half-hour periods, excluding those during which there have not been any historical maxima. The most common outcome is the exclusion of the morning half-hours (e.g. 7:30am-9:30am).

Likewise, we exclude the months of April, May, September and October. This is done consistently for all terminal stations because we do not construct half-hourly demand models for these months.[40]

The approach consists of first sampling weather from the historical data for a daily block. For each day we wish to forecast maximum demand, we sample one record of temperature observations from the historical data for each half-hour. This record contains the value of all temperature variables used in our model at the time of the historical temperature observations. For example, the daily block for 1 January 2018 includes the lagged temperatures for 31 December 2017.

Each day consists of 48 half-hourly records, which we align to half-hourly records for the forecast day for which we are sampling a temperature record.

The temperature variable record sampled for a forecasting half-hour come from:

- the same half-hour
- the same month
- any year, and
- any day of the month.

40 This follows the approach of Monash to only build models for summer (including November and March) and winter.

What follows is a worked example of our approach to sampling:

- We begin by sampling temperatures for the first iteration of the simulation
  - We wish to simulate temperature for all half-hours of the 1st of January 2018
    - There are a certain total number of January days in the sample, e.g. there may be 435 January days in the total historical temperature record. Let this be denoted by $d_{January}$
    - A random number $r$ between 1 and $d_{January}$ is generated (let $r = 234$)
    - We sample the value of all temperature variables for all half-hours of the 234th January day in our historical data.
  - This sampling takes place for every day of the forecast period for random values of $r$ and with $d_{month}$ taking different values for each month.
- This entire process is repeated for each iteration of the simulation, which thus will provide 1000 simulations.
  - We add an adjustment to temperature records to account for the warming trend in temperatures. We multiply the average annual change of 0.035°C by the number of years between the year the sampled temperature was observed and the year for which we are sampling temperature.

### *Non-systematic variation*

The fitting of maximum demand models for each half-hour and each day of the historical demand period generates residuals. These residuals reflect the difference between what the model predicts and actual demand. Residuals need to be sampled because without doing so, the variation in demand forecasts may understate the variation in demand in the history. This would lead to a biased forecast of peak demand. We take the same approach to sampling residuals as for sampling weather, in that we randomly select residuals from a corresponding month for each forecast day. We sample residuals in daily blocks to account for the differences in residuals for different half-hourly models.

One potential issue with sampling residuals is that there are some abnormally large residuals as a consequence of temporary transfers across terminal stations. We have not been able to systematically identify which periods have temporary transfers and which do not. For these periods, the models will tend to show large residuals — that is, the model cannot predict what actually occurred and hence the residual is large. The forecast should ignore the effect of temporary transfers, to do this we remove the top and bottom 0.1 per cent of residuals from our sample.

A secondary issue is that the residuals for peak demand days may not necessarily have the same characteristics as residuals for that month/hour of the day. Residuals at peak summer times may have a negative mean and a lower variance than all residuals. This could reflect some level of saturation of electricity use on very hot days — additional temperatures push demand higher in the model but historically households are constrained as air conditioners are already on. To accommodate this second issue, we adjust residuals so that the historical probability of exceedance levels for summer match the observed actual maxima.

# *Post-modelling adjustments*

## *Embedded generators*

The demand from major embedded generators was added to the terminal station demand where data on embedded generators was available over the period which average demand is estimated, or the entire life of embedded generator. After the simulation of maximum demand, we subtract embedded generation to provide a measure of the maximum demand for the terminal station. We also adjust for already committed embedded generators, which were provided by Powercor. In total, historical data was available for 13 embedded generators and for 10 committed embedded generators (table 2.15). The historical embedded generators are the same as those included in the 2015 report; additional data was provided regarding additional embedded generators but were not included as data was not available over the entire period of their operation.

**2.15 Embedded generators accounted for in modelling**

| Terminal station | Embedded generator |
|---|---|
| ATS West | ▪ Boral Landfill<br>▪ Melbourne Water |
| ATS/BLTS | ▪ Quenos |
| BATS | ▪ Challicum Hills wind farm<br>▪ Leonards Hill wind farm<br>▪ Yendon Windfarm [a] |
| GTS66 | ▪ Mt Gellibrand Wind Farm[a]<br>▪ 245 Bacchus Marsh Rd Solar[a] |
| HOTS66 | ▪ Challicum Hills wind farm |
| KGTS22 | ▪ Greenswitch Solar Farm[a] |
| KGTS66 | ▪ Edify Battery (at Gannawarra Solar Farm GSF)[a] |
| RCTS22 | ▪ Carwarp Solar<br>▪ Thurla Solar |
| RCTS66 | ▪ Yatpool Solar Farm[a]<br>▪ Karadoc Solar Farm[b] |
| SHTS | ▪ Lake Mulwala wind farm<br>▪ Numurka Solar Farm[a] |
| TGTS | ▪ Codrington wind farm<br>▪ Mortons Lane wind farm<br>▪ Oaklands Hill wind farm<br>▪ Yambuk wind farm<br>▪ Mt Gellibrand Wind Farm[a] |
| WETS66 | ▪ Bannerton Solar Farm[a]<br>▪ Wemen Solar Farm[a] |

[a] Expected to be commissioned in 2018

[b] Expected to be commissioned in 2019

*Note:* Mt Gellibrand Wind Farm has been split between TGTS and GTS66 reflecting it is located across two connection points.

*Source:* Powercor, Oakley Greenwood

Table 2.16 summarises these post-modelling adjustments made to maximum demand forecasts for embedded generators before 2018, in 2018 and in 2019. There are three steps to determining the adjustment to be made:

1 Calculating the historic level of output of each embedded generator at the time of annual maximum demand for the relevant terminal station.

2 Taking the average of those levels across all years of data. Where there appears to be a structural break in the data (i.e. there is a large increase in embedded generation over more recent years), we take an average over the most recent years which are likely to better reflect current embedded generation patterns.

3 Calculating embedded generation in 2018 and 2019 for committed generators, using a capacity factor provided by Oakley Greenwood, and adding these to existing capacity adjustments

### 2.16 Post-modelling adjustments for wind farms by terminal station

| Terminal station | Pre 2018 | 2018 | 2019 and onwards |
|---|---|---|---|
| | MW | MW | MW |
| ATS West | -7.9 | -7.9 | -7.9 |
| ATS/BLTS | -6.5 | -6.5 | -6.5 |
| BATS | -33.1 | -44.8 | -44.8 |
| GTS66 | 0.0 | -5.5 | -5.5 |
| HOTS66 | -38.7 | -38.7 | -38.7 |
| KGTS22 | 0.0 | -3.3 | -3.3 |
| KGTS66 | 0.0 | -10.0 | -10.0 |
| RCTS22 | -2.1 | -2.1 | -2.1 |
| RCTS66 | 0.0 | -8.9 | -18.8 |
| SHTS | -4.4 | -15.4 | -15.4 |
| TGTS | -82.7 | -88.0 | -88.0 |
| WETS66 | 0.0 | -19.3 | -19.3 |
| TPC | -98.7 | -140.9 | -146.5 |

*Note:* These figures are adjustments made to decrease the forecasts after the simulation, and therefore these figures are added to the forecasts. Total Powercor embedded generator adjustments for 2018 and 2019 and onwards are calculated by taking the sum of embedded generation adjustments across terminal stations for those periods and multiplying by the historical ratio of the Total Powercor embedded generation adjustment to the sum of embedded generation adjustments across terminal stations, which adjusts for the fact terminal stations peak at different times.

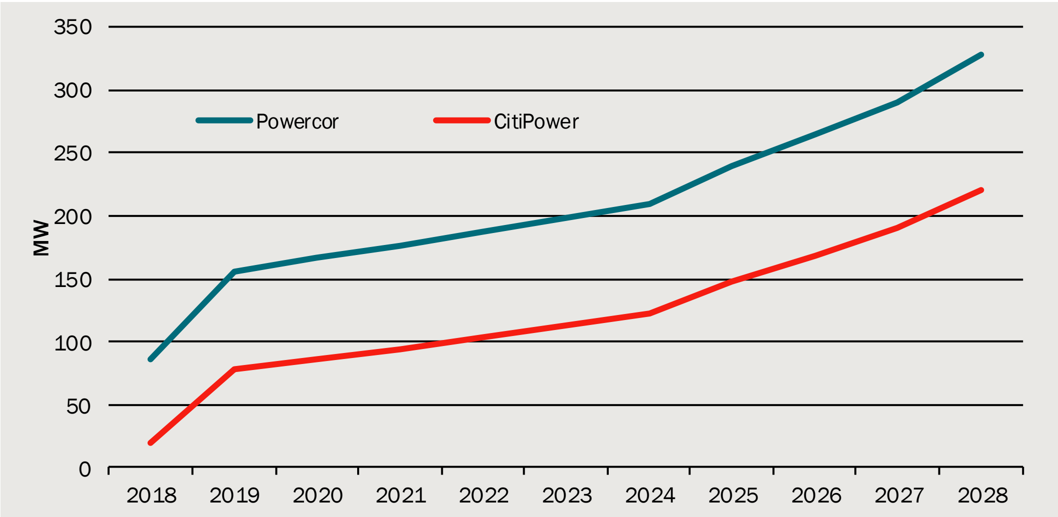
*Source:* The CIE.

## *Technology impacts*

We make post-modelling-adjustments to our forecasts of maximum demand for solar PV generation, energy efficiency, battery storage, electric vehicles and large scale solar. These adjustments all decrease maximum demand except for electricity vehicles which result in increased demand. The attached Oakley Greenwood report[41] summarises the impact of the five technologies on terminal station demand. Because these are post-modelling adjustments, they do not require further simulation of temperatures in order to be implemented. The forecasts, by default, include post-modelling adjustments for all five technologies, however the model includes the option to exclude specific adjustments from the forecasts.

Adjustments for solar PV (chart 2.17) were updated following the Victorian state election to include the Labour Government's election commitment to provide an estimated 650,000 eligible customers with zero interest loans with a four-year payback, which would come into effect from 1 July 2019.

**2.17 Solar PV post-modelling adjustment for solar PV generation**




*Data source:* The CIE, Oakley Greenwood.

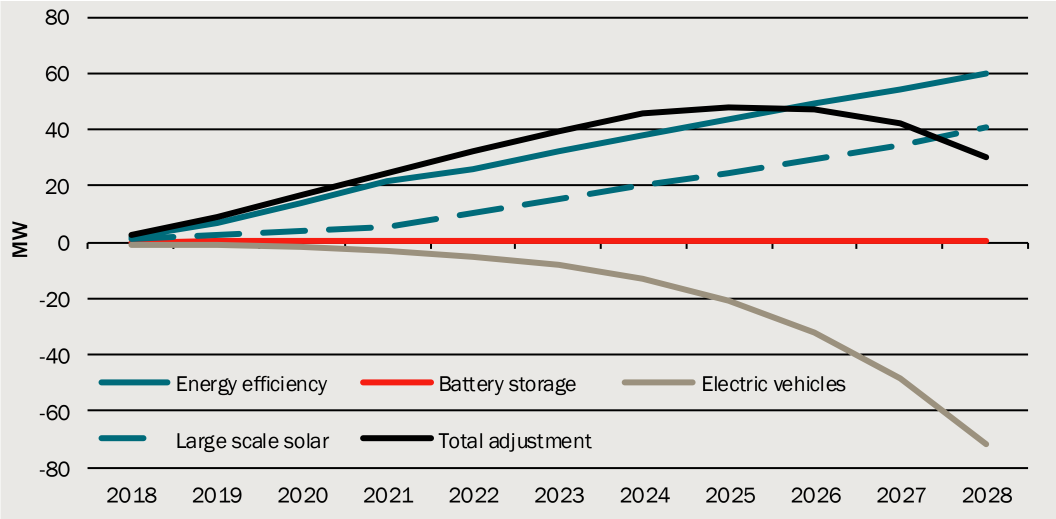
Our forecasts also include post modelling adjustments for energy efficiency, battery storage, electric vehicles and large scale solar (see charts 2.18 and 2.19). The adjustment for battery storage is small for both the CitiPower and Powercor networks, with large scale solar adjustment also negligible in the CitiPower area. The uptake of electric vehicles is expected to ramp up over time resulting in higher electricity demand, somewhat offsetting lower network demand due to the other technologies.

Energy efficiency changes are included in estimated average demand insofar as its impact on demand is picked up by the solar PV capacity variable.[42] Given we hold solar PV capacity constant over the forecast period, we are able to include the full energy efficiency adjustment without double counting.

41 Oakley Greenwood 2018, *Post-Model Adjustments for Terminal Station Forecasts*

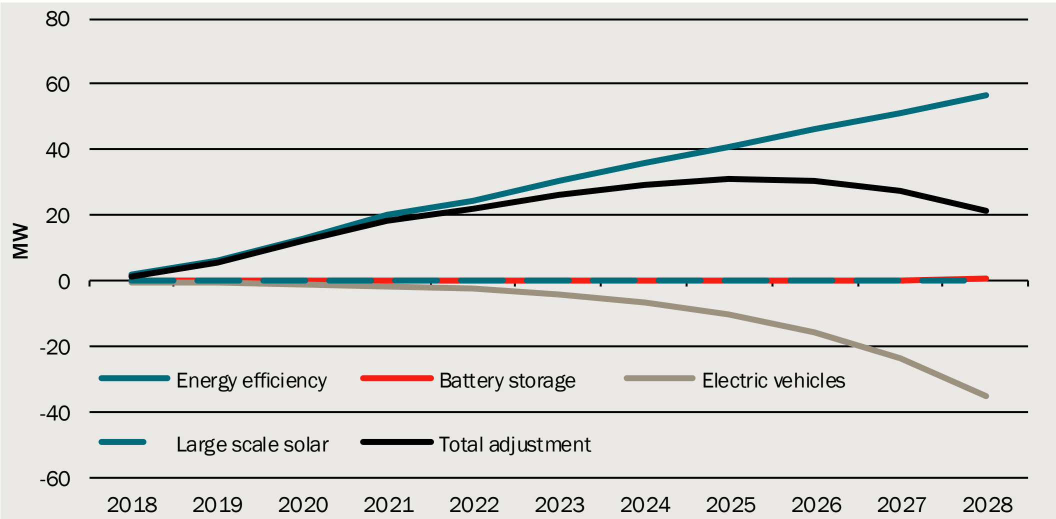
42 This depends on how strongly energy efficiency is correlated with solar PV capacity.

**2.18 Post-modelling adjustments excluding solar PV, Powercor**




*Data source:* The CIE, Oakley Greenwood.

**2.19 Post-modelling adjustments excluding solar PV, CitiPower**




*Data source:* The CIE, Oakley Greenwood.

## *Industrial and agricultural load*

We make an adjustment to the maximum demand forecasts for certain terminal stations that have a significant amount of industrial and/or agricultural customer load at peak. This is because, underlying drivers such as population growth, income per capita and temperature are likely to be poor indicators of industrial and agricultural electricity demand, which in general will be very stable and not grow over time.

We make the adjustment to the forecasts for certain terminal stations to make industrial/agricultural load a fixed component of maximum demand that does not grow.

This is combined with non-industrial/agricultural load growing at the rate estimated using the statistical models.[43]

The mechanism for implementing this adjustment is as follows:

1 Calculate the proportion of maximum demand (MW) in summer 2017/18 and winter 2017 that is accounted for by industrial and agricultural load (MW). This is based on half hourly data by customer type provided by Powercor and CitiPower.
2 Combine this with previously provided information on industrial load for summer 2013/14 and winter 2013, which was used in the 2015 forecasts. Where industrial load is accounted for in the existing data, an adjustment is only made for agricultural load.
3 Subtract that proportion of maximum demand from the forecasts for subsequent years.
4 Add the amount of industrial/agricultural load at peak to the maximum demand forecasts for future years.

This reduces the maximum demand forecast such that non-industrial/agricultural demand is forecast by the model while industrial and agricultural demand is fixed overtime. Block load adjustments account for subsequent discrete changes in industrial demand as provided by Powercor and CitiPower.

### 2.20 Industrial load at peak by terminal station

| Terminal Station | Summer | Winter |
|---|---|---|
| | MW | MW |
| RCTS 22kV | 14 | 0.0 |
| RCTS 66kV | 0 | 0.0 |
| WETS 66kV | 45 | 12.0 |
| KGTS 22kV | 0 | 0.0 |
| KGTS 66kV | 0 | 0.0 |
| HOTS 66kV | 3.6 | 2.7 |
| BETS 22kV | 2.5 | 1.9 |
| BETS 66kV | 10.8 | 8.1 |
| SHTS/GNTS | 0 | 0.0 |
| HYTS/TGTS/APD | 22 | 16.5 |
| BATS/ELTS | 0 | 0.0 |
| MLTS/GTS/PTH | 84.2 | 84.2 |
| ATS West | 0 | 0.0 |
| ATS-BLTS | 70.9 | 64.2 |
| BLTS 22kV | 20.7 | 19.0 |
| KTS East | 0 | 0.0 |

43 AEMO estimates separate models for residential and business demand in the 2018 Electricity Statement of Opportunites industrial and residential demand in the 2015 NEFR, because of data constraints this is not possible at the terminal station level.

| Terminal Station | Summer | Winter |
|---|---|---|
| KTS West | 0 | 0.0 |
| WMTS 66kV | 3.7 | 2.8 |
| WMTS 22kV | 3.7 | 2.8 |
| BTS 22kV | 1.1 | 0.8 |
| FBTS 66kV | 13.2 | 9.9 |
| RTS 66kV transformers 1&4 | 0 | 0.0 |
| RTS 66kV transformers 2&3 | 0 | 0.0 |
| RTS 22kV | 0 | 0.0 |
| SVTS 66kV | 0 | 0.0 |
| TSTS 66kV | 0 | 0.0 |

*Source:* The CIE, Powercor/CitiPower.

The adjustments made for the total Powercor and CitiPower networks are the sum of adjustments for Powercor and CitiPower terminal stations respectively.

### *Block loads*

We make adjustments for step changes in demand identified by Powercor and CitiPower, known as block loads.

Block load adjustments have been obtained from Powercor and CitiPower, with the adjustments representing the cumulative impact of step changes in demand. They can be attributed to new large industrial loads, existing industrial loads being removed (such as when a factory shuts down) and transfers between terminal stations. For industrial customers each step change is carried forward unchanged in the adjustment to future years. For transfers between terminal stations, we assume the transfer grows as the same rate as maximum demand for terminal station from which the load originated (i.e. if 10 MW is transfer from terminal station A to B, the 10 MW of demand will grow at the rate implied by terminal station A's growth rate). Post-modelling adjustment includes all current and past block loads.

The block load adjustments provided by CitiPower and Powercor are similar though not identical for summer and winter. We assumed that the summer block loads are applicable for annual maximum demand estimates, and these adjustments are shown in table 2.21.

## 2.21 Block load adjustments annual maximum demand

| Terminal Station | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW | MW |
| RCTS 22kV | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| RCTS 66kV | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| WETS 66kV | -4.0 | -4.0 | -4.0 | -4.0 | -4.0 | -4.0 | -4.0 | -4.0 | -4.0 | -4.0 | -4.0 |
| KGTS 22kV | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| KGTS 66kV | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| HOTS 66kV | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| BETS 22kV | 5.1 | 5.3 | 5.3 | 5.4 | 5.5 | 5.6 | 5.7 | 5.8 | 5.9 | 6.1 | 6.1 |
| BETS 66kV | 0.3 | 0.1 | 0.1 | 0.0 | -0.1 | -0.2 | -0.3 | -0.4 | -0.5 | -0.7 | -0.7 |
| SHTS/GNTS | 13.2 | 13.2 | 13.2 | 13.2 | 13.2 | 13.2 | 13.2 | 13.2 | 13.2 | 13.2 | 13.2 |
| HYTS/TGTS/APD | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 |
| BATS/ELTS | 10.8 | 11.1 | 11.3 | 11.6 | 12.0 | 12.3 | 12.5 | 13.0 | 13.4 | 13.7 | 14.1 |
| MLTS/GTS/PTH | -9.9 | -9.9 | -9.9 | -9.9 | -9.9 | -9.9 | -9.9 | -9.9 | -9.9 | -9.9 | -9.9 |
| ATS West | -24.6 | -26.0 | -27.4 | -28.9 | -30.5 | -32.2 | -34.0 | -35.8 | -37.7 | -39.6 | -42.1 |
| ATS-BLTS | -26.4 | -27.2 | -27.9 | -28.7 | -29.5 | -30.4 | -31.1 | -32.0 | -32.9 | -33.8 | -34.6 |
| BLTS 22kV | 2.6 | 2.8 | 2.9 | 3.1 | 3.2 | 3.4 | 3.6 | 3.8 | 4.0 | 4.2 | 4.5 |
| KTS East | 6.9 | 7.1 | 7.2 | 7.4 | 7.5 | 7.6 | 7.7 | 7.8 | 7.9 | 8.0 | 8.1 |
| KTS West | -67.6 | -72.7 | -76.7 | -80.8 | -83.9 | -86.6 | -93.9 | -96.4 | -98.0 | -104.0 | -109.4 |
| DPTS | 109.7 | 122.4 | 128.1 | 133.9 | 138.7 | 143.4 | 152.7 | 157.2 | 160.8 | 168.9 | 176.9 |
| WMTS 66kV | 36.7 | 38.2 | 70.7 | 73.5 | 75.2 | 96.9 | 98.4 | 100.3 | 102.1 | 103.9 | 106.3 |
| WMTS 22kV | -15.4 | -22.9 | -50.0 | -52.0 | -54.3 | -76.5 | -78.4 | -81.0 | -83.5 | -86.0 | -88.2 |
| BTS 22kV | 6.2 | 7.6 | 7.6 | 7.6 | 7.6 | 7.6 | 7.6 | 7.6 | 7.6 | 7.6 | 7.6 |
| FBTS 66kV | 7.3 | 12.1 | 15.1 | 16.1 | 17.2 | 17.1 | 16.8 | 16.7 | 16.7 | 16.5 | 16.3 |
| BTS66kV | -1.2 | 124.0 | 127.4 | 130.9 | 133.5 | 136.2 | 140.4 | 142.6 | 144.9 | 148.6 | 151.2 |
| RTS 66kV transformers 1&2 | 23.0 | 24.4 | 25.7 | 26.5 | 26.5 | 26.8 | 28.2 | 27.8 | 27.5 | 28.3 | 28.6 |
| RTS 66kV transformers 3&4 | 0.0 | -99.7 | -102.6 | -105.4 | -107.5 | -109.5 | -112.8 | -114.5 | -116.3 | -119.2 | -120.9 |
| RTS 22kV | -12.1 | -9.8 | -11.4 | -12.4 | -12.4 | -32.8 | -34.6 | -34.1 | -33.7 | -34.6 | -35.1 |
| SVTS 66kV | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| TSTS 66kV | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Powercor | 22.7 | 28.7 | 28.7 | 28.7 | 28.7 | 28.7 | 28.7 | 28.7 | 28.7 | 28.7 | 28.7 |
| Total CitiPower | 44.7 | 74.1 | 82.5 | 84.8 | 85.8 | 65.9 | 65.6 | 65.5 | 65.5 | 65.2 | 65.9 |

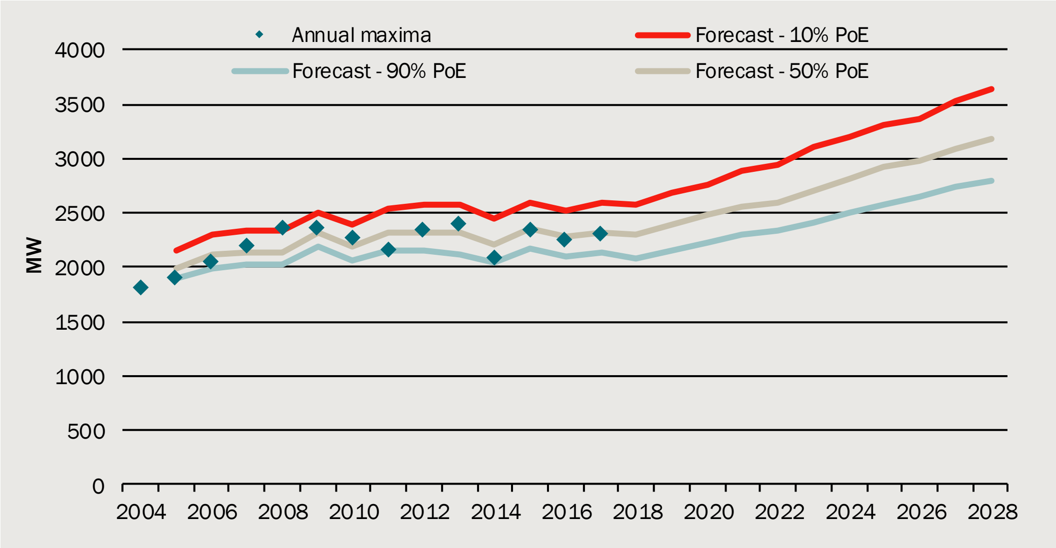
*Source:* Powercor, CitiPower, The CIE.

# 3 Powercor forecasts

## Total network forecasts

Maximum demand forecasts for the Total Powercor network are the coincident network-wide maxima, rather than the summation of individual terminal station maxima.

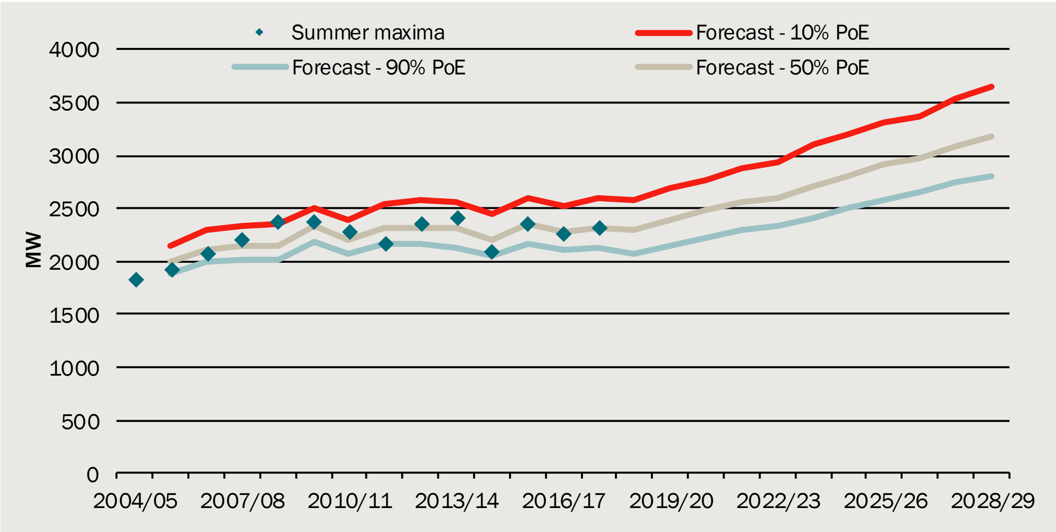
### 3.1 Total Powercor annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

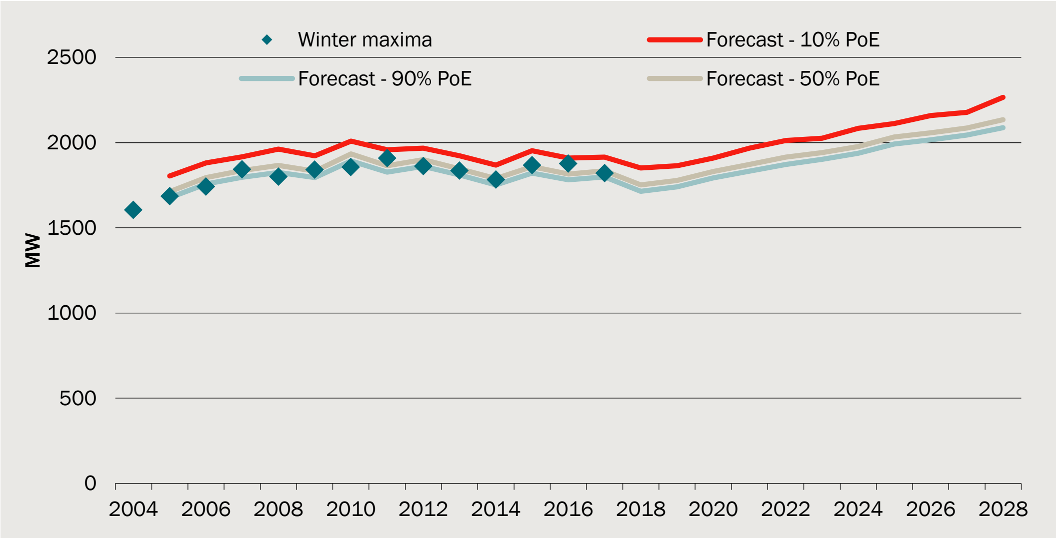
### 3.2 Total Powercor summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.3 Total Powercor winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.4 Total Powercor maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 2075.6 | 2153.7 | 2224.0 | 2294.6 | 2335.5 | 2415.2 | 2506.0 | 2575.2 | 2647.9 | 2741.5 | 2798.7 |
| 50% PoE | 2294.9 | 2382.8 | 2479.4 | 2552.0 | 2602.0 | 2711.4 | 2812.6 | 2921.0 | 2976.7 | 3088.8 | 3180.7 |
| 10% PoE | 2580.3 | 2687.7 | 2767.7 | 2880.2 | 2942.8 | 3109.9 | 3203.4 | 3306.8 | 3363.4 | 3536.7 | 3649.1 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 1714.0 | 1739.8 | 1792.3 | 1832.0 | 1872.9 | 1902.6 | 1936.8 | 1992.0 | 2016.2 | 2045.1 | 2087.6 |
| 50% PoE | 1751.7 | 1777.6 | 1830.3 | 1872.6 | 1914.6 | 1941.2 | 1977.5 | 2033.6 | 2057.8 | 2085.3 | 2134.0 |
| 10% PoE | 1851.1 | 1864.0 | 1909.7 | 1967.5 | 2013.6 | 2025.2 | 2083.2 | 2112.8 | 2159.5 | 2178.4 | 2265.3 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 2075.6 | 2153.7 | 2224.0 | 2294.6 | 2335.5 | 2415.2 | 2506.0 | 2575.2 | 2647.9 | 2741.5 | 2798.7 |
| 50% PoE | 2294.9 | 2382.8 | 2479.4 | 2552.0 | 2602.0 | 2711.4 | 2812.6 | 2921.0 | 2976.7 | 3088.8 | 3180.7 |
| 10% PoE | 2580.3 | 2687.7 | 2767.7 | 2880.2 | 2942.8 | 3109.9 | 3203.4 | 3306.8 | 3363.4 | 3536.7 | 3649.1 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.5 Total Powercor maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 1898.9 | 1884.0 | 1928.5 | 1971.5 | 1989.5 | 2040.3 | 2097.4 | 2129.3 | 2169.6 | 2225.8 | 2250.4 |
| 50% PoE | 2089.5 | 2083.1 | 2150.4 | 2195.1 | 2221.0 | 2297.7 | 2363.7 | 2429.7 | 2455.4 | 2527.6 | 2582.4 |
| 10% PoE | 2337.4 | 2348.0 | 2400.9 | 2480.3 | 2517.1 | 2643.9 | 2703.3 | 2764.9 | 2791.3 | 2916.7 | 2989.3 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 1519.8 | 1469.5 | 1504.3 | 1521.4 | 1539.1 | 1546.9 | 1560.0 | 1575.9 | 1573.7 | 1578.7 | 1591.2 |
| 50% PoE | 1553.3 | 1503.0 | 1538.0 | 1557.4 | 1576.1 | 1581.1 | 1596.1 | 1612.8 | 1610.5 | 1614.3 | 1632.4 |
| 10% PoE | 1641.3 | 1579.5 | 1608.3 | 1641.5 | 1663.8 | 1655.6 | 1689.8 | 1683.0 | 1700.7 | 1696.8 | 1748.7 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 1898.9 | 1884.0 | 1928.5 | 1971.5 | 1989.5 | 2040.3 | 2097.4 | 2129.3 | 2169.6 | 2225.8 | 2250.4 |
| 50% PoE | 2089.5 | 2083.1 | 2150.4 | 2195.1 | 2221.0 | 2297.7 | 2363.7 | 2429.7 | 2455.4 | 2527.6 | 2582.4 |
| 10% PoE | 2337.4 | 2348.0 | 2400.9 | 2480.3 | 2517.1 | 2643.9 | 2703.3 | 2764.9 | 2791.3 | 2916.7 | 2989.3 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

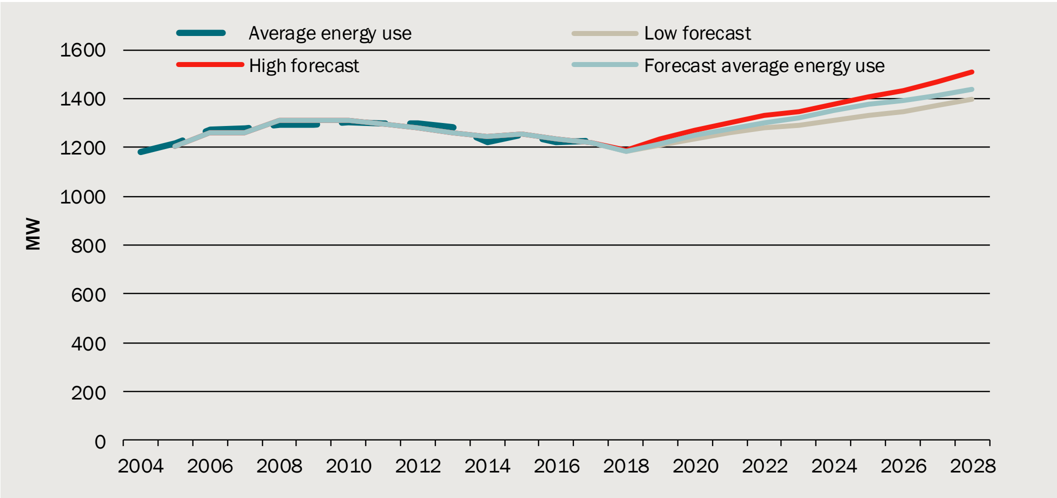
The average demand model was estimated using the long run relationship only, as the coefficient on the error correction term was less than -1.

### 3.6 Total Powercor average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate long run model only | -0.1006 |
| Income | The CIE estimate long run model only | 0.0773 |

*Source:* Powercor terminal station data, The CIE.

### 3.7 Total Powercor average demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.8 Total Powercor predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 2368.9 | 2356.7 | 2263.7 | 2160.0 | 2336.9 | 2409.8 | 2087.2 | 2345.2 | 2246.8 | 2302.1 |
| 90% PoE | 2016.0 | 2185.4 | 2062.8 | 2158.9 | 2158.2 | 2124.9 | 2044.7 | 2163.4 | 2100.3 | 2132.7 |
| 50% PoE | 2141.5 | 2327.4 | 2194.8 | 2324.5 | 2322.9 | 2312.8 | 2208.6 | 2347.1 | 2272.5 | 2325.3 |
| 10% PoE | 2345.6 | 2507.1 | 2386.4 | 2543.4 | 2574.8 | 2567.8 | 2453.7 | 2597.0 | 2521.1 | 2600.1 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 1798.0 | 1839.2 | 1854.4 | 1906.4 | 1860.3 | 1834.3 | 1781.8 | 1865.6 | 1875.4 | 1819.5 |
| 90% PoE | 1825.6 | 1796.0 | 1892.7 | 1826.3 | 1861.2 | 1809.8 | 1752.2 | 1820.5 | 1781.6 | 1798.4 |
| 50% PoE | 1866.4 | 1833.0 | 1933.1 | 1865.3 | 1900.0 | 1846.6 | 1788.6 | 1858.0 | 1816.2 | 1834.2 |
| 10% PoE | 1961.3 | 1923.4 | 2008.8 | 1957.8 | 1968.1 | 1922.7 | 1867.5 | 1952.1 | 1909.2 | 1914.6 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 2368.9 | 2356.7 | 2263.7 | 2160.0 | 2336.9 | 2409.8 | 2087.2 | 2345.2 | 2246.8 | 2302.1 |
| 90% PoE | 2021.2 | 2185.4 | 2066.0 | 2158.9 | 2158.7 | 2124.9 | 2044.7 | 2163.4 | 2100.3 | 2132.7 |
| 50% PoE | 2142.2 | 2327.4 | 2196.8 | 2324.5 | 2322.9 | 2312.8 | 2208.6 | 2347.1 | 2272.5 | 2325.3 |
| 10% PoE | 2345.6 | 2507.1 | 2386.4 | 2543.4 | 2574.8 | 2567.8 | 2453.7 | 2597.0 | 2521.1 | 2600.1 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.9 Total Powercor average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.767 |
| Winter | 0.826 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

Summer peaks occur during the early afternoon, while winter peaks occur around 6pm.

### 3.10 Total Powercor details of actual maxima

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 21-07-04 17:30 | 1594.2 | 8.8 | 2.5 | 11.4 | 8.2 |
| 12-07-05 17:30 | 1668.5 | 8.7 | 4.7 | 9.5 | 8.2 |
| 13-06-06 18:00 | 1723.0 | 8.6 | 4.3 | 10.8 | 8.9 |
| 17-07-07 18:00 | 1779.9 | 3.8 | 3.1 | 8.5 | 7.0 |
| 29-07-08 17:30 | 1744.1 | 10.4 | 0.3 | 12.4 | 9.0 |
| 10-06-09 17:30 | 1781.5 | 6.8 | 4.5 | 9.3 | 9.6 |
| 20-07-10 18:00 | 1822.6 | 8.6 | 2.8 | 11.6 | 8.7 |

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| 07-06-11 17:30 | 1809.8 | 6.0 | 4.4 | 9.8 | 9.0 |
| 26-06-12 17:30 | 1807.0 | 6.9 | 3.1 | 10.7 | 9.1 |
| 09-07-13 18:00 | 1778.2 | 7.5 | 2.1 | 12.9 | 10.7 |
| 22-07-14 18:00 | 1722.1 | 5.6 | 3.1 | 9.7 | 8.4 |
| 14-07-15 18:30 | 1769.6 | 6.0 | 5.3 | 9.1 | 8.1 |
| 27-06-16 17:30 | 1719.0 | 9.6 | 5.5 | 10.0 | 8.1 |
| 03-08-17 18:00 | 1793.8 | 6.9 | 1.3 | 8.1 | 8.4 |
| **Summer** | | | | | |
| 20-02-04 16:00 | 1736.1 | 40.1 | 13.3 | 40.1 | 18.5 |
| 25-01-05 15:30 | 1795.8 | 34.6 | 16.3 | 35.4 | 22.7 |
| 24-02-06 15:30 | 1871.4 | 34.2 | 18.4 | 35.2 | 21.3 |
| 16-01-07 14:30 | 2019.8 | 39.1 | 16.2 | 40.1 | 23.8 |
| 17-03-08 15:30 | 2163.4 | 37.7 | 19.7 | 38.8 | 24.5 |
| 29-01-09 13:30 | 2355.0 | 42.6 | 27.6 | 43.6 | 27.1 |
| 11-01-10 15:30 | 2299.4 | 42.0 | 15.6 | 42.0 | 23.1 |
| 01-02-11 12:00 | 2195.9 | 38.3 | 16.9 | 38.9 | 23.6 |
| 24-01-12 15:30 | 2114.8 | 33.5 | 17.2 | 34.1 | 22.7 |
| 12-03-13 16:00 | 2221.9 | 35.7 | 24.4 | 35.7 | 19.0 |
| 16-01-14 15:30 | 2345.9 | 42.3 | 23.7 | 42.3 | 25.5 |
| 07-01-15 15:30 | 2043.5 | 36.6 | 16.5 | 39.2 | 23.1 |
| 13-01-16 15:00 | 2194.6 | 24.9 | 15.3 | 42.2 | 22.2 |
| 08-02-17 17:30 | 2115.0 | 35.0 | 14.5 | 35.2 | 22.6 |
| 28-01-18 17:00 | 2269.2 | 38.1 | 21.4 | 38.3 | 23.6 |

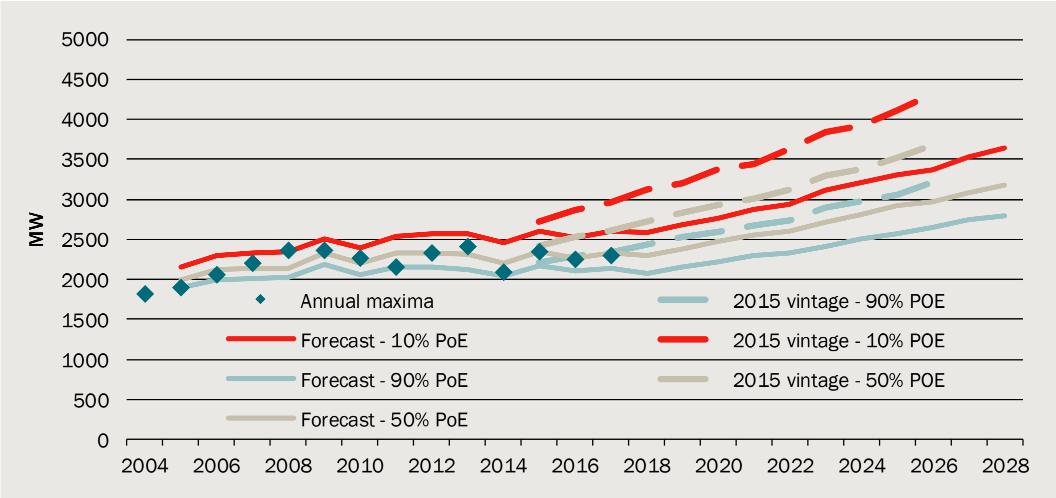
*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.
*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

## *Comparison to 2015 forecasts and AEMO forecasts*

In the following section we compared maximum demand forecasts to 2015 forecasts prepared by the CIE and 2018 forecasts prepared by AEMO.

The updated CIE forecasts are significantly lower than the 2015 forecasts, reflecting weaker demand than expected over the past few years. This is largely due to average demand forecasts from 2015 being significantly higher than actuals. Growth rates are also weaker compared to the 2015 forecasts.

### 3.11 Powercor maximum demand compared to 2015 forecasts

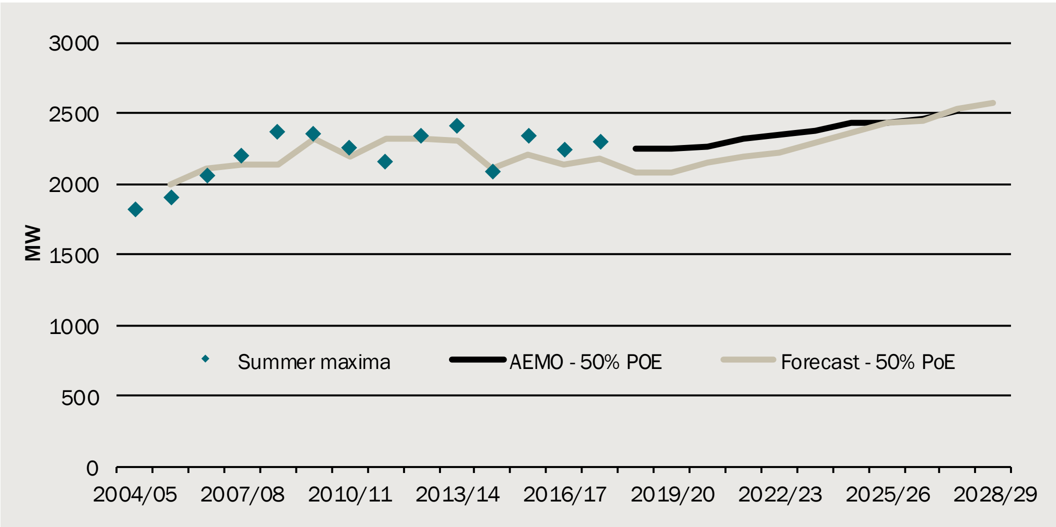



*Note:* Does not include block load adjustments.

*Data source:* Powercor, The CIE.

Compared to AEMO the level of the forecasts is broadly in line, however AEMO forecasts have a higher starting point. This results in the CIE forecasts having a stronger growth rate and appears to be driven by a combination of weak average demand in 2018 and block load transfers. Further work will seek to verify the driver of the weak average demand in 2018.

### 3.12 Powercor maximum demand compared to AEMO

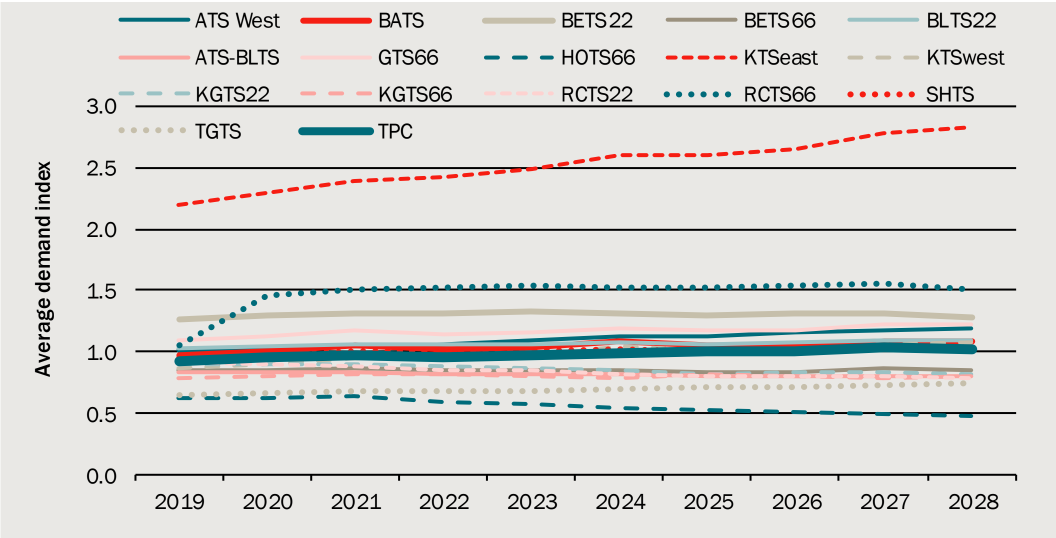



*Note:* Includes block load adjustments.

*Data source:* Powercor, AEMO, The CIE.

Across terminal stations there is significant variation in the ratio of CIE forecasts to AEMO forecasts. The ratios are generally stable, indicating similar growth rates between the two sets of forecasts, however in some instances there are large differences between the level of forecasts. It is not immediately clear why there should be a level difference in forecasts.

### 3.13 Ratio of CIE forecasts to AEMO forecasts




*Note:* Includes block load adjustments.

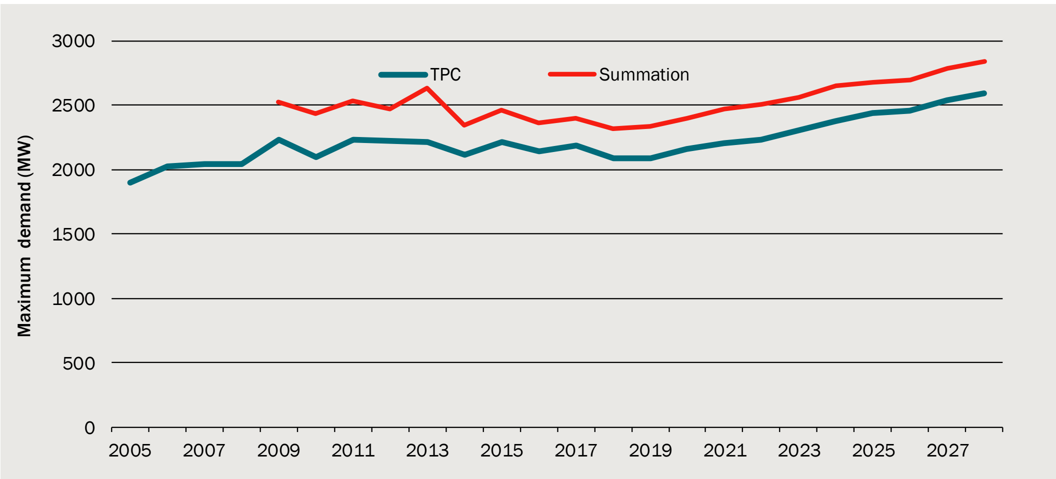
*Data source:* Powercor, AEMO, The CIE.

## *Powercor reconciliation*

We reconcile the individual terminal station demand forecasts with the forecast for total Powercor network demand. This provides a way to verify that the forecasts are sensible and that the individual terminal station forecasts are not biased.

Chart 3.14 compares actual and forecast maximum demand to the summation of actual and forecast maximum demand for all Powercor terminal stations. Because peak demand will occur at different times for different terminal stations, the sum of terminal station peaks should be greater than the total Powercor peak, which we observe across the modelling horizon.

### 3.14 Sum of TS max demand reconciliation to total Powercor

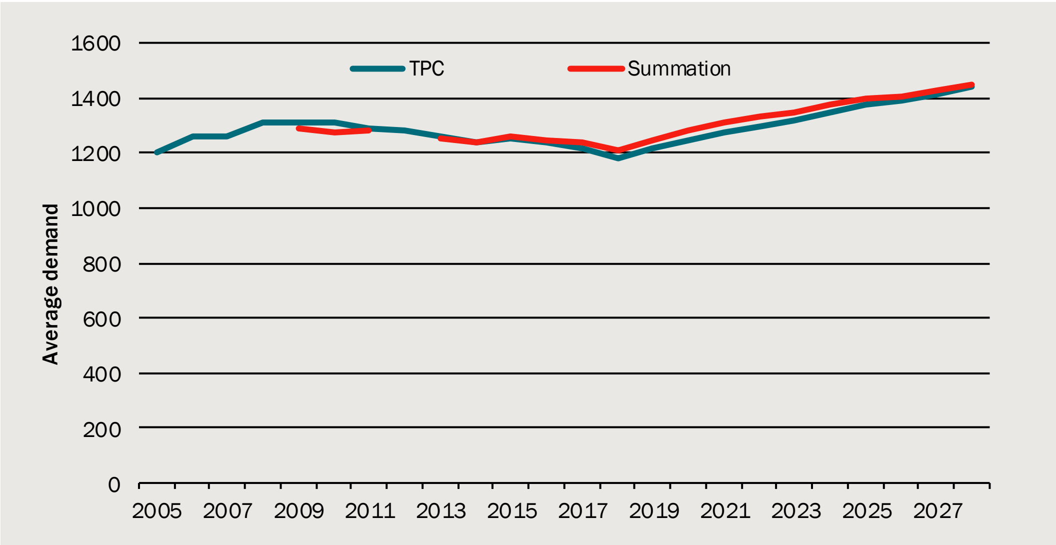



*Note:* There are gaps in the summation series where historical data was not robust for a terminal station (e.g. for ATS West prior to 2008).

*Data source:* The CIE.

Chart 3.15 compares the sum of individual terminal station actual and forecast average demand. We expect these curves to be very close to one another, and any differences between them reflect small amounts of measurement error; again the models perform as expected.

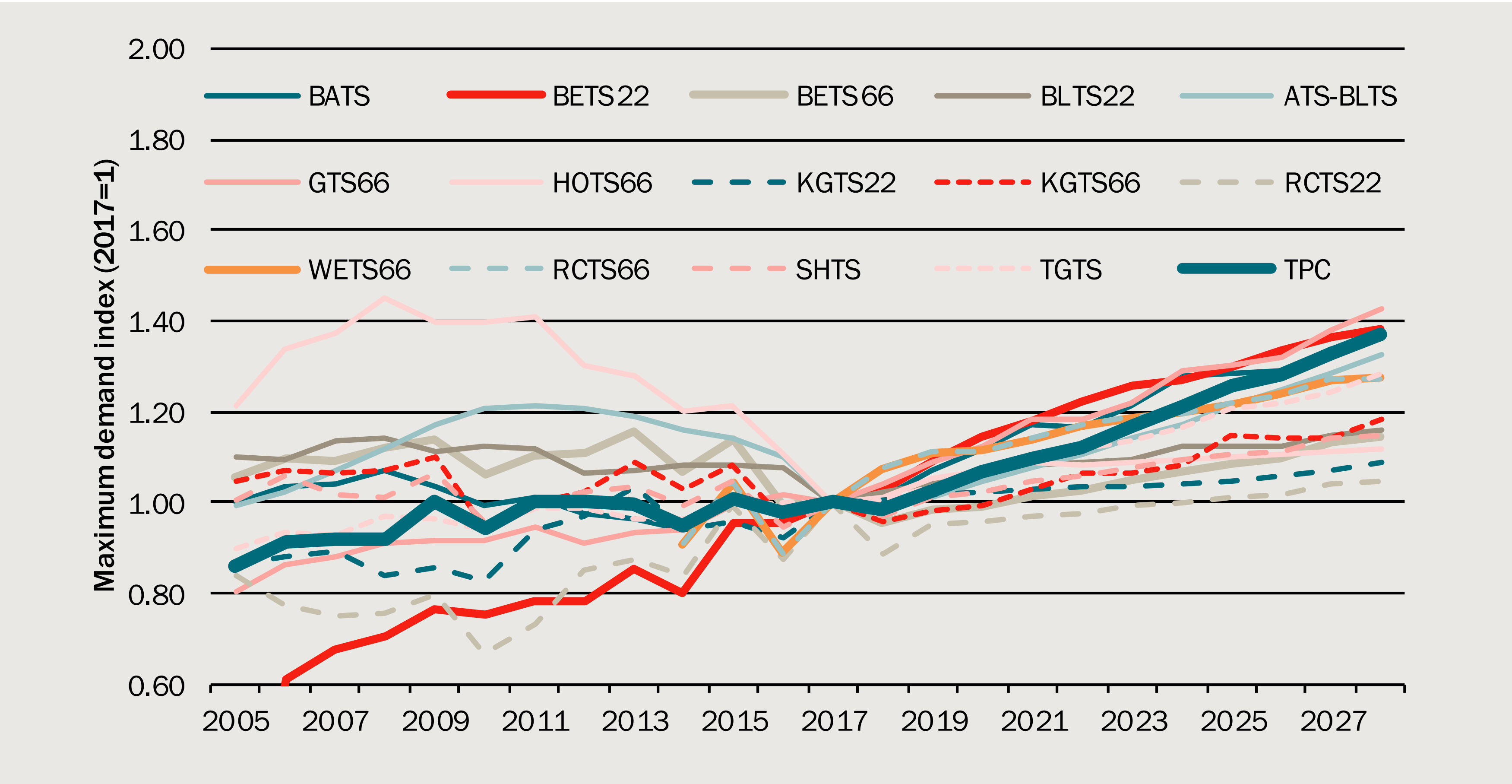
### 3.15 Sum of TS average demand reconciliation to total Powercor




*Note:* There are gaps in the summation series where historical data was not robust for a terminal station (e.g. for ATS West prior to 2008).
*Data source:* The CIE.

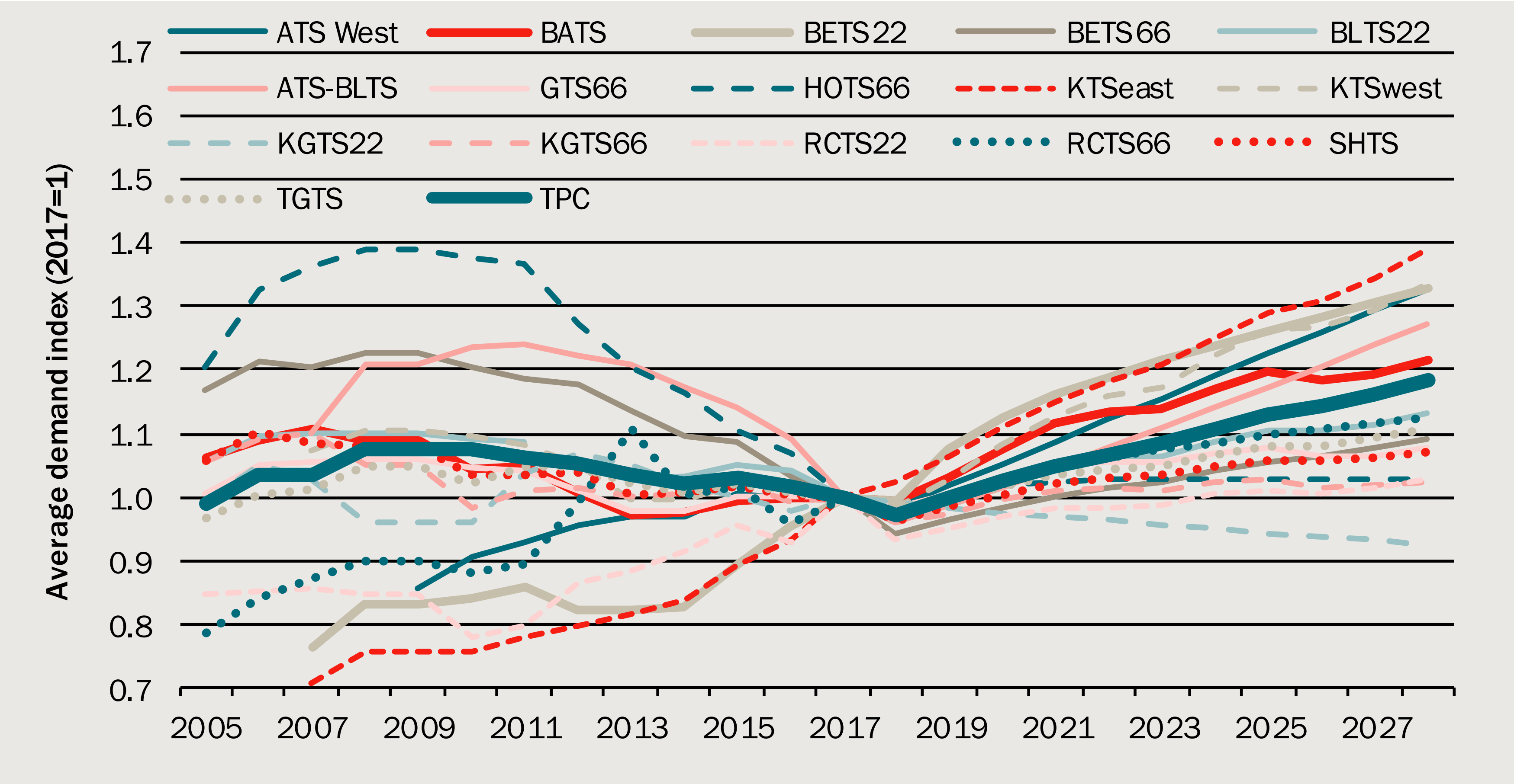
The following charts provide comparisons of actual and forecast maximum demand before p, average demand and the peak-to average ratio all before post modelling adjustments for total Powercor and individual terminal stations. They validate that the individual forecasts align to the total network forecasts if the total network forecast line has a roughly average level of growth in each measure. These charts confirm that the individual terminal station forecasts reconcile to the total network forecast adequately.

**3.16 Maximum demand reconciliation – Powercor**



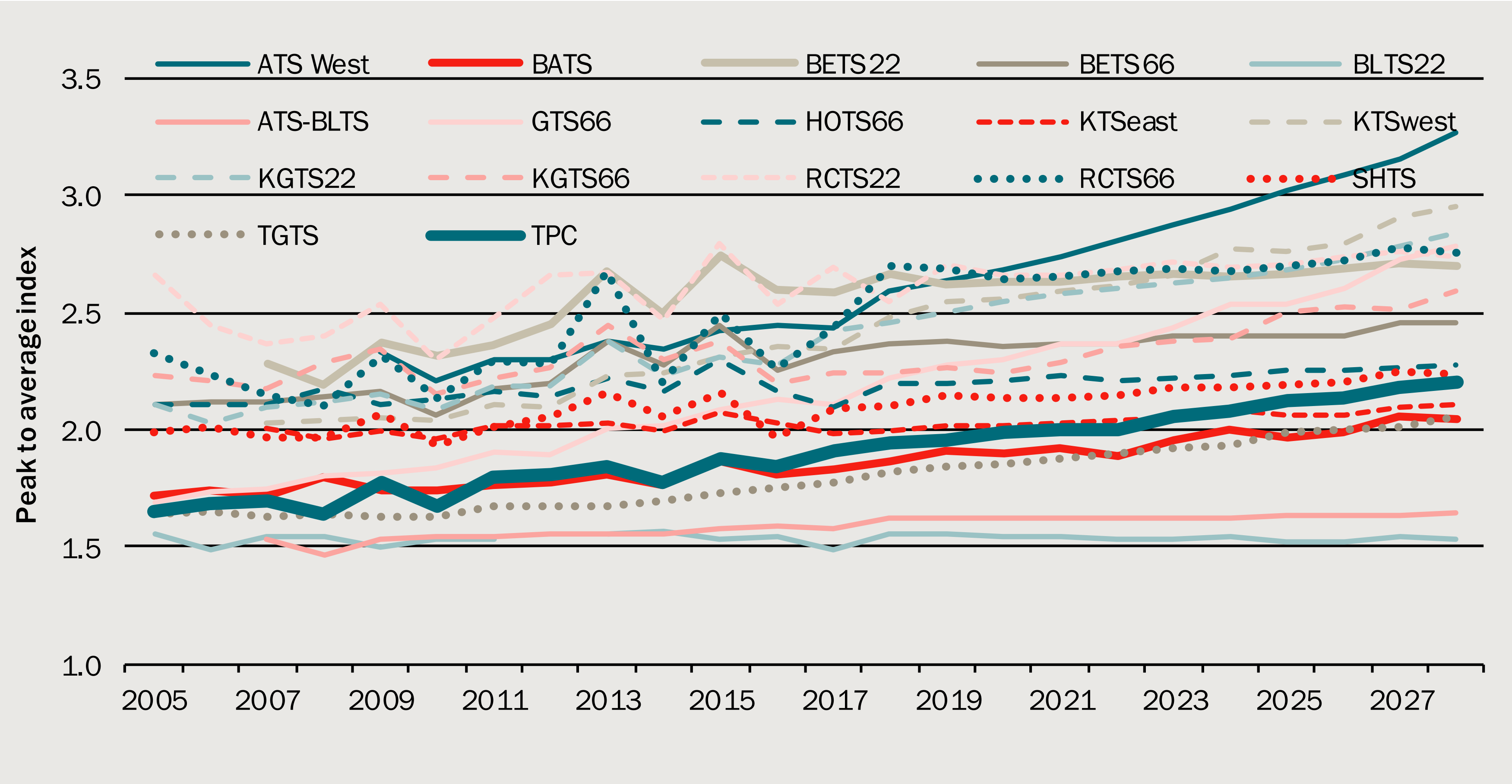

*Data source:* The CIE.

**3.17 Average demand reconciliation – Powercor**




*Data source:* The CIE.

**3.18 Peak-to-average demand ratio reconciliation - Powercor**




*Data source:* The CIE.

## Differences between terminal stations

Table 3.19 summarises the differences between terminal station forecasts in terms of the impact of population on the average and maximum demand forecasts.

### 3.19 Impact of variables by TS relative to impact on total Powercor, Summer

| Terminal Station | Average demand growth | Peak demand growth | Peak demand growth including post-modelling adjustments | Per capita average demand growth | Population growth |
|---|---|---|---|---|---|
| | Per cent | Per cent | Per cent | Per cent | Per cent |
| **Total Powercor** | **2.0** | **3.3** | **2.2** | **0.0** | **2.0** |
| ATS West | 3.1 | 5.5 | 4.4 | 0.3 | 2.8 |
| BATS | 2.0 | 3.0 | 2.7 | 0.3 | 1.7 |
| BETS22 | 2.9 | 3.0 | 2.7 | 1.4 | 1.5 |
| BETS66 | 1.5 | 1.9 | -0.1 | 0.3 | 1.2 |
| BLTS22 | 1.4 | 1.3 | 0.7 | 0.3 | 1.1 |
| ATS/BLTS | 2.9 | 2.8 | 0.9 | 0.2 | 2.7 |
| DPTS[a] | NA | NA | 3.7 | NA | 2.9 |
| GTS66 | 0.9 | 3.2 | 2.1 | -0.8 | 1.7 |
| HOTS | 0.7 | 1.1 | -1.0 | 0.9 | -0.2 |
| KGTS22 | -0.7 | -0.5 | -1.1 | 0.1 | -0.8 |
| KGTS66 | 0.7 | 1.1 | 0.1 | 0.6 | 0.0 |
| KTS East | 3.1 | 3.6 | 2.9 | 0.5 | 2.6 |
| KTS West | 3.1 | 4.9 | 2.6 | 0.3 | 2.8 |
| RCTS22 | 1.0 | 1.7 | 1.0 | 0.2 | 0.7 |
| RCTS66 | 1.5 | 1.7 | 1.1 | 0.9 | 0.6 |
| WETS | 1.5 | 1.7 | -3.5 | 1.2 | 0.3 |
| SHTS | 1.1 | 1.7 | 1.1 | 0.3 | 0.8 |
| TGTS | 1.2 | 2.1 | 2.6 | 0.7 | 0.6 |

[a] Estimates for DPTS are based on load transfers from other terminal stations. Terminal station specific average demand and maximum demand models are not estimated for DPTS.

*Note:* Growth rates are from 2018 to 2028.

*Source:* The CIE.

Average and peak demand, before post modelling adjustments, is expected to grow across all terminal stations, with the exception of KGTS22. This differs from the historical period, as electricity prices are expected to fall, whereas historically prices have increased strongly. Peak demand is generally expected to grow more rapidly than average, reflecting increasing temperature sensitivity in some cases, and increasing temperatures across terminal stations.

After post modelling adjustments, maximum demand growth is lower for the Powercor network area as the impact of solar PV, energy efficiency and lost industrial demand is greater than the positive block load adjustments from electric vehicles and new industrial demand. This result is consistent across terminal stations, though the size of the post-modelling adjustment varies considerably.

Per capita average demand is expected to remain relatively flat. Accordingly, average demand growth tends to reflect population growth (terminal stations with higher population growth tend to have higher average demand growth).

## *Terminal station forecasts reporting structure*

For each terminal station, we set out, in a consistent format:

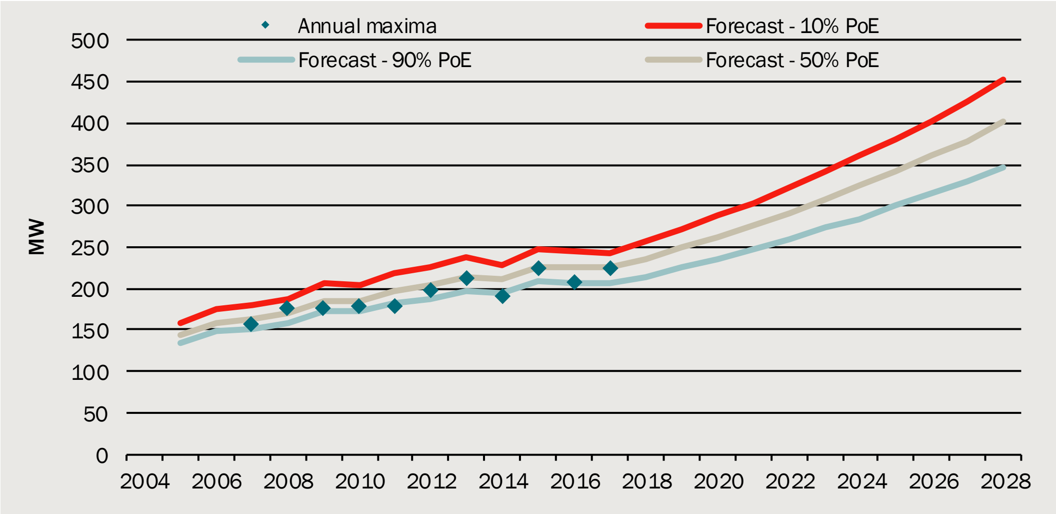
- charts showing forecasts of annual, summer and winter peak demand — these are before adjustments for block loads
- tables showing the annual, summer and winter forecasts prior to making post-modelling adjustments and after making post-modelling adjustments (post-modelling adjustments are made for industrial load, PV generation and block loads where applicable)
- the key coefficients used from the half hourly model and whether these are estimated for the terminal station or the AEMO coefficients for Victoria
- a chart of average demand forecasts
- a table showing actual and predicted maximum demand during the historical period
- the statistical average performance of the half hourly models, and
- a list of historical maxima that have occurred.

Where any other adjustments have been made these are detailed in the text.

## *ATS West*

This modelling was performed with a smaller sample size for this terminal station (demand data was not available before 2008).

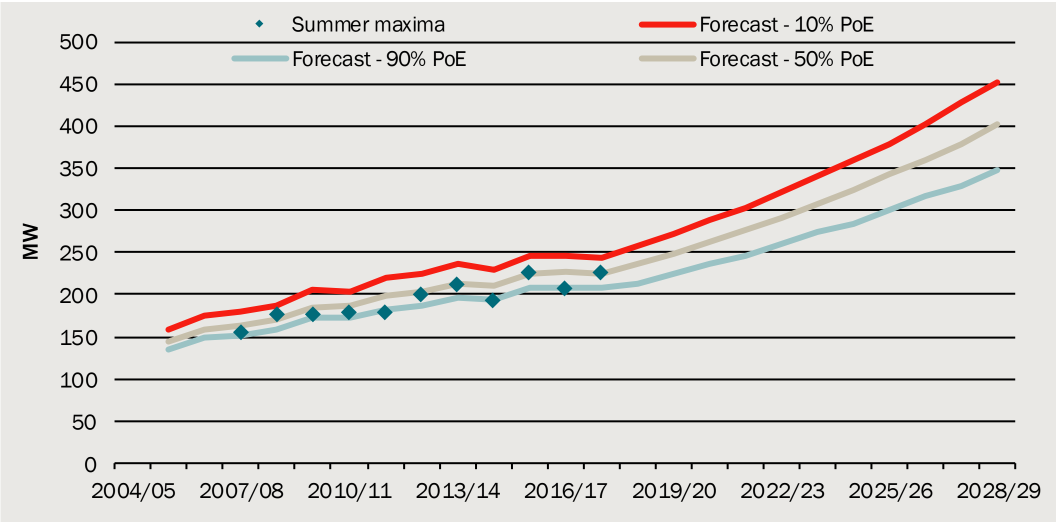
### 3.20 ATS West annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

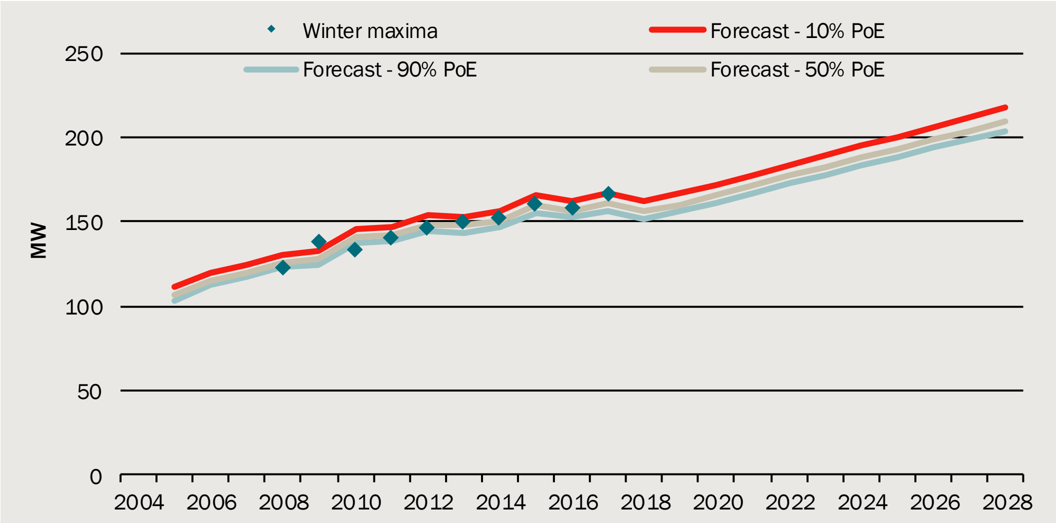
### 3.21 ATS West summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.22 ATS West winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.23 ATS West maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 213.3 | 224.9 | 236.2 | 246.9 | 259.9 | 273.4 | 284.6 | 300.8 | 315.9 | 329.1 | 347.4 |
| 50% PoE | 235.5 | 248.7 | 261.9 | 276.0 | 291.3 | 307.8 | 325.1 | 342.6 | 360.6 | 378.4 | 402.1 |
| 10% PoE | 257.4 | 272.8 | 287.6 | 303.1 | 322.1 | 341.2 | 360.4 | 379.1 | 402.5 | 426.9 | 451.7 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 152.1 | 156.5 | 161.6 | 167.0 | 172.5 | 177.5 | 183.4 | 188.5 | 193.9 | 199.3 | 204.3 |
| 50% PoE | 156.2 | 160.6 | 166.0 | 171.7 | 177.3 | 182.5 | 187.9 | 193.2 | 198.9 | 204.1 | 209.8 |
| 10% PoE | 162.4 | 166.7 | 172.1 | 178.1 | 184.1 | 189.6 | 195.2 | 200.4 | 205.7 | 211.8 | 217.6 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 213.3 | 224.9 | 236.2 | 246.9 | 259.9 | 273.4 | 284.6 | 300.8 | 315.9 | 329.1 | 347.4 |
| 50% PoE | 235.5 | 248.7 | 261.9 | 276.0 | 291.3 | 307.8 | 325.1 | 342.6 | 360.6 | 378.4 | 402.1 |
| 10% PoE | 257.4 | 272.8 | 287.6 | 303.1 | 322.1 | 341.2 | 360.4 | 379.1 | 402.5 | 426.9 | 451.7 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.24 ATS West maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 172.5 | 169.5 | 176.9 | 183.4 | 192.5 | 201.8 | 208.8 | 217.6 | 226.4 | 233.4 | 243.4 |
| 50% PoE | 194.7 | 193.4 | 202.6 | 212.6 | 223.9 | 236.3 | 249.3 | 259.4 | 271.1 | 282.7 | 298.0 |
| 10% PoE | 216.6 | 217.5 | 228.3 | 239.7 | 254.8 | 269.7 | 284.6 | 295.9 | 313.0 | 331.2 | 347.7 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 117.9 | 109.8 | 111.8 | 113.9 | 116.4 | 118.3 | 121.2 | 120.1 | 120.5 | 121.0 | 119.5 |
| 50% PoE | 122.1 | 113.8 | 116.2 | 118.6 | 121.2 | 123.3 | 125.7 | 124.8 | 125.5 | 125.8 | 125.1 |
| 10% PoE | 128.2 | 120.0 | 122.3 | 125.0 | 128.0 | 130.4 | 133.0 | 132.0 | 132.3 | 133.5 | 132.8 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 172.5 | 169.5 | 176.9 | 183.4 | 192.5 | 201.8 | 208.8 | 217.6 | 226.4 | 233.4 | 243.4 |
| 50% PoE | 194.7 | 193.4 | 202.6 | 212.6 | 223.9 | 236.3 | 249.3 | 259.4 | 271.1 | 282.7 | 298.0 |
| 10% PoE | 216.6 | 217.5 | 228.3 | 239.7 | 254.8 | 269.7 | 284.6 | 295.9 | 313.0 | 331.2 | 347.7 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

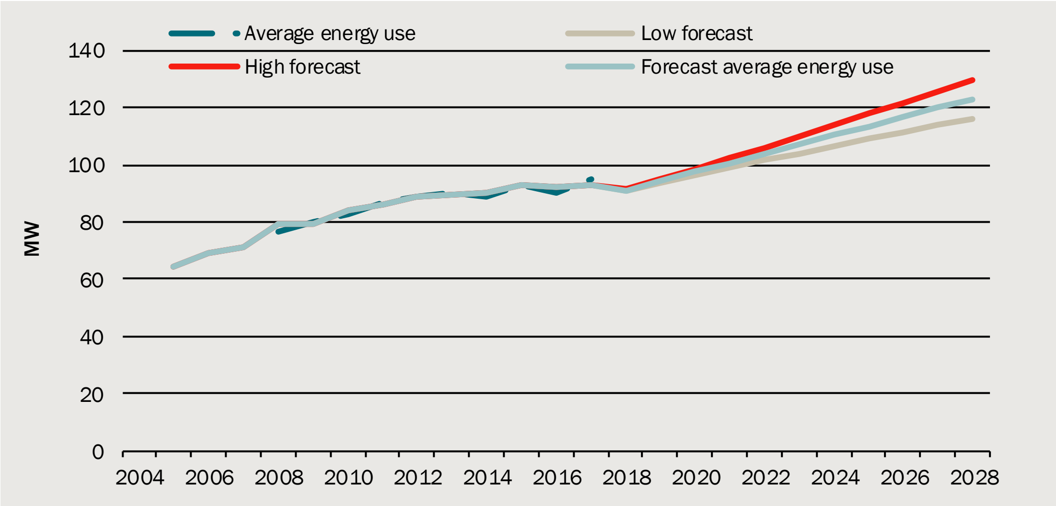
The average demand model was estimated using the long run relationship only and constraining the price elasticity to zero. When the model was estimated without restriction the income elasticity was very large, while constraining the income elasticity resulted in a positive price elasticity.

### 3.25 ATS West average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE constrained long run model only | 0.0 |
| Income | AEMO constrained long run model only | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

### 3.26 ATS West average demand forecasts




*Data source:* Powercor terminal station data, The CIE.

### 3.27 ATS West predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 176.4 | 175.0 | 179.0 | 177.8 | 198.9 | 212.7 | 191.5 | 225.4 | 207.3 | 225.7 |
| 90% PoE | 158.2 | 171.4 | 172.8 | 183.2 | 187.9 | 196.7 | 194.2 | 208.6 | 207.3 | 207.1 |
| 50% PoE | 169.7 | 185.3 | 185.6 | 197.5 | 204.1 | 213.3 | 210.6 | 225.5 | 226.3 | 225.6 |
| 10% PoE | 187.5 | 206.2 | 204.1 | 219.5 | 224.6 | 237.5 | 228.5 | 246.7 | 245.0 | 242.5 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 122.7 | 138.8 | 133.5 | 140.6 | 146.4 | 149.4 | 152.1 | 160.8 | 158.3 | 166.6 |
| 90% PoE | 123.0 | 125.0 | 137.2 | 138.3 | 144.9 | 144.0 | 147.1 | 155.8 | 153.2 | 157.0 |
| 50% PoE | 126.2 | 128.3 | 140.8 | 141.9 | 148.4 | 147.6 | 150.6 | 159.5 | 156.8 | 161.2 |
| 10% PoE | 131.1 | 132.9 | 146.4 | 147.2 | 154.0 | 152.7 | 156.3 | 165.4 | 162.0 | 167.0 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 176.4 | 175.0 | 179.0 | 177.8 | 198.9 | 212.7 | 191.5 | 225.4 | 207.3 | 225.7 |
| 90% PoE | 158.2 | 171.4 | 172.8 | 183.2 | 187.9 | 196.7 | 194.2 | 208.6 | 207.3 | 207.1 |
| 50% PoE | 169.7 | 185.3 | 185.6 | 197.5 | 204.1 | 213.3 | 210.6 | 225.5 | 226.3 | 225.6 |
| 10% PoE | 187.5 | 206.2 | 204.1 | 219.5 | 224.6 | 237.5 | 228.5 | 246.7 | 245.0 | 242.5 |

*Note:* All forecasts are in MW. Terminal station data was not provided for 2005-06.

*Source:* Powercor terminal station data, The CIE.

### 3.28 ATS West average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.805 |
| Winter | 0.683 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

### 3.29 ATS West details of actual maxima

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 21/08/2008 18:00 | 122.7 | 7.4 | 5.6 | 10.4 | 8.9 |
| 9/06/2009 17:30 | 138.8 | 6.7 | 5.0 | 13.0 | 9.8 |
| 18/08/2010 18:00 | 133.5 | 9.9 | 6.8 | 11.0 | 10.0 |
| 8/06/2011 18:00 | 140.6 | 8.6 | 4.4 | 10.6 | 9.1 |
| 9/08/2012 18:00 | 146.4 | 9.0 | 7.3 | 14.3 | 10.1 |
| 24/06/2013 18:00 | 149.4 | 10.2 | 0.7 | 11.5 | 7.1 |
| 1/08/2014 18:00 | 152.1 | 12.6 | 4.1 | 16.1 | 9.8 |

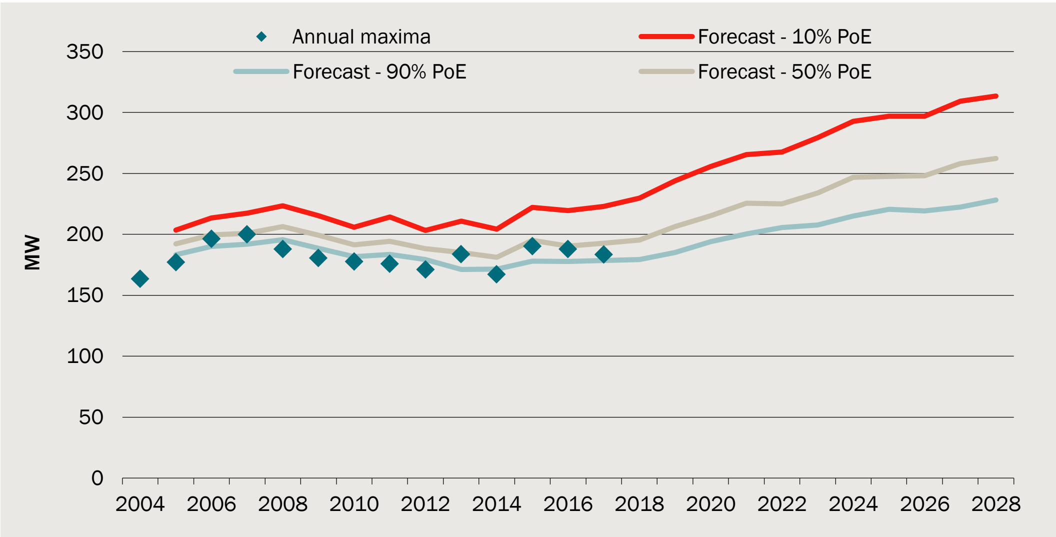
| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| 14/07/2015 17:30 | 160.8 | 7.6 | 6.3 | 9.5 | 8.8 |
| 12/07/2016 18:00 | 158.3 | 6.5 | 5.6 | 12.8 | 9.6 |
| 3/08/2017 18:00 | 166.6 | 7.4 | 0.2 | 8.2 | 8.1 |
| **Summer** | | | | | |
| 17/03/2008 16:00 | 155.8 | 38.9 | 17.7 | 39.3 | 23.9 |
| 29/01/2009 16:30 | 176.4 | 42.4 | 25.3 | 44.1 | 26.5 |
| 11/01/2010 15:30 | 175.0 | 44.2 | 15.6 | 44.2 | 23.6 |
| 1/02/2011 12:30 | 179.0 | 39.7 | 17.0 | 39.7 | 22.8 |
| 25/02/2012 15:30 | 177.8 | 37.4 | 24.0 | 37.8 | 21.9 |
| 12/03/2013 16:00 | 198.9 | 36.2 | 21.5 | 37.0 | 19.5 |
| 28/01/2014 17:00 | 212.7 | 40.3 | 19.6 | 40.3 | 20.9 |
| 7/01/2015 16:00 | 191.5 | 35.6 | 17.0 | 40.1 | 23.2 |
| 13/01/2016 16:00 | 225.4 | 38.3 | 14.8 | 43.0 | 22.2 |
| 8/02/2017 17:30 | 207.3 | 35.7 | 14.9 | 35.7 | 22.5 |
| 28/01/2018 18:30 | 225.7 | 37.8 | 20.8 | 39.8 | 23.5 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.
*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

## *BATS*

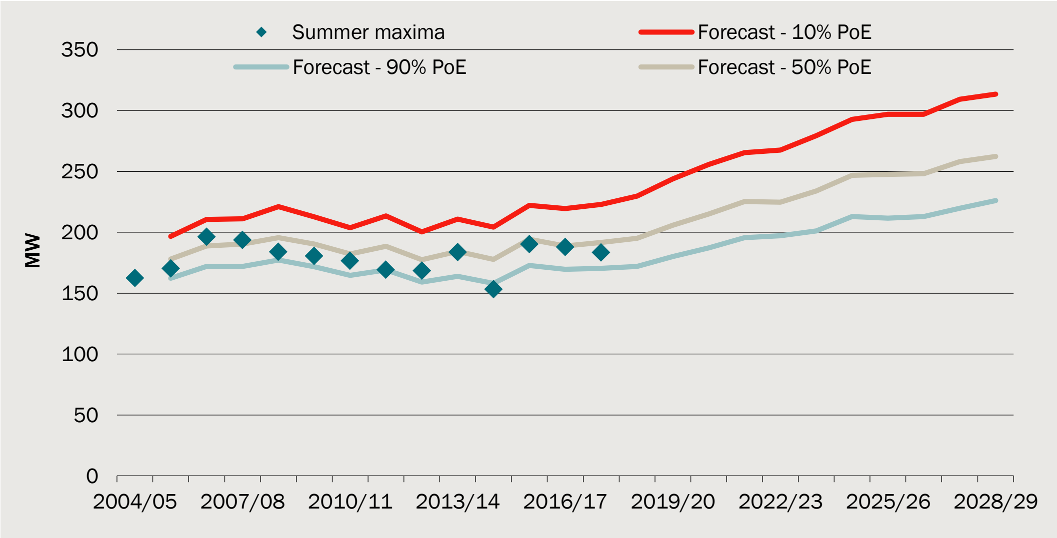
BATS annual peaks have occurred in both winter and summer. The projection is for annual maxima to be predominantly from summer peaks.

### 3.30 BATS annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

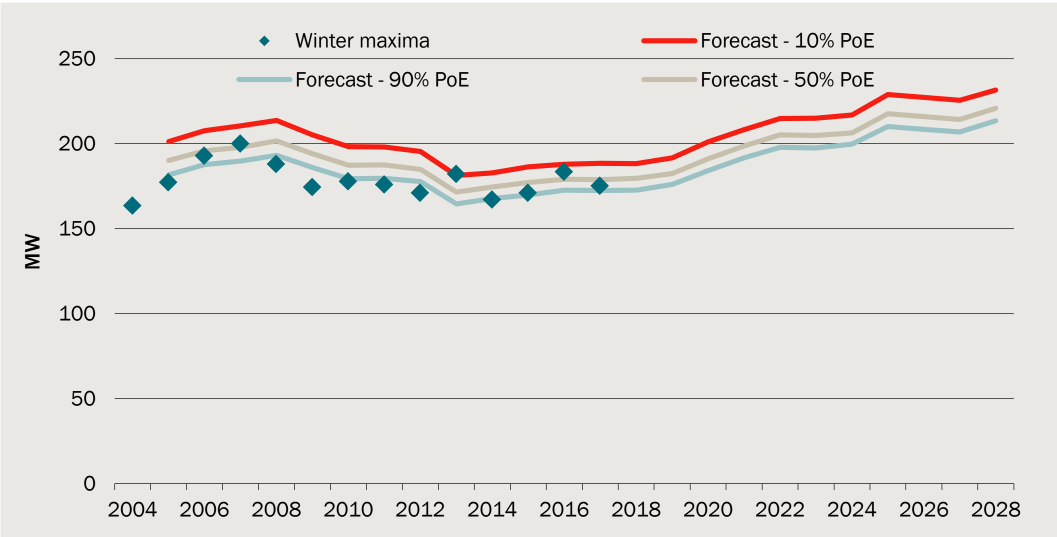
### 3.31 BATS summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.32 BATS winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.33 BATS maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 172.1 | 180.0 | 187.3 | 195.5 | 197.2 | 201.2 | 213.0 | 211.6 | 213.0 | 219.9 | 226.1 |
| 50% PoE | 195.0 | 205.9 | 215.2 | 225.2 | 224.8 | 234.0 | 246.8 | 247.6 | 248.2 | 258.1 | 262.2 |
| 10% PoE | 229.7 | 243.9 | 255.7 | 265.6 | 267.5 | 279.4 | 292.6 | 297.0 | 297.0 | 309.2 | 313.5 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 172.7 | 175.9 | 184.2 | 191.6 | 197.8 | 197.5 | 199.6 | 210.0 | 208.4 | 206.9 | 213.5 |
| 50% PoE | 179.6 | 182.4 | 191.1 | 198.5 | 205.2 | 204.8 | 206.4 | 217.5 | 215.9 | 214.1 | 220.8 |
| 10% PoE | 188.2 | 191.6 | 201.0 | 208.2 | 214.7 | 215.0 | 216.9 | 228.8 | 227.2 | 225.5 | 231.6 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 179.3 | 185.0 | 194.0 | 200.3 | 205.6 | 207.8 | 215.1 | 220.4 | 219.1 | 222.3 | 228.0 |
| 50% PoE | 195.3 | 206.3 | 215.3 | 225.4 | 225.0 | 234.0 | 246.8 | 247.6 | 248.2 | 258.1 | 262.2 |
| 10% PoE | 229.7 | 243.9 | 255.7 | 265.6 | 267.5 | 279.4 | 292.6 | 297.0 | 297.0 | 309.2 | 313.5 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.34 BATS maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 132.0 | 132.5 | 138.3 | 145.0 | 145.6 | 148.4 | 158.9 | 155.1 | 155.1 | 160.8 | 165.8 |
| 50% PoE | 154.9 | 158.3 | 166.1 | 174.7 | 173.1 | 181.1 | 192.7 | 191.1 | 190.3 | 199.1 | 201.9 |
| 10% PoE | 189.6 | 196.3 | 206.6 | 215.1 | 215.8 | 226.5 | 238.6 | 240.5 | 239.1 | 250.2 | 253.2 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 130.0 | 126.0 | 132.7 | 138.6 | 143.6 | 142.3 | 143.5 | 151.2 | 148.3 | 145.9 | 151.2 |
| 50% PoE | 137.0 | 132.4 | 139.6 | 145.6 | 151.1 | 149.6 | 150.2 | 158.7 | 155.8 | 153.1 | 158.5 |
| 10% PoE | 145.5 | 141.6 | 149.5 | 155.3 | 160.6 | 159.8 | 160.8 | 170.1 | 167.1 | 164.5 | 169.3 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 139.2 | 137.5 | 145.0 | 149.8 | 153.9 | 154.9 | 161.1 | 163.9 | 161.2 | 163.3 | 167.7 |
| 50% PoE | 155.1 | 158.7 | 166.2 | 174.9 | 173.3 | 181.1 | 192.7 | 191.1 | 190.3 | 199.1 | 201.9 |
| 10% PoE | 189.6 | 196.3 | 206.6 | 215.1 | 215.8 | 226.5 | 238.6 | 240.5 | 239.1 | 250.2 | 253.2 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

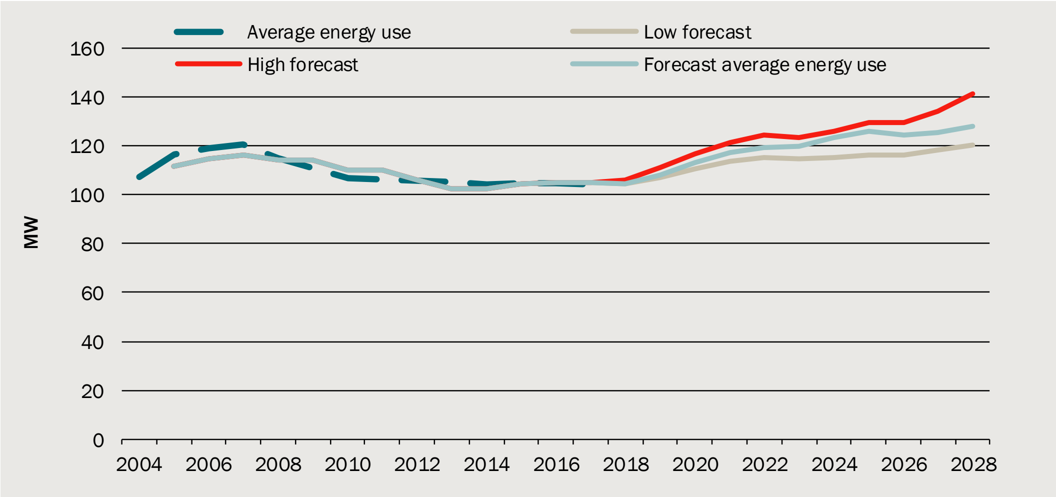
The average demand model was estimated using the long run relationship only and the AEMO constrained income elasticity.

### 3.35 BATS average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate long run model only | -0.3745 |
| Income | AEMO constrained long run model only | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

### 3.36 BATS average demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.37 BATS predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 184.0 | 180.6 | 176.7 | 169.3 | 168.6 | 183.7 | 153.1 | 190.3 | 187.9 | 183.3 |
| 90% PoE | 177.1 | 171.7 | 164.6 | 169.2 | 159.2 | 163.9 | 158.0 | 172.8 | 169.5 | 170.4 |
| 50% PoE | 195.6 | 190.2 | 182.3 | 188.4 | 177.6 | 184.4 | 177.7 | 194.3 | 188.9 | 191.8 |
| 10% PoE | 221.0 | 212.6 | 203.9 | 213.4 | 200.3 | 210.9 | 204.2 | 222.1 | 219.4 | 223.0 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 187.9 | 174.4 | 177.7 | 175.9 | 171.1 | 182.1 | 167.0 | 171.0 | 183.4 | 175.2 |
| 90% PoE | 193.1 | 186.0 | 179.4 | 179.5 | 177.6 | 164.6 | 167.8 | 169.7 | 172.6 | 172.3 |
| 50% PoE | 201.5 | 194.1 | 187.3 | 187.4 | 184.9 | 171.4 | 174.4 | 177.1 | 178.9 | 178.9 |
| 10% PoE | 213.7 | 205.2 | 198.2 | 197.9 | 195.4 | 181.3 | 182.8 | 186.3 | 187.9 | 188.3 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 187.9 | 180.6 | 177.7 | 175.9 | 171.1 | 183.7 | 167.0 | 190.3 | 187.9 | 183.3 |
| 90% PoE | 195.7 | 188.5 | 181.6 | 183.5 | 179.2 | 171.2 | 171.6 | 178.1 | 177.7 | 178.6 |
| 50% PoE | 206.4 | 199.4 | 191.4 | 194.3 | 188.4 | 185.2 | 181.3 | 195.0 | 190.4 | 192.7 |
| 10% PoE | 223.6 | 215.3 | 205.9 | 214.2 | 203.3 | 210.9 | 204.3 | 222.1 | 219.4 | 223.0 |

*Note:* All forecasts are in MW.
*Source:* Powercor terminal station data, The CIE.

### 3.38 BATS average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.650 |
| Winter | 0.573 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1. The figures are the average adjusted $R^2$ across all half-hour models for either summer or winter.

## 3.39 BATS details of actual maxima

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 19/07/2004 18:00 | 156.2 | 6.8 | 3.7 | 9.0 | 5.2 |
| 12/07/2005 18:00 | 160.8 | 6.3 | 1.3 | 9.0 | 6.1 |
| 27/06/2006 17:30 | 167.2 | 6.5 | 1.6 | 7.1 | 6.5 |
| 17/07/2007 17:30 | 178.4 | 1.7 | 0.3 | 6.2 | 4.7 |
| 23/06/2008 18:00 | 163.3 | 9.8 | 7.2 | 11.6 | 8.5 |
| 16/07/2009 9:00 | 163.9 | 3.9 | -1.7 | 10.6 | 7.4 |
| 15/06/2010 18:00 | 152.3 | 2.9 | -0.5 | 8.9 | 6.5 |
| 6/06/2011 17:30 | 147.9 | 6.4 | -2.0 | 7.8 | 5.7 |
| 21/06/2012 17:30 | 164.7 | 6.1 | 6.1 | 7.9 | 6.1 |
| 20/06/2013 18:00 | 171.0 | 3.6 | -2.8 | 9.6 | 6.0 |
| 1/07/2014 10:30 | 148.7 | 7.8 | 5.7 | 9.3 | 7.4 |
| 2/06/2015 17:30 | 152.0 | 6.5 | 0.2 | 8.4 | 6.8 |
| 27/06/2016 18:00 | 150.2 | 4.6 | 2.4 | 7.9 | 5.0 |
| 27/06/2006 17:30 | 167.2 | 6.5 | 1.6 | 7.1 | 6.5 |
| **Summer** | | | | | |
| 12/02/2004 15:00 | 136.0 | 31.1 | 10.4 | 31.1 | 21.1 |
| 25/01/2005 14:00 | 146.2 | 31.3 | 16.0 | 32.3 | 20.9 |
| 23/02/2006 14:30 | 148.9 | 31.8 | 13.4 | 32.8 | 19.5 |
| 21/02/2007 15:00 | 170.2 | 32.0 | 17.0 | 32.0 | 21.6 |
| 17/03/2008 15:00 | 177.1 | 35.5 | 20.1 | 36.0 | 24.1 |
| 29/01/2009 15:00 | 175.7 | 38.4 | 27.5 | 40.3 | 26.7 |
| 8/02/2010 16:00 | 162.6 | 34.6 | 16.1 | 34.6 | 21.7 |
| 31/01/2011 14:00 | 159.9 | 33.5 | 17.2 | 34.9 | 23.5 |
| 24/01/2012 13:30 | 168.3 | 31.0 | 14.1 | 33.3 | 22.5 |
| 18/02/2013 17:00 | 147.3 | 31.9 | 18.1 | 32.7 | 22.6 |
| 15/01/2014 14:30 | 171.9 | 37.5 | 22.1 | 38.6 | 22.9 |
| 7/01/2015 15:00 | 147.0 | 35.3 | 14.5 | 36.2 | 21.5 |
| 8/03/2016 18:00 | 159.4 | 34.7 | 15.6 | 37.4 | 22.9 |
| 9/02/2017 14:00 | 170.0 | 38.0 | 17.8 | 39.0 | 21.5 |
| 19/01/2018 17:00 | 177.3 | 40.2 | 17.8 | 40.2 | 23.1 |

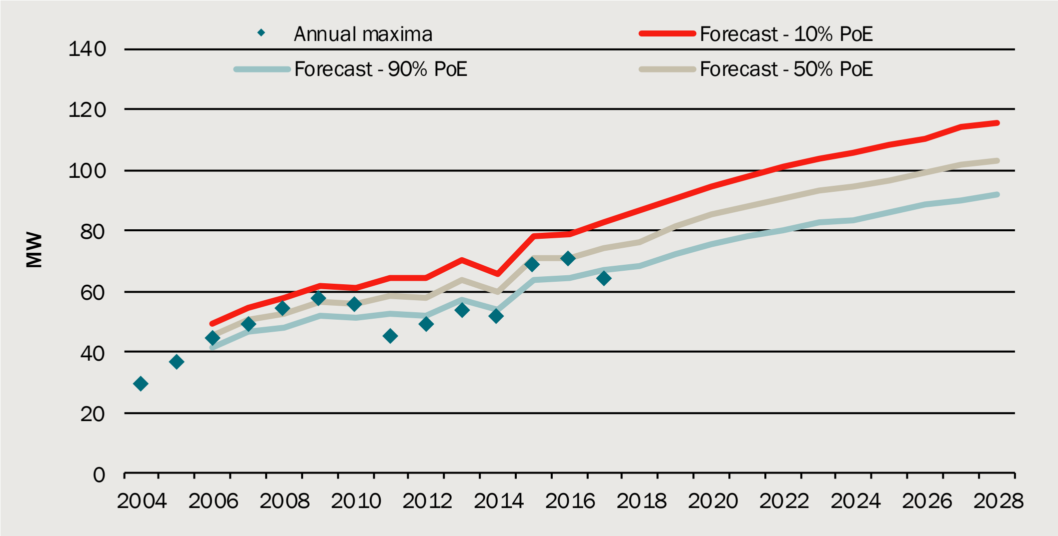
*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.

*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

## BETS22

Annual peaks have been consistently occurring in summer, which tends to have overpredicted demand in recent years.

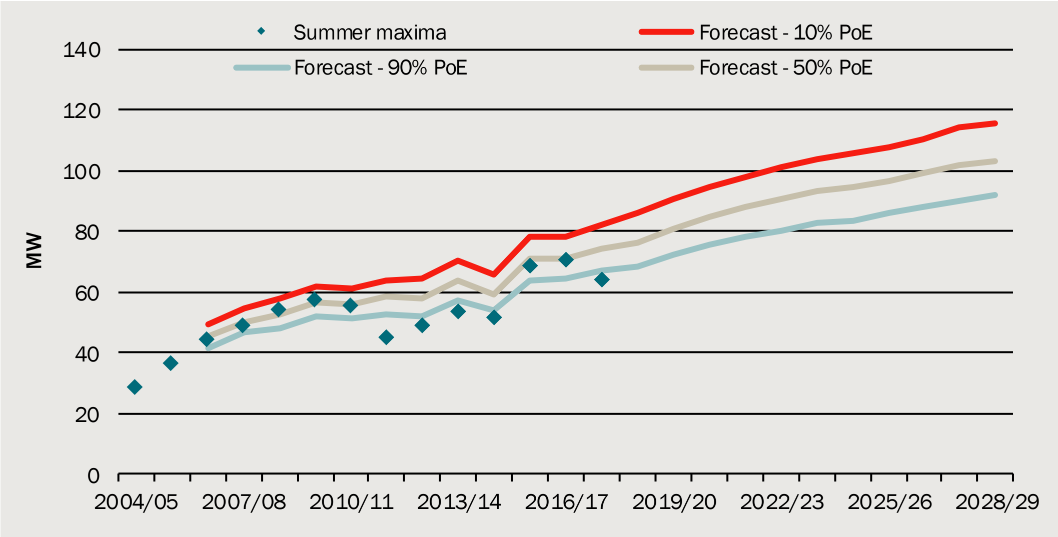
### 3.40 BETS22 annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

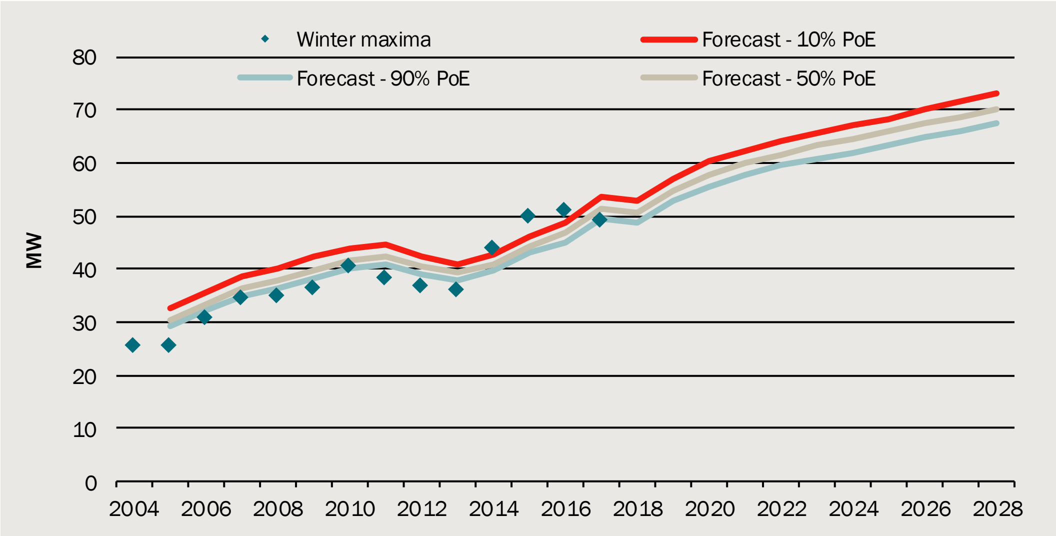
### 3.41 BETS22 summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.42 BETS22 winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.43 BETS22 maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 68.4 | 72.4 | 75.8 | 78.3 | 80.4 | 82.6 | 83.7 | 86.3 | 88.4 | 90.0 | 92.0 |
| 50% PoE | 76.4 | 81.2 | 85.1 | 88.0 | 90.7 | 93.4 | 94.6 | 96.7 | 99.3 | 101.7 | 103.0 |
| 10% PoE | 86.4 | 90.7 | 94.8 | 97.8 | 101.2 | 103.7 | 105.9 | 108.0 | 110.2 | 114.3 | 115.7 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 48.8 | 52.7 | 55.7 | 57.7 | 59.5 | 60.8 | 62.1 | 63.5 | 64.9 | 66.2 | 67.4 |
| 50% PoE | 50.7 | 54.7 | 57.7 | 59.9 | 61.7 | 63.3 | 64.5 | 65.8 | 67.3 | 68.6 | 70.0 |
| 10% PoE | 53.0 | 57.0 | 60.2 | 62.1 | 64.3 | 65.8 | 67.2 | 68.4 | 70.0 | 71.5 | 73.0 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 68.4 | 72.4 | 75.8 | 78.3 | 80.4 | 82.6 | 83.7 | 86.3 | 88.4 | 90.0 | 92.0 |
| 50% PoE | 76.4 | 81.2 | 85.1 | 88.0 | 90.7 | 93.4 | 94.6 | 96.7 | 99.3 | 101.7 | 103.0 |
| 10% PoE | 86.4 | 90.7 | 94.8 | 97.8 | 101.2 | 103.7 | 105.9 | 108.0 | 110.2 | 114.3 | 115.7 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.44 BETS22 maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 72.2 | 75.7 | 78.8 | 81.1 | 83.1 | 85.2 | 86.2 | 88.5 | 90.4 | 92.0 | 93.7 |
| 50% PoE | 79.9 | 84.0 | 87.7 | 90.4 | 92.9 | 95.4 | 96.6 | 98.5 | 100.8 | 103.1 | 104.2 |
| 10% PoE | 89.3 | 93.1 | 96.8 | 99.7 | 102.9 | 105.3 | 107.3 | 109.2 | 111.2 | 115.1 | 116.3 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 52.5 | 55.7 | 58.4 | 60.3 | 62.0 | 63.2 | 64.3 | 65.5 | 66.7 | 67.8 | 68.9 |
| 50% PoE | 54.3 | 57.5 | 60.4 | 62.4 | 64.0 | 65.5 | 66.5 | 67.7 | 69.0 | 70.1 | 71.4 |
| 10% PoE | 56.5 | 59.7 | 62.8 | 64.5 | 66.5 | 67.9 | 69.2 | 70.2 | 71.5 | 72.8 | 74.2 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 72.2 | 75.7 | 78.8 | 81.1 | 83.1 | 85.2 | 86.2 | 88.5 | 90.4 | 92.0 | 93.7 |
| 50% PoE | 79.9 | 84.0 | 87.7 | 90.4 | 92.9 | 95.4 | 96.6 | 98.5 | 100.8 | 103.1 | 104.2 |
| 10% PoE | 89.3 | 93.1 | 96.8 | 99.7 | 102.9 | 105.3 | 107.3 | 109.2 | 111.2 | 115.1 | 116.3 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

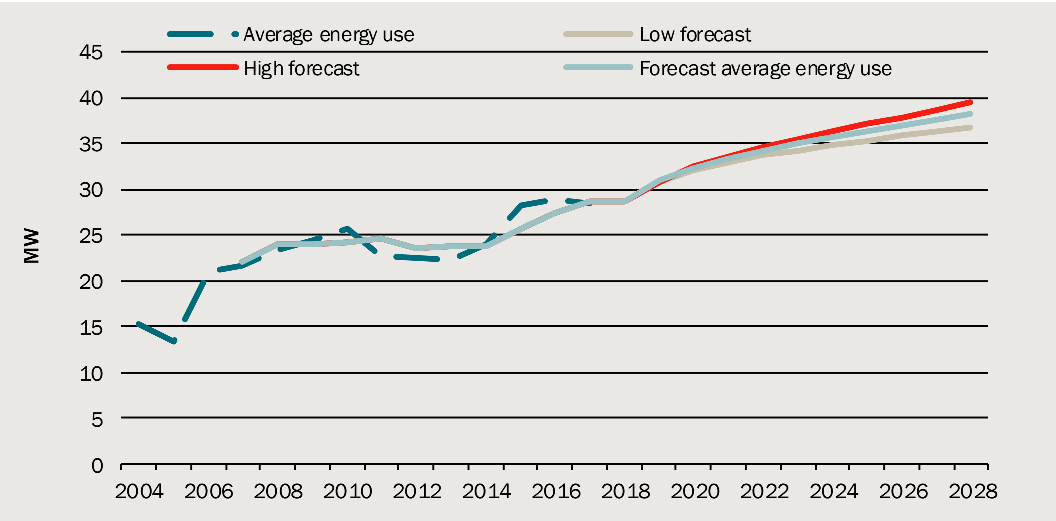
The average demand model was estimated using the error correction model, constraining the price elasticity to zero. When the model was estimated without restriction the income elasticity was very large, while constraining the income elasticity resulted in a positive price elasticity.

### 3.45 BETS22 average demand model specification an d coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE constrained ECM | 0.0 |
| Income | AEMO constrained ECM | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

### 3.46 BETS22 average demand forecasts




*Data source:* Powercor terminal station data, The CIE.

### 3.47 BETS22 predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 54.4 | 57.4 | 55.6 | 45.3 | 48.9 | 53.7 | 51.6 | 68.9 | 70.7 | 63.9 |
| 90% PoE | 48.0 | 52.1 | 51.6 | 52.7 | 52.2 | 57.2 | 53.9 | 64.0 | 64.2 | 67.3 |
| 50% PoE | 52.6 | 56.7 | 56.1 | 58.4 | 58.1 | 63.5 | 59.5 | 70.8 | 71.1 | 74.4 |
| 10% PoE | 57.7 | 62.0 | 61.2 | 64.1 | 64.2 | 70.3 | 65.7 | 78.3 | 78.6 | 82.4 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 35.0 | 36.4 | 40.7 | 38.3 | 36.9 | 36.3 | 44.2 | 49.9 | 51.3 | 49.2 |
| 90% PoE | 36.3 | 38.1 | 40.1 | 40.8 | 39.0 | 38.1 | 39.6 | 43.0 | 45.1 | 49.7 |
| 50% PoE | 37.8 | 39.8 | 41.7 | 42.4 | 40.4 | 39.4 | 41.0 | 44.4 | 46.8 | 51.4 |
| 10% PoE | 40.0 | 42.3 | 44.1 | 44.7 | 42.2 | 41.0 | 42.8 | 46.1 | 48.7 | 53.5 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 54.4 | 57.4 | 55.6 | 45.3 | 48.9 | 53.7 | 51.6 | 68.9 | 70.7 | 63.9 |
| 90% PoE | 48.0 | 52.1 | 51.6 | 52.7 | 52.2 | 57.2 | 53.9 | 64.0 | 64.2 | 67.3 |
| 50% PoE | 52.6 | 56.7 | 56.1 | 58.4 | 58.1 | 63.5 | 59.5 | 70.8 | 71.1 | 74.4 |
| 10% PoE | 57.7 | 62.0 | 61.2 | 64.1 | 64.2 | 70.3 | 65.7 | 78.3 | 78.6 | 82.4 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.48 BETS22 average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.783 |
| Winter | 0.581 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

### 3.49 BETS22 details of actual maxima

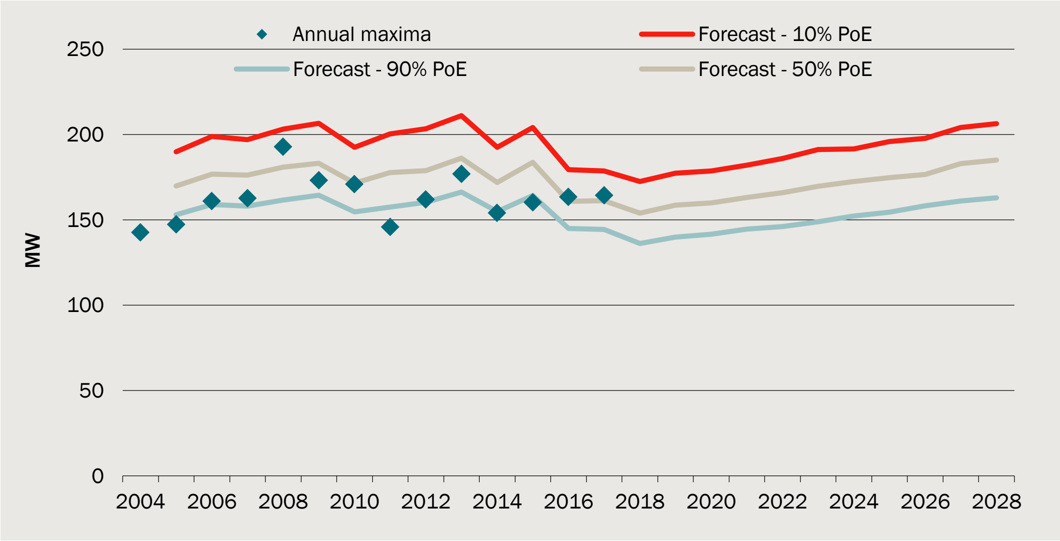
| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 15/07/2004 20:30 | 25.5 | 7.6 | 1.6 | 10.7 | 5.7 |
| 11/08/2005 8:30 | 25.8 | 2.6 | -2.3 | 9.7 | 5.9 |
| 10/08/2006 18:00 | 31.0 | 10.3 | -0.2 | 14.2 | 7.4 |
| 17/07/2007 17:30 | 34.6 | 4.2 | 1.0 | 8.2 | 5.3 |
| 4/08/2008 9:00 | 35.0 | 5.9 | 5.1 | 9.0 | 7.0 |
| 11/06/2009 17:30 | 36.4 | 7.2 | -2.6 | 9.0 | 7.1 |
| 28/06/2010 17:30 | 40.7 | 7.5 | -3.8 | 9.3 | 6.3 |
| 8/06/2011 17:30 | 38.3 | 8.4 | 1.5 | 10.6 | 7.2 |
| 21/06/2012 17:30 | 36.9 | 8.4 | 7.7 | 12.3 | 7.6 |
| 20/08/2013 18:00 | 36.3 | 8.1 | 1.3 | 10.3 | 9.5 |
| 17/07/2014 18:00 | 44.2 | 5.3 | 2.8 | 11.6 | 6.8 |
| 4/08/2015 18:00 | 49.9 | 7.4 | -2.4 | 8.5 | 5.8 |
| 12/07/2016 18:00 | 51.3 | 5.4 | 4.2 | 10.7 | 7.9 |
| 20/07/2017 18:00 | 49.2 | 6.8 | -0.3 | 10.6 | 6.4 |
| **Summer** | | | | | |
| 20/02/2004 16:00 | 27.5 | 39.1 | 13.0 | 39.2 | 19.6 |
| 1/02/2005 15:00 | 29.0 | 22.6 | 12.4 | 35.8 | 18.0 |
| 27/01/2006 14:00 | 36.3 | 34.9 | 22.3 | 35.8 | 25.5 |
| 16/01/2007 14:30 | 44.2 | 39.8 | 20.6 | 39.8 | 24.8 |
| 16/02/2008 16:30 | 49.2 | 33.1 | 14.9 | 33.3 | 21.3 |
| 29/01/2009 15:30 | 54.4 | 42.0 | 24.0 | 42.2 | 30.2 |
| 11/01/2010 15:30 | 57.4 | 41.2 | 20.9 | 41.9 | 25.5 |
| 31/01/2011 15:30 | 55.6 | 39.5 | 20.2 | 39.5 | 26.1 |
| 3/01/2012 14:30 | 45.3 | 36.2 | 19.0 | 36.5 | 23.4 |
| 25/02/2013 15:30 | 48.9 | 35.2 | 21.3 | 35.6 | 24.9 |
| 15/01/2014 17:00 | 53.7 | 42.2 | 21.8 | 42.3 | 27.2 |
| 11/02/2015 16:30 | 51.6 | 36.4 | 18.7 | 36.4 | 24.5 |
| 13/01/2016 16:30 | 68.9 | 39.0 | 22.8 | 41.3 | 25.1 |
| 10/02/2017 17:30 | 70.7 | 40.4 | 19.4 | 40.8 | 25.6 |
| 28/01/2018 17:30 | 63.9 | 37.4 | 22.5 | 37.7 | 27.9 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.

*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

# *BETS66*

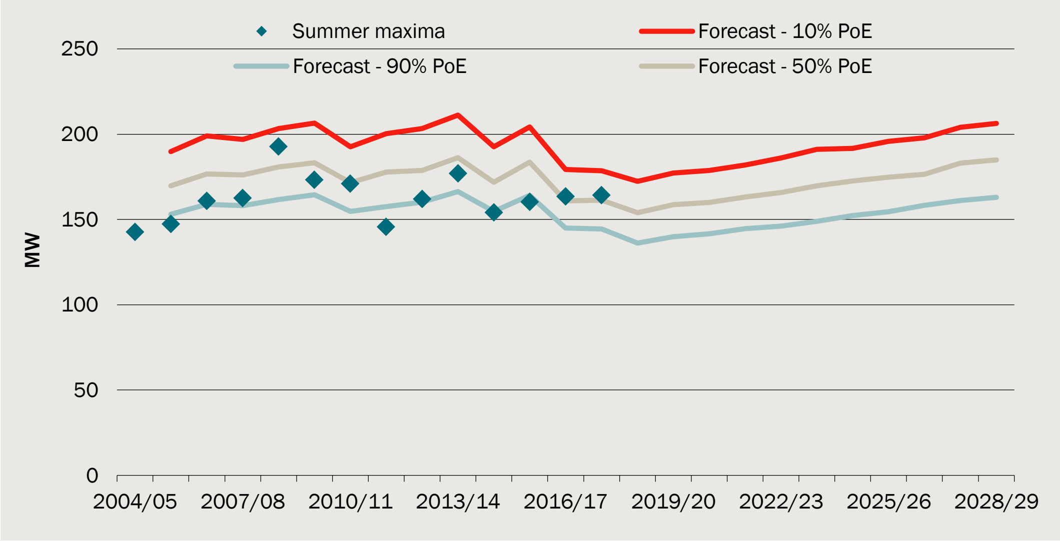
### 3.50 BETS66 annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

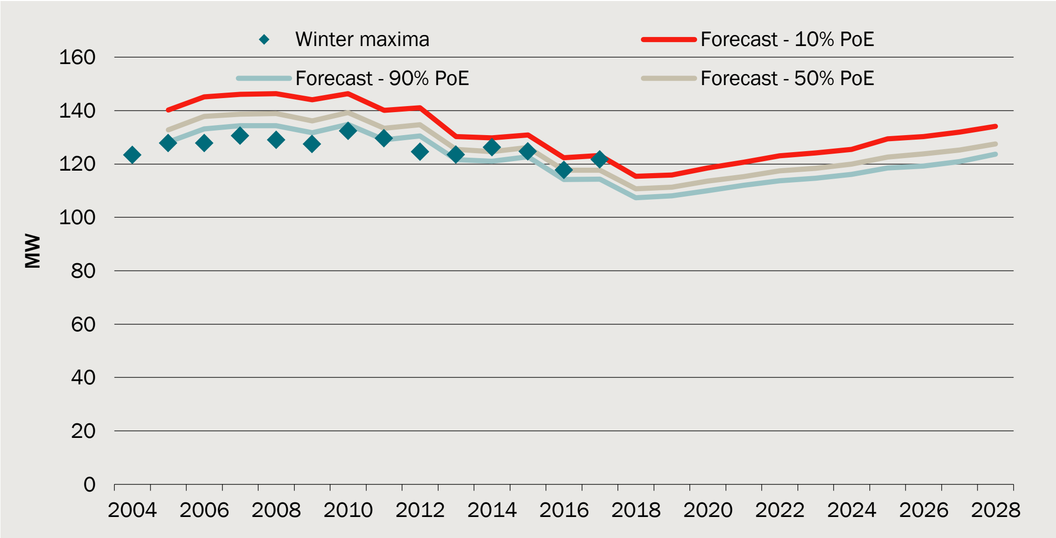
### 3.51 BETS66 summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.52 BETS66 winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.53 BETS66 maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 136.2 | 139.9 | 141.6 | 144.5 | 146.1 | 148.8 | 152.3 | 154.5 | 158.3 | 161.1 | 162.9 |
| 50% PoE | 153.9 | 158.6 | 160.0 | 163.1 | 165.9 | 169.7 | 172.5 | 174.8 | 176.6 | 183.0 | 185.0 |
| 10% PoE | 172.4 | 177.3 | 178.7 | 182.0 | 186.0 | 191.2 | 191.7 | 195.8 | 197.8 | 204.1 | 206.4 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 107.3 | 108.1 | 110.1 | 112.0 | 113.7 | 114.7 | 116.1 | 118.5 | 119.2 | 121.0 | 123.6 |
| 50% PoE | 110.7 | 111.3 | 113.6 | 115.2 | 117.4 | 118.4 | 120.0 | 122.5 | 123.8 | 125.2 | 127.5 |
| 10% PoE | 115.4 | 115.9 | 118.6 | 120.7 | 123.0 | 124.2 | 125.5 | 129.4 | 130.3 | 131.9 | 134.1 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 136.2 | 139.9 | 141.6 | 144.5 | 146.1 | 148.8 | 152.3 | 154.5 | 158.3 | 161.1 | 162.9 |
| 50% PoE | 153.9 | 158.6 | 160.0 | 163.1 | 165.9 | 169.7 | 172.5 | 174.8 | 176.6 | 183.0 | 185.0 |
| 10% PoE | 172.4 | 177.3 | 178.7 | 182.0 | 186.0 | 191.2 | 191.7 | 195.8 | 197.8 | 204.1 | 206.4 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.54 BETS66 maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 131.3 | 127.0 | 126.7 | 127.4 | 126.4 | 126.5 | 127.6 | 126.1 | 126.9 | 127.2 | 126.5 |
| 50% PoE | 147.8 | 144.4 | 143.7 | 144.7 | 144.8 | 145.9 | 146.3 | 144.9 | 144.0 | 147.6 | 147.0 |
| 10% PoE | 165.0 | 161.8 | 161.1 | 162.2 | 163.5 | 165.9 | 164.2 | 164.5 | 163.7 | 167.2 | 166.9 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 102.6 | 95.7 | 95.5 | 95.4 | 94.5 | 93.1 | 92.3 | 90.9 | 89.0 | 88.4 | 88.4 |
| 50% PoE | 105.7 | 98.7 | 98.8 | 98.4 | 97.9 | 96.6 | 95.9 | 94.7 | 93.2 | 92.4 | 92.0 |
| 10% PoE | 110.1 | 103.0 | 103.4 | 103.5 | 103.2 | 102.0 | 101.1 | 101.1 | 99.3 | 98.6 | 98.2 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 131.3 | 127.0 | 126.7 | 127.4 | 126.4 | 126.5 | 127.6 | 126.1 | 126.9 | 127.2 | 126.5 |
| 50% PoE | 147.8 | 144.4 | 143.7 | 144.7 | 144.8 | 145.9 | 146.3 | 144.9 | 144.0 | 147.6 | 147.0 |
| 10% PoE | 165.0 | 161.8 | 161.1 | 162.2 | 163.5 | 165.9 | 164.2 | 164.5 | 163.7 | 167.2 | 166.9 |

*Note:* All forecasts are in MW.

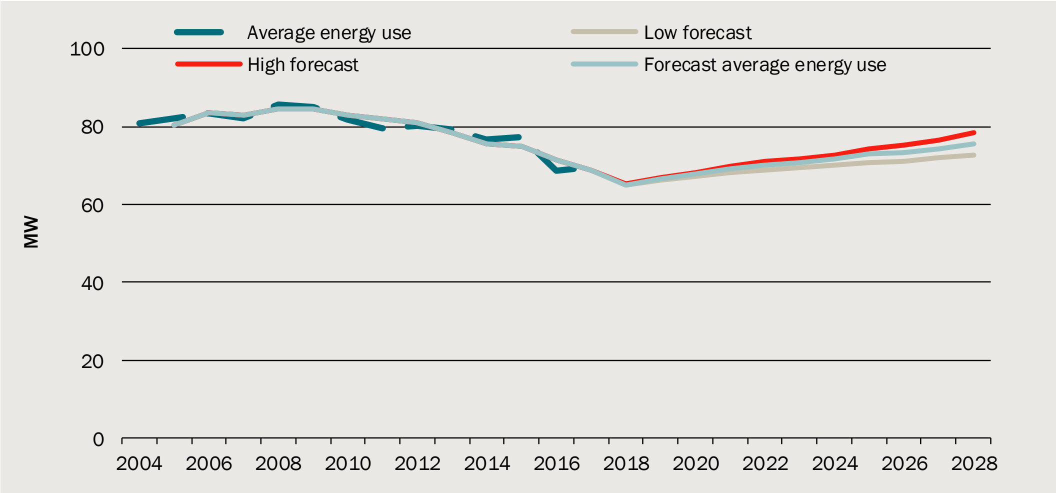
*Source:* Powercor terminal station data, The CIE.

## 3.55 BETS66 average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate long run model only | -0.0448 |
| Income | AEMO constrained long run model only | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

## 3.56 BETS66 average demand forecasts




*Data source:* Powercor terminal station data, The CIE.

## 3.57 BETS66 predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 192.8 | 173.1 | 170.9 | 145.7 | 161.9 | 176.9 | 154.1 | 160.2 | 163.4 | 164.2 |
| 90% PoE | 161.6 | 164.5 | 154.6 | 157.5 | 160.2 | 166.3 | 154.8 | 164.2 | 145.0 | 144.4 |
| 50% PoE | 180.9 | 183.2 | 171.6 | 177.7 | 178.8 | 186.2 | 171.8 | 183.6 | 160.8 | 161.3 |
| 10% PoE | 203.2 | 206.5 | 192.6 | 200.3 | 203.3 | 211.1 | 192.5 | 204.1 | 179.3 | 178.6 |

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | |
| Actual | 129.0 | 127.5 | 132.4 | 129.7 | 124.6 | 123.5 | 126.2 | 124.7 | 117.7 | 121.6 |
| 90% PoE | 134.3 | 131.7 | 134.9 | 129.1 | 130.5 | 121.7 | 121.0 | 122.7 | 114.2 | 114.3 |
| 50% PoE | 139.0 | 136.1 | 139.3 | 133.4 | 134.7 | 125.5 | 124.6 | 126.2 | 117.7 | 117.7 |
| 10% PoE | 146.4 | 144.1 | 146.3 | 140.2 | 141.1 | 130.2 | 129.9 | 130.9 | 122.3 | 123.2 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 192.8 | 173.1 | 170.9 | 145.7 | 161.9 | 176.9 | 154.1 | 160.2 | 163.4 | 164.2 |
| 90% PoE | 161.6 | 164.5 | 154.7 | 157.5 | 160.2 | 166.3 | 154.8 | 164.2 | 145.0 | 144.4 |
| 50% PoE | 180.9 | 183.2 | 171.6 | 177.7 | 178.8 | 186.2 | 171.8 | 183.6 | 160.8 | 161.3 |
| 10% PoE | 203.2 | 206.5 | 192.6 | 200.3 | 203.3 | 211.1 | 192.5 | 204.1 | 179.3 | 178.6 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.58 BETS66 average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.772 |
| Winter | 0.746 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

### 3.59 BETS66 details of actual maxima

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 17/06/2004 17:30 | 123.4 | 7.9 | 6.3 | 10.4 | 8.8 |
| 11/08/2005 1:00 | 127.8 | 1.0 | -2.3 | 9.7 | 5.9 |
| 14/06/2006 18:00 | 127.9 | 3.9 | -4.5 | 12.7 | 5.6 |
| 17/07/2007 18:00 | 130.6 | 3.8 | 1.0 | 8.2 | 5.3 |
| 23/07/2008 18:00 | 129.0 | 7.2 | -1.0 | 10.8 | 6.3 |
| 24/07/2009 8:00 | 127.5 | -1.2 | -2.5 | 11.6 | 6.1 |
| 5/08/2010 18:00 | 132.4 | 9.0 | 1.8 | 11.7 | 9.6 |
| 8/06/2011 17:30 | 129.7 | 8.4 | 1.5 | 10.6 | 7.2 |
| 21/06/2012 17:30 | 124.6 | 8.4 | 7.7 | 12.3 | 7.6 |
| 20/06/2013 23:00 | 123.5 | 2.5 | -0.8 | 11.4 | 7.3 |
| 17/07/2014 18:00 | 126.2 | 5.3 | 2.8 | 11.6 | 6.8 |
| 14/07/2015 18:00 | 124.7 | 6.5 | 3.4 | 7.0 | 6.7 |
| 15/06/2016 8:00 | 117.7 | 4.4 | 2.0 | 13.6 | 6.7 |
| 21/07/2017 8:00 | 121.6 | -0.9 | -1.4 | 12.7 | 6.4 |

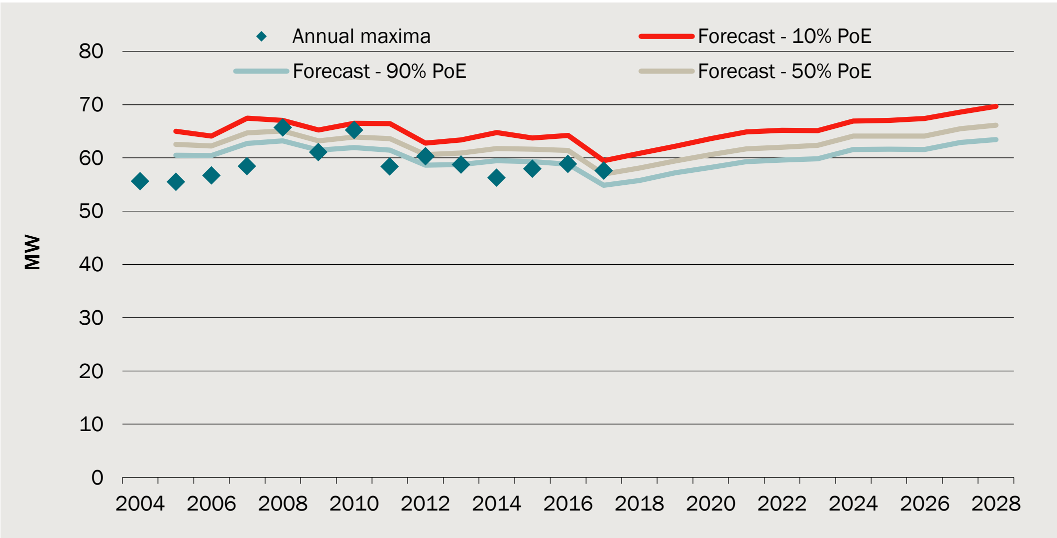
| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Summer** | | | | | |
| 20/02/2004 16:00 | 141.5 | 39.1 | 13.0 | 39.2 | 19.6 |
| 1/03/2005 16:00 | 142.7 | 37.3 | 17.1 | 37.3 | 19.7 |
| 10/01/2006 13:00 | 147.4 | 38.6 | 21.1 | 39.1 | 23.7 |
| 5/02/2007 15:30 | 160.9 | 39.3 | 13.9 | 40.0 | 21.3 |
| 17/03/2008 17:00 | 162.6 | 35.3 | 18.4 | 35.8 | 26.3 |
| 29/01/2009 13:00 | 192.8 | 40.9 | 24.0 | 42.2 | 30.2 |
| 11/01/2010 16:00 | 173.1 | 41.7 | 20.9 | 41.9 | 25.5 |
| 31/01/2011 16:00 | 170.9 | 38.7 | 20.2 | 39.5 | 26.1 |
| 2/01/2012 17:00 | 145.7 | 37.5 | 17.8 | 38.6 | 23.4 |
| 29/11/2012 15:00 | 161.9 | 38.2 | 21.0 | 39.1 | 24.3 |
| 15/01/2014 15:30 | 176.9 | 40.8 | 21.8 | 42.3 | 27.2 |
| 11/02/2015 16:30 | 154.1 | 36.4 | 18.7 | 36.4 | 24.5 |
| 13/01/2016 16:00 | 160.2 | 41.3 | 22.8 | 41.3 | 25.1 |
| 10/02/2017 17:30 | 163.4 | 40.4 | 19.4 | 40.8 | 25.6 |
| 29/01/2018 14:30 | 164.2 | 35.9 | 19.8 | 37.1 | 21.7 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.

*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

## BLTS22

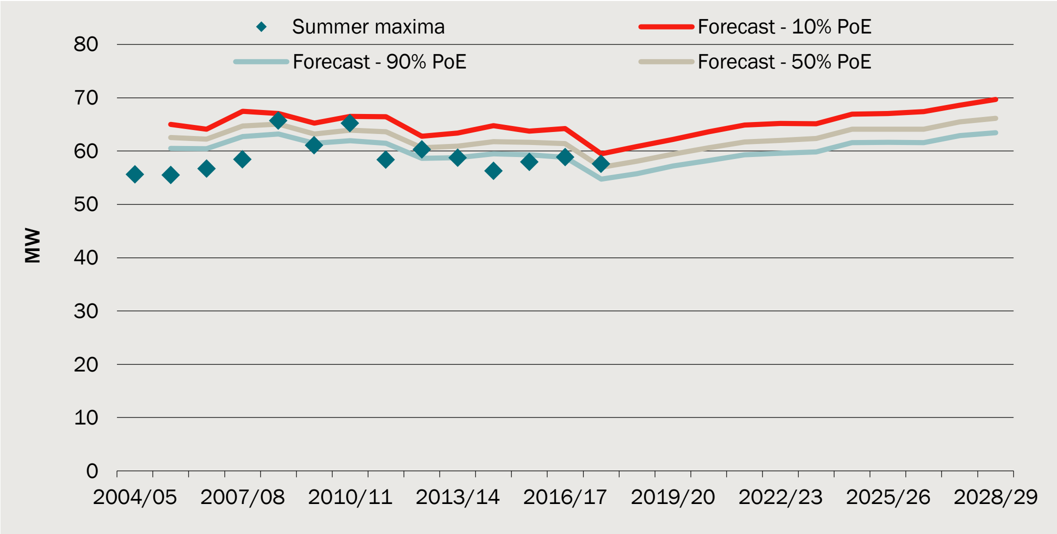
### 3.60 BLTS22 annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

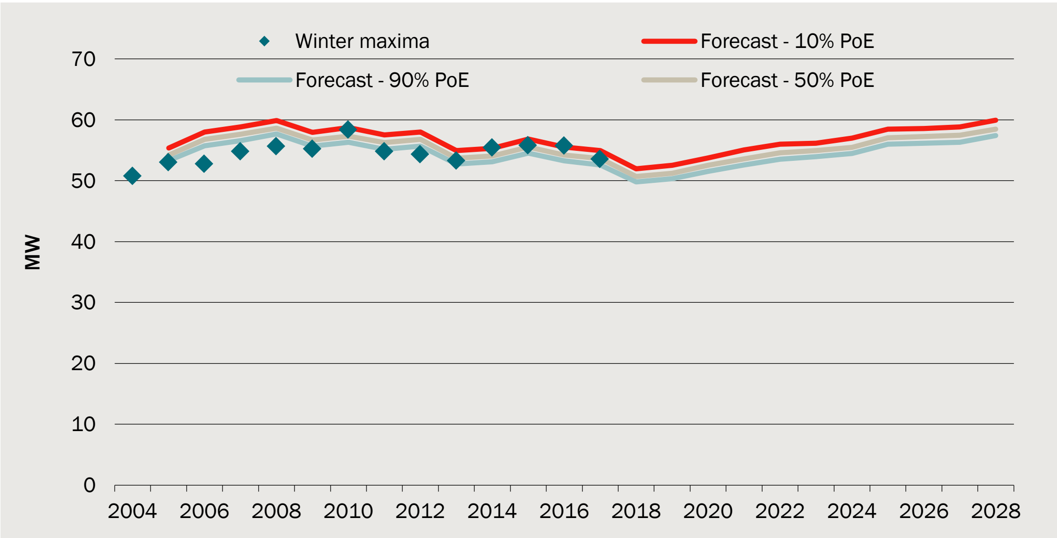
### 3.61 BLTS22 summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.62 BLTS22 winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.63 BLTS22 maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 55.7 | 57.2 | 58.2 | 59.3 | 59.6 | 59.8 | 61.6 | 61.7 | 61.6 | 62.9 | 63.4 |
| 50% PoE | 58.1 | 59.4 | 60.6 | 61.7 | 62.0 | 62.3 | 64.1 | 64.1 | 64.1 | 65.5 | 66.1 |
| 10% PoE | 60.9 | 62.2 | 63.6 | 64.9 | 65.1 | 65.1 | 66.9 | 67.1 | 67.4 | 68.6 | 69.7 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 49.8 | 50.3 | 51.5 | 52.6 | 53.5 | 53.9 | 54.5 | 56.0 | 56.2 | 56.3 | 57.4 |
| 50% PoE | 50.7 | 51.2 | 52.5 | 53.6 | 54.6 | 54.9 | 55.5 | 57.1 | 57.3 | 57.5 | 58.5 |
| 10% PoE | 52.0 | 52.6 | 53.7 | 55.1 | 56.0 | 56.2 | 57.0 | 58.4 | 58.6 | 58.9 | 59.9 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 55.7 | 57.2 | 58.2 | 59.3 | 59.6 | 59.8 | 61.6 | 61.7 | 61.6 | 62.9 | 63.4 |
| 50% PoE | 58.1 | 59.4 | 60.6 | 61.7 | 62.0 | 62.3 | 64.1 | 64.1 | 64.1 | 65.5 | 66.1 |
| 10% PoE | 60.9 | 62.2 | 63.6 | 64.9 | 65.1 | 65.1 | 66.9 | 67.1 | 67.4 | 68.6 | 69.7 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.64 BLTS22 maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 58.0 | 58.3 | 58.9 | 59.6 | 59.9 | 60.0 | 61.2 | 61.2 | 61.1 | 62.0 | 62.3 |
| 50% PoE | 59.5 | 59.7 | 60.5 | 61.1 | 61.3 | 61.6 | 62.8 | 62.7 | 62.7 | 63.6 | 64.0 |
| 10% PoE | 61.2 | 61.5 | 62.4 | 63.2 | 63.4 | 63.4 | 64.6 | 64.6 | 64.8 | 65.5 | 66.3 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 52.5 | 52.2 | 52.8 | 53.4 | 54.0 | 54.1 | 54.4 | 55.2 | 55.2 | 55.2 | 55.7 |
| 50% PoE | 53.1 | 52.7 | 53.5 | 54.1 | 54.6 | 54.8 | 55.1 | 55.9 | 55.9 | 55.9 | 56.4 |
| 10% PoE | 53.9 | 53.6 | 54.2 | 55.0 | 55.5 | 55.6 | 56.0 | 56.8 | 56.7 | 56.8 | 57.3 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 58.0 | 58.3 | 58.9 | 59.6 | 59.9 | 60.0 | 61.2 | 61.2 | 61.1 | 62.0 | 62.3 |
| 50% PoE | 59.5 | 59.7 | 60.5 | 61.1 | 61.3 | 61.6 | 62.8 | 62.7 | 62.7 | 63.6 | 64.0 |
| 10% PoE | 61.2 | 61.5 | 62.4 | 63.2 | 63.4 | 63.4 | 64.6 | 64.6 | 64.8 | 65.5 | 66.3 |

*Note:* All forecasts are in MW.

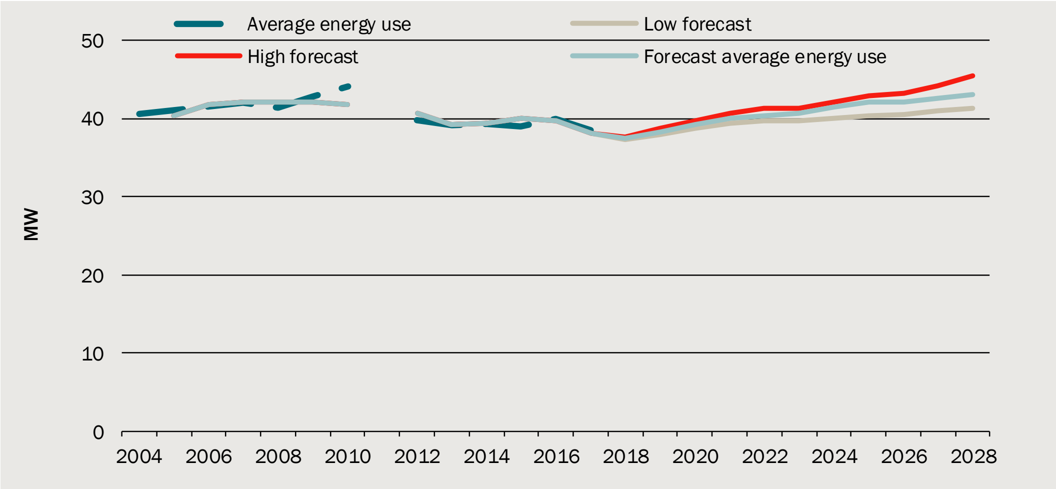
*Source:* Powercor terminal station data, The CIE.

### 3.65 BLTS22 average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate long run model only | -0.2053 |
| Income | AEMO estimate long run model only | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

### 3.66 BLTS22 average demand forecasts




*Data source:* Powercor terminal station data, The CIE.

### 3.67 BLTS22 predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 65.7 | 61.0 | 65.2 | 58.4 | 60.3 | 58.7 | 56.3 | 58.0 | 58.9 | 57.6 |
| 90% PoE | 63.2 | 61.4 | 61.9 | 61.4 | 58.6 | 58.8 | 59.5 | 59.3 | 58.8 | 54.7 |
| 50% PoE | 65.0 | 63.2 | 63.9 | 63.6 | 60.6 | 60.9 | 61.7 | 61.6 | 61.4 | 56.9 |
| 10% PoE | 67.1 | 65.3 | 66.5 | 66.4 | 62.8 | 63.4 | 64.7 | 63.7 | 64.2 | 59.5 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 55.6 | 55.2 | 58.4 | 54.8 | 54.3 | 53.3 | 55.4 | 55.8 | 55.8 | 53.6 |
| 90% PoE | 57.7 | 55.7 | 56.3 | 55.2 | 55.7 | 52.7 | 53.1 | 54.5 | 53.3 | 52.6 |
| 50% PoE | 58.6 | 56.7 | 57.3 | 56.3 | 56.8 | 53.7 | 54.1 | 55.5 | 54.2 | 53.6 |
| 10% PoE | 59.9 | 57.9 | 58.7 | 57.5 | 58.0 | 54.9 | 55.3 | 56.8 | 55.5 | 54.9 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 65.7 | 61.0 | 65.2 | 58.4 | 60.3 | 58.7 | 56.3 | 58.0 | 58.9 | 57.6 |
| 90% PoE | 63.2 | 61.4 | 61.9 | 61.4 | 58.6 | 58.8 | 59.5 | 59.3 | 58.8 | 54.8 |
| 50% PoE | 65.0 | 63.2 | 63.9 | 63.6 | 60.6 | 60.9 | 61.7 | 61.6 | 61.4 | 56.9 |
| 10% PoE | 67.1 | 65.3 | 66.5 | 66.4 | 62.8 | 63.4 | 64.7 | 63.7 | 64.2 | 59.5 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.68 BLTS22 average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.807 |
| Winter | 0.881 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

## 3.69 BLTS22 details of actual maxima

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 23-06-04 10:30 | 50.8 | 11.4 | 9.1 | 11.5 | 9.9 |
| 01-06-05 10:00 | 53.0 | 12.2 | 9.0 | 13.3 | 11.0 |
| 07-06-06 9:00 | 52.8 | 3.8 | 1.6 | 13.6 | 6.8 |
| 18-07-07 9:30 | 54.8 | 5.7 | 3.1 | 10.1 | 7.1 |
| 24-06-08 8:00 | 55.6 | 10.0 | 8.6 | 15.6 | 12.1 |
| 10-06-09 11:30 | 55.2 | 9.5 | 4.9 | 10.4 | 9.8 |
| 25-08-10 12:00 | 58.4 | 9.2 | 3.8 | 12.8 | 9.6 |
| 19-07-11 9:00 | 54.8 | 11.4 | 9.2 | 13.8 | 10.0 |
| 10-07-12 10:00 | 54.3 | 9.2 | 6.8 | 13.3 | 10.6 |
| 09-08-13 9:00 | 53.3 | 9.4 | 8.4 | 12.2 | 10.5 |
| 24-06-14 9:00 | 55.4 | 9.9 | 5.6 | 13.5 | 10.5 |
| 09-07-15 9:00 | 55.8 | 11.1 | 8.7 | 12.9 | 8.8 |
| 02-06-16 9:00 | 55.8 | 7.3 | 3.0 | 11.5 | 8.8 |
| 03-08-17 10:30 | 53.6 | 4.6 | 0.2 | 8.2 | 8.1 |
| **Summer** | | | | | |
| 20-02-04 14:30 | 55.4 | 39.8 | 12.7 | 39.8 | 18.6 |
| 01-03-05 12:30 | 55.6 | 36.2 | 16.5 | 37.2 | 18.7 |
| 03-03-06 13:00 | 55.5 | 33.7 | 17.5 | 33.7 | 19.7 |
| 16-02-07 13:00 | 56.7 | 34.4 | 18.6 | 36.1 | 26.2 |
| 19-02-08 13:30 | 58.4 | 34.6 | 17.0 | 35.3 | 19.2 |
| 29-01-09 10:00 | 65.7 | 40.6 | 25.3 | 44.1 | 26.5 |
| 09-02-10 14:00 | 61.0 | 28.8 | 17.9 | 31.0 | 22.7 |
| 01-02-11 12:30 | 65.2 | 39.7 | 17.0 | 39.7 | 22.8 |
| 17-01-12 12:30 | 58.4 | 33.1 | 23.5 | 34.2 | 20.5 |
| 18-02-13 13:30 | 60.3 | 36.1 | 17.2 | 36.9 | 23.5 |
| 15-01-14 11:30 | 58.7 | 40.7 | 25.9 | 41.6 | 25.4 |
| 22-01-15 14:00 | 56.3 | 33.4 | 17.5 | 35.7 | 18.9 |
| 13-01-16 13:00 | 58.0 | 42.0 | 14.8 | 43.0 | 22.2 |
| 09-02-17 12:00 | 58.9 | 33.7 | 19.0 | 35.1 | 22.5 |
| 19-01-18 11:30 | 57.6 | 41.6 | 20.2 | 42.1 | 22.9 |

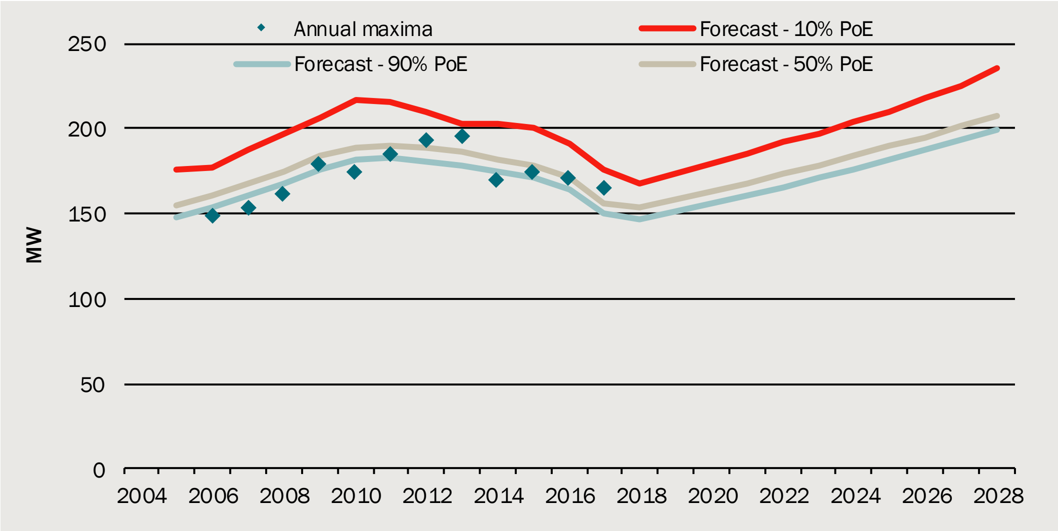
*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.

*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

## *ATS/BLTS*

The annual maximum demand model slightly overestimates historical maximum demand. This is due to the winter model overestimating maximum demand, but the summer model performs well.

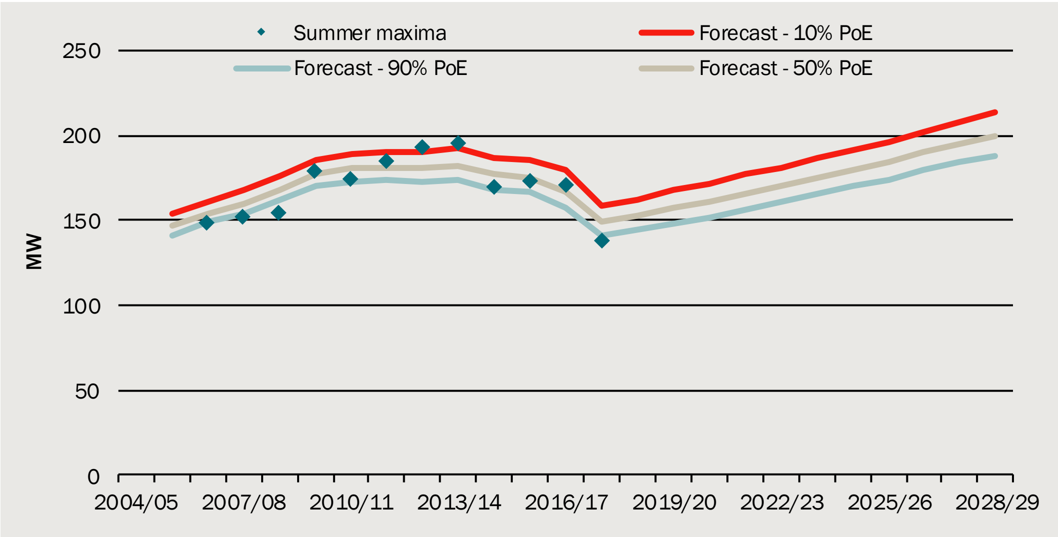
### 3.70 ATS/BLTS annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

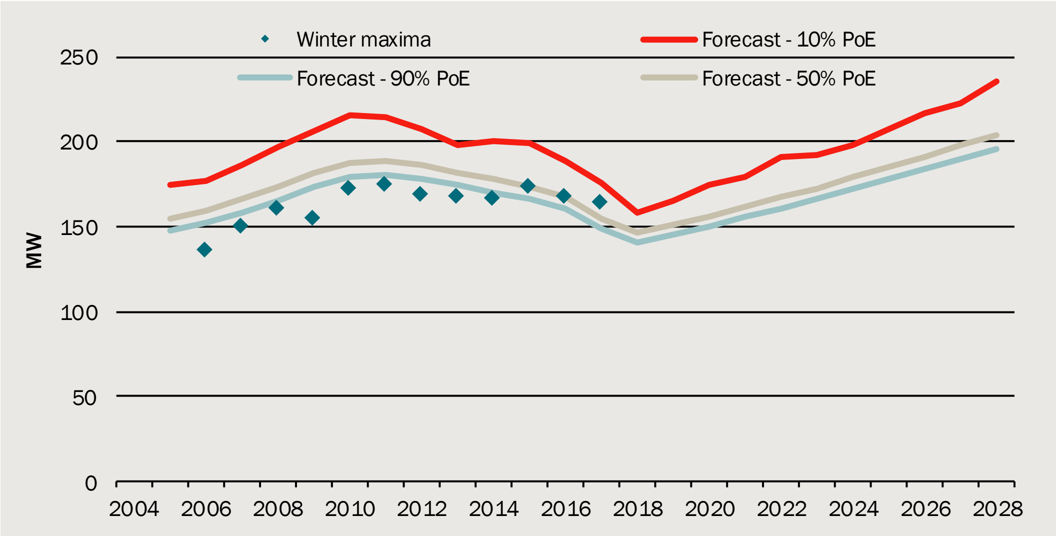
### 3.71 ATS/BLTS summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.72 ATS/BLTS winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.73 ATS/BLTS maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 144.0 | 147.9 | 151.2 | 156.4 | 161.1 | 165.6 | 169.8 | 174.3 | 179.1 | 184.8 | 188.1 |
| 50% PoE | 152.2 | 157.0 | 161.1 | 166.0 | 170.1 | 175.5 | 179.8 | 184.9 | 189.9 | 195.0 | 199.9 |
| 10% PoE | 162.6 | 167.6 | 171.6 | 176.9 | 181.2 | 186.3 | 191.9 | 196.5 | 201.4 | 207.8 | 213.8 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 140.2 | 145.4 | 150.0 | 155.3 | 160.6 | 166.5 | 172.3 | 178.0 | 184.0 | 190.3 | 196.2 |
| 50% PoE | 146.1 | 151.1 | 156.1 | 161.6 | 167.4 | 172.9 | 178.9 | 184.8 | 191.3 | 197.9 | 204.1 |
| 10% PoE | 158.6 | 165.3 | 175.0 | 179.9 | 190.9 | 191.9 | 197.8 | 208.0 | 217.1 | 223.2 | 235.2 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 146.4 | 150.8 | 155.6 | 160.7 | 165.7 | 170.8 | 176.2 | 181.7 | 187.6 | 193.4 | 199.0 |
| 50% PoE | 154.0 | 158.4 | 163.2 | 168.2 | 173.2 | 178.2 | 183.6 | 189.4 | 194.9 | 201.0 | 207.3 |
| 10% PoE | 168.2 | 173.5 | 179.4 | 184.7 | 192.8 | 196.6 | 203.8 | 210.1 | 218.2 | 225.1 | 235.9 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.74 ATS/BLTS maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 120.1 | 119.2 | 119.9 | 121.5 | 123.1 | 124.4 | 125.6 | 126.5 | 127.8 | 129.6 | 130.1 |
| 50% PoE | 125.0 | 124.5 | 125.7 | 127.1 | 128.4 | 130.1 | 131.5 | 132.7 | 134.1 | 135.6 | 136.9 |
| 10% PoE | 131.0 | 130.7 | 131.8 | 133.5 | 134.9 | 136.4 | 138.5 | 139.4 | 140.7 | 143.1 | 145.0 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 114.2 | 115.1 | 116.7 | 118.6 | 120.5 | 122.8 | 125.1 | 126.7 | 128.7 | 131.1 | 133.0 |
| 50% PoE | 117.9 | 118.7 | 120.4 | 122.4 | 124.7 | 126.7 | 129.1 | 130.9 | 133.3 | 135.7 | 137.9 |
| 10% PoE | 125.6 | 127.4 | 132.1 | 133.7 | 139.2 | 138.5 | 140.8 | 145.2 | 149.2 | 151.4 | 157.1 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 121.5 | 120.9 | 122.5 | 124.1 | 125.8 | 127.4 | 129.4 | 130.8 | 132.7 | 134.7 | 136.4 |
| 50% PoE | 126.0 | 125.3 | 126.9 | 128.4 | 130.2 | 131.7 | 133.7 | 135.3 | 136.9 | 139.1 | 141.2 |
| 10% PoE | 134.3 | 134.1 | 136.4 | 138.1 | 141.6 | 142.5 | 145.5 | 147.3 | 150.6 | 153.1 | 157.9 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

The average demand model was estimated using the long run relationship only, as the coefficient on the error correction term was less than -1. Both the CIE model and the fixed income elasticity parameter model resulted in a positive price elasticity, which is inconsistent with economic theory. The price elasticity was therefore set to zero.

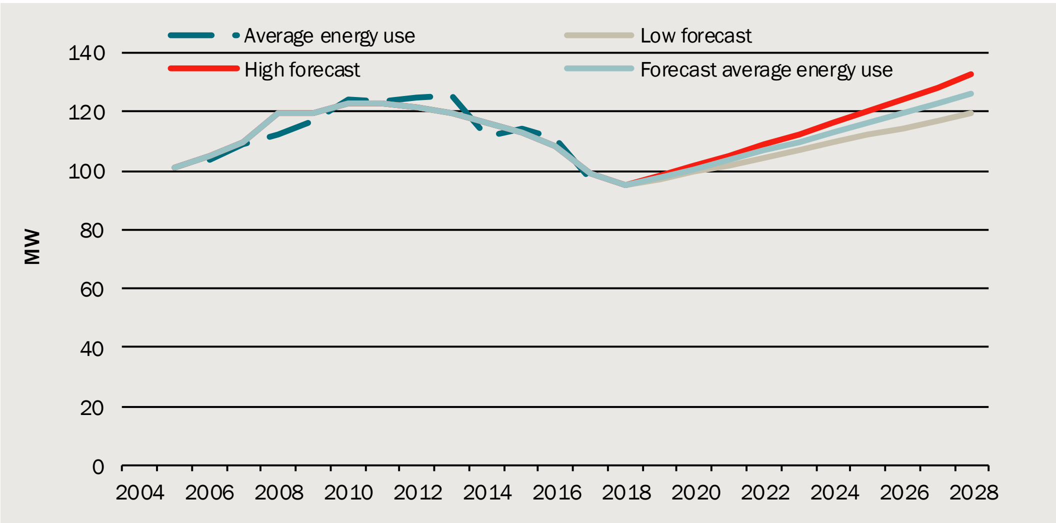
### 3.75 ATS/BLTS average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE constrained long run model only | 0.0 |
| Income | AEMO constrained long run model only | 0.1736 |

*Note:* Coefficient is for 4pm-8pm

*Source:* Powercor terminal station data, The CIE.

### 3.76 ATS/BLTS average demand forecasts




*Data source:* Powercor terminal station data, The CIE.

## 3.77 ATS/BLTS predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 153.9 | 178.8 | 174.2 | 185.2 | 193.2 | 194.9 | 169.8 | 172.7 | 171.1 | 137.7 |
| 90% PoE | 161.9 | 170.5 | 172.8 | 173.8 | 173.0 | 173.2 | 168.0 | 166.2 | 157.9 | 140.9 |
| 50% PoE | 168.2 | 177.0 | 180.8 | 181.4 | 181.2 | 182.2 | 176.8 | 175.2 | 167.2 | 148.8 |
| 10% PoE | 175.6 | 185.1 | 188.9 | 190.1 | 190.6 | 192.5 | 186.6 | 186.0 | 179.5 | 158.0 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 160.9 | 155.6 | 172.9 | 174.8 | 169.1 | 167.9 | 166.7 | 173.5 | 168.7 | 164.3 |
| 90% PoE | 165.7 | 173.5 | 179.0 | 180.2 | 178.7 | 174.1 | 169.7 | 166.5 | 160.5 | 148.8 |
| 50% PoE | 173.3 | 181.3 | 187.4 | 188.7 | 186.5 | 181.8 | 177.7 | 173.5 | 167.3 | 155.1 |
| 10% PoE | 197.2 | 206.1 | 215.7 | 214.2 | 207.3 | 198.2 | 200.2 | 199.4 | 189.3 | 175.4 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 160.9 | 178.8 | 174.2 | 185.2 | 193.2 | 194.9 | 169.8 | 173.5 | 171.1 | 164.3 |
| 90% PoE | 167.9 | 175.8 | 181.4 | 182.4 | 180.8 | 178.6 | 174.2 | 171.1 | 164.1 | 150.5 |
| 50% PoE | 174.9 | 183.6 | 188.9 | 190.0 | 188.5 | 186.1 | 181.5 | 178.8 | 171.7 | 156.4 |
| 10% PoE | 197.4 | 206.5 | 217.3 | 215.7 | 210.3 | 202.9 | 202.3 | 200.7 | 191.3 | 175.8 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

## 3.78 ATS/BLTS average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.723 |
| Winter | 0.772 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

### 3.79 ATS/BLTS details of actual maxima

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 11-07-06 8:30 | 136.2 | 12.2 | 7.6 | 14.1 | 9.3 |
| 20-08-07 12:00 | 151.0 | 13.7 | 0.8 | 13.9 | 11.3 |
| 12-08-08 8:00 | 160.9 | 8.0 | 5.4 | 13.2 | 9.2 |
| 16-06-09 8:30 | 155.6 | 6.1 | 3.1 | 13.2 | 8.3 |
| 17-06-10 10:00 | 172.9 | 11.3 | 8.6 | 14.8 | 9.5 |
| 07-06-11 10:30 | 174.8 | 9.4 | 3.8 | 10.3 | 9.1 |
| 22-06-12 7:00 | 169.1 | 9.1 | 3.7 | 11.1 | 9.0 |
| 19-07-13 7:30 | 162.1 | 13.8 | 9.5 | 16.7 | 11.2 |
| 13-06-14 8:30 | 166.6 | 12.0 | 7.4 | 17.7 | 11.7 |
| 11-08-15 7:30 | 173.5 | 7.4 | 7.2 | 14.6 | 10.0 |
| 13-07-16 7:30 | 165.0 | 4.4 | 3.3 | 11.0 | 9.6 |
| 12-07-17 8:30 | 163.2 | 1.0 | 0.2 | 14.9 | 9.2 |
| **Summer** | | | | | |
| 20-02-07 12:00 | 148.3 | 25.4 | 18.3 | 27.1 | 22.1 |
| 18-03-08 11:00 | 152.6 | 25.7 | 17.1 | 29.7 | 18.8 |
| 20-01-09 12:30 | 153.9 | 39.5 | 15.3 | 39.7 | 19.4 |
| 16-12-09 13:30 | 178.8 | 37.1 | 15.9 | 38.3 | 18.1 |
| 06-12-10 12:30 | 174.2 | 25.0 | 15.9 | 25.0 | 21.3 |
| 23-01-12 14:00 | 185.2 | 31.3 | 14.8 | 32.1 | 21.9 |
| 25-02-13 13:00 | 174.9 | 28.3 | 19.2 | 28.7 | 23.1 |
| 28-01-14 14:30 | 176.5 | 25.5 | 19.6 | 40.3 | 20.9 |
| 11-02-15 12:30 | 169.8 | 28.2 | 15.2 | 28.2 | 22.2 |
| 23-02-16 14:00 | 172.7 | 39.6 | 17.3 | 39.9 | 21.2 |
| 09-02-17 13:00 | 170.7 | 29.0 | 19.0 | 35.1 | 22.5 |
| 07-02-18 14:30 | 131.3 | 37.0 | 16.8 | 37.2 | 22.4 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.

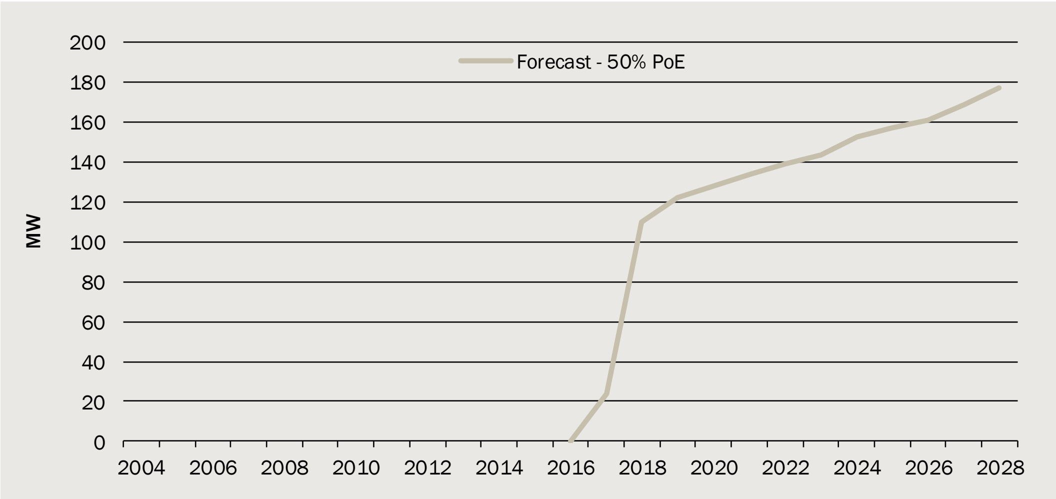
*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

## DPTS

Average demand and maximum demand models were not estimated for DPTS, due to the limited data available for this new terminal station. Several years of demand observations, unaffected by load transfers, are required to estimate the average demand and maximum demand models.

Maximum demand for DPTS was instead estimated using load transfers from other terminal stations provided by Powercor. Maximum demand forecasts are only prepared for the 50 per cent PoE. The future profile of maximum demand reflects the forecast profiles of the terminal stations from which transfers occur.[44]

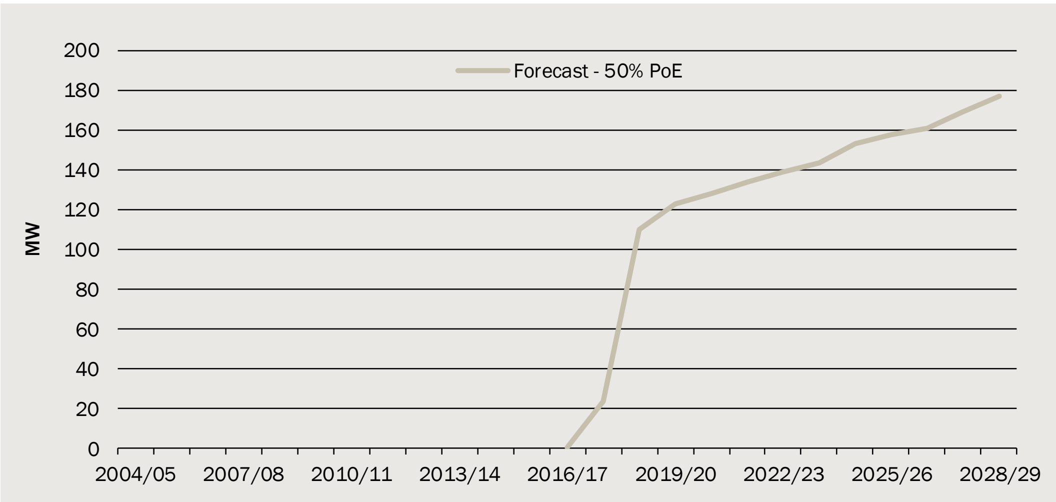
### 3.80 DPTS annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.81 DPTS summer maximum demand forecasts

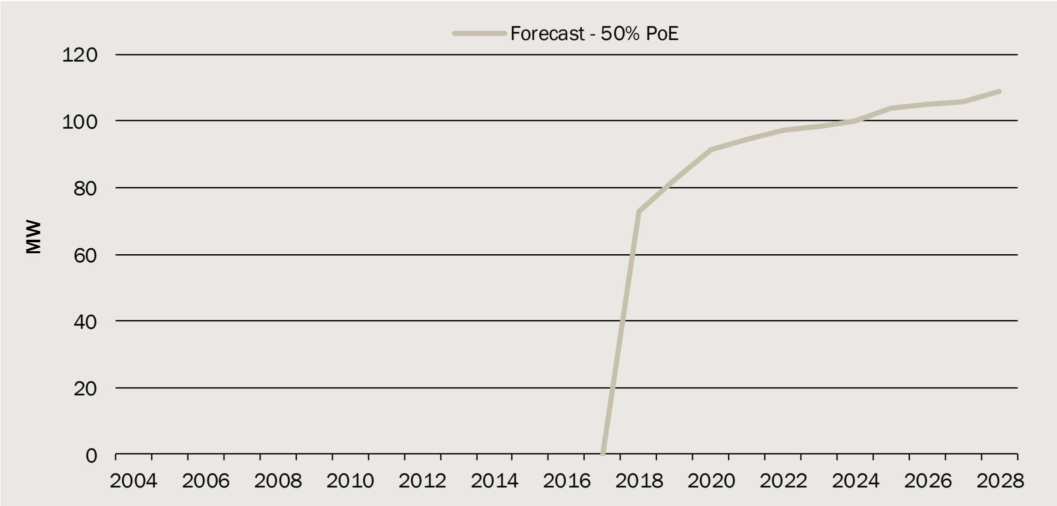



*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

44 For DPTS, loads are transferred from KTS West, ATS/BLTS, ATS West and BATS.

### 3.82 DPTS winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.83 DPTS maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 50% PoE | 103.6 | 110.1 | 114.4 | 119.0 | 122.6 | 126.2 | 134.4 | 136.2 | 137.8 | 144.0 | 149.5 |
| **Winter Maxima** | | | | | | | | | | | |
| 50% PoE | 66.7 | 70.0 | 78.0 | 79.6 | 81.1 | 81.1 | 81.8 | 82.9 | 82.0 | 81.1 | 81.5 |
| **Annual Maxima** | | | | | | | | | | | |
| 50% PoE | 103.6 | 110.1 | 114.4 | 119.0 | 122.6 | 126.1 | 134.3 | 136.2 | 137.8 | 144.0 | 149.5 |

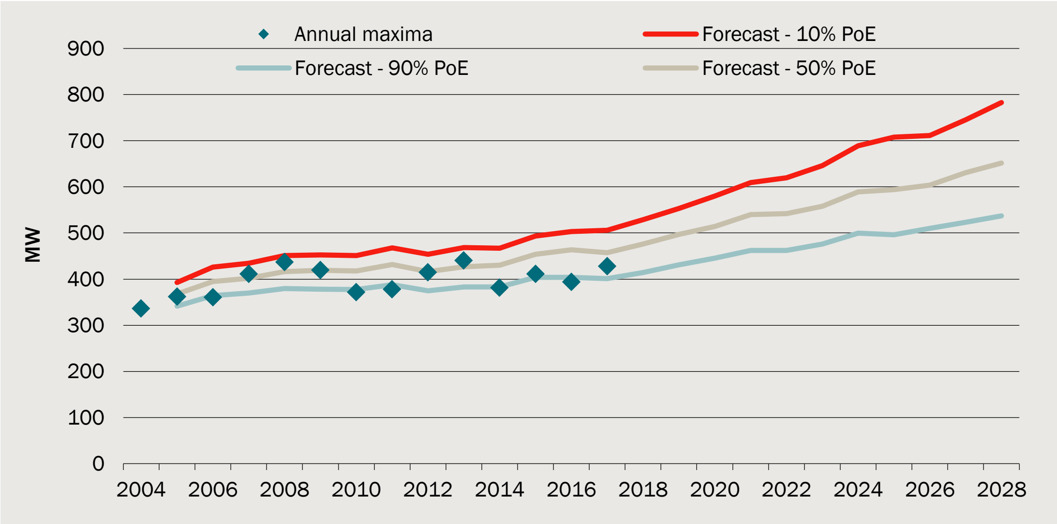
*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

# *GTS66*

For GTS66, the summer and winter models perform well in matching historical data.

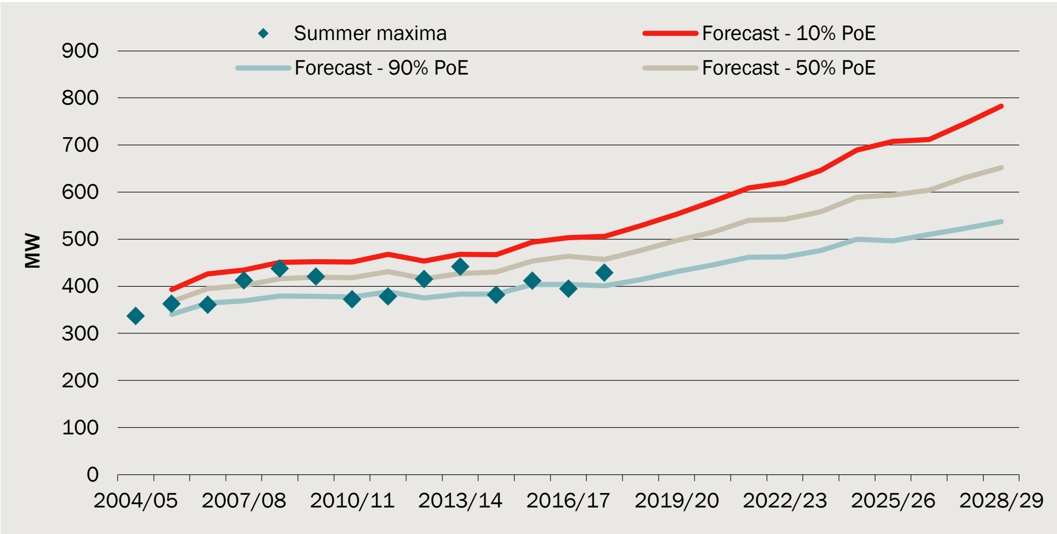
### 3.84 GTS66 annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

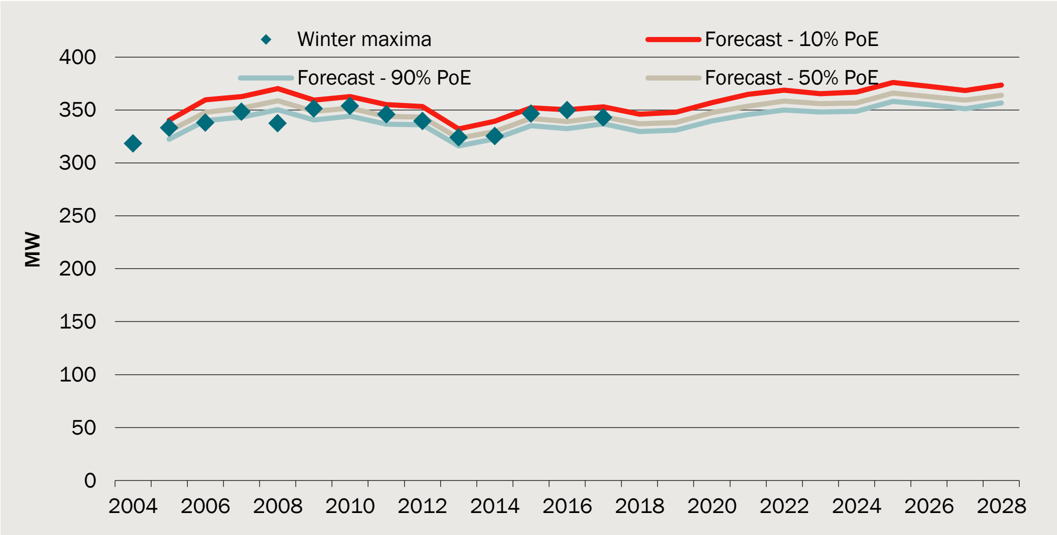
### 3.85 GTS66 summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.86 GTS66 winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.87 GTS66 maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 414.1 | 430.7 | 445.2 | 461.9 | 462.3 | 475.9 | 499.5 | 496.2 | 510.1 | 523.0 | 537.2 |
| 50% PoE | 475.8 | 497.0 | 514.5 | 540.1 | 542.1 | 558.1 | 589.0 | 593.8 | 604.0 | 630.9 | 651.7 |
| 10% PoE | 528.5 | 553.2 | 580.1 | 609.2 | 619.6 | 646.2 | 689.5 | 707.9 | 711.4 | 745.5 | 782.8 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 329.7 | 330.9 | 339.6 | 345.7 | 350.1 | 348.3 | 348.6 | 358.1 | 355.1 | 351.3 | 356.7 |
| 50% PoE | 337.1 | 338.1 | 347.5 | 353.5 | 358.4 | 356.0 | 356.7 | 366.1 | 362.7 | 359.3 | 364.0 |
| 10% PoE | 346.0 | 348.0 | 357.0 | 364.7 | 368.8 | 365.5 | 367.0 | 376.0 | 372.6 | 368.6 | 373.7 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 414.1 | 430.7 | 445.2 | 461.9 | 462.3 | 475.9 | 499.5 | 496.2 | 510.1 | 523.0 | 537.2 |
| 50% PoE | 475.8 | 497.0 | 514.5 | 540.1 | 542.1 | 558.1 | 589.0 | 593.8 | 604.0 | 630.9 | 651.7 |
| 10% PoE | 528.5 | 553.2 | 580.1 | 609.2 | 619.6 | 646.2 | 689.5 | 707.9 | 711.4 | 745.5 | 782.8 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.88 GTS66 maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 382.3 | 383.8 | 392.5 | 402.8 | 401.0 | 409.4 | 425.6 | 418.4 | 425.8 | 432.7 | 439.8 |
| 50% PoE | 430.4 | 435.4 | 446.5 | 463.8 | 463.2 | 473.4 | 495.4 | 494.4 | 498.9 | 516.8 | 529.0 |
| 10% PoE | 471.4 | 479.2 | 497.6 | 517.6 | 523.6 | 542.0 | 573.7 | 583.3 | 582.6 | 606.1 | 631.1 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 293.7 | 283.1 | 287.0 | 288.9 | 290.0 | 286.4 | 284.5 | 286.8 | 281.2 | 275.3 | 275.2 |
| 50% PoE | 299.1 | 288.4 | 292.8 | 294.7 | 296.1 | 292.1 | 290.5 | 292.8 | 286.8 | 281.2 | 280.6 |
| 10% PoE | 305.8 | 295.7 | 299.9 | 303.0 | 303.8 | 299.1 | 298.1 | 300.1 | 294.1 | 288.1 | 287.8 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 382.3 | 383.8 | 392.5 | 402.8 | 401.0 | 409.4 | 425.6 | 418.4 | 425.8 | 432.7 | 439.8 |
| 50% PoE | 430.4 | 435.4 | 446.5 | 463.8 | 463.2 | 473.4 | 495.4 | 494.4 | 498.9 | 516.8 | 529.0 |
| 10% PoE | 471.4 | 479.2 | 497.6 | 517.6 | 523.6 | 542.0 | 573.7 | 583.3 | 582.6 | 606.1 | 631.1 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

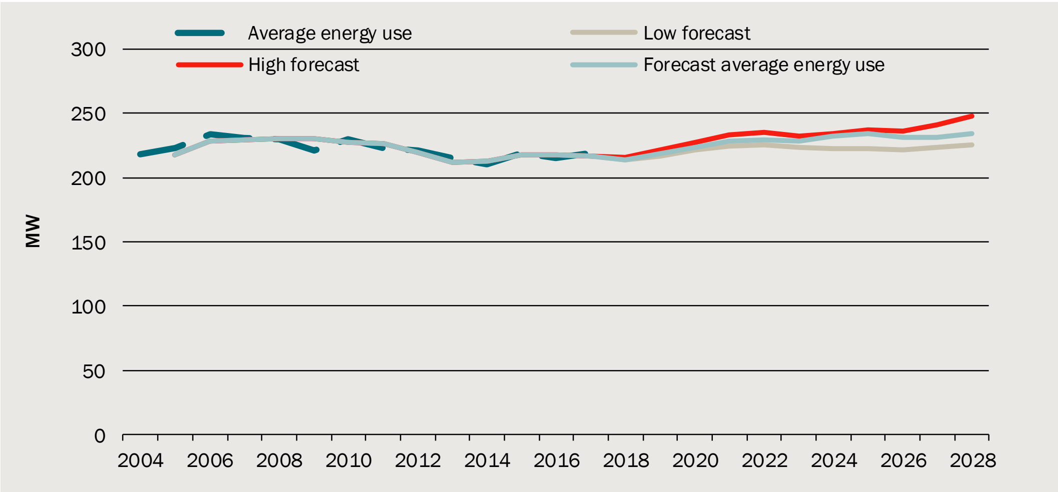
The average demand model was estimated using the long run relationship only, as the coefficient on the error correction term was less than -1.

### 3.89 GTS66 average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate long run model only | -0.2348 |
| Income | AEMO constrained long run model only | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

### 3.90 GTS66 average demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.91 GTS66 predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 437.0 | 419.8 | 371.6 | 377.7 | 414.3 | 440.6 | 381.3 | 410.9 | 393.7 | 427.8 |
| 90% PoE | 379.0 | 378.4 | 377.4 | 387.9 | 374.9 | 383.3 | 383.2 | 404.0 | 403.9 | 400.9 |
| 50% PoE | 416.3 | 419.3 | 417.8 | 431.3 | 416.2 | 426.7 | 430.1 | 453.6 | 463.7 | 457.1 |
| 10% PoE | 450.9 | 452.3 | 451.3 | 468.0 | 453.8 | 468.1 | 467.2 | 493.4 | 503.1 | 506.0 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 337.2 | 351.2 | 353.4 | 345.7 | 339.1 | 323.7 | 325.0 | 346.2 | 349.5 | 342.7 |
| 90% PoE | 350.3 | 340.5 | 344.3 | 336.7 | 335.9 | 316.0 | 322.9 | 335.2 | 332.4 | 336.9 |
| 50% PoE | 358.7 | 348.6 | 351.9 | 344.0 | 343.4 | 323.2 | 329.8 | 342.2 | 339.2 | 343.6 |
| 10% PoE | 370.3 | 359.3 | 362.9 | 355.1 | 353.2 | 332.3 | 339.3 | 352.1 | 350.3 | 353.1 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 437.0 | 419.8 | 371.6 | 377.7 | 414.3 | 440.6 | 381.3 | 410.9 | 393.7 | 427.8 |
| 90% PoE | 379.3 | 378.4 | 377.7 | 387.9 | 374.9 | 383.3 | 383.2 | 404.0 | 403.9 | 400.9 |
| 50% PoE | 416.3 | 419.3 | 417.8 | 431.3 | 416.2 | 426.7 | 430.1 | 453.6 | 463.7 | 457.1 |
| 10% PoE | 450.9 | 452.3 | 451.3 | 468.0 | 453.8 | 468.1 | 467.2 | 493.4 | 503.1 | 506.0 |

*Note:* All forecasts are in MW.
*Source:* Powercor terminal station data, The CIE.

### 3.92 GTS66 average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.717 |
| Winter | 0.744 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.
Source: Powercor terminal station data, The CIE.

### 3.93 GTS66 details of actual maxima

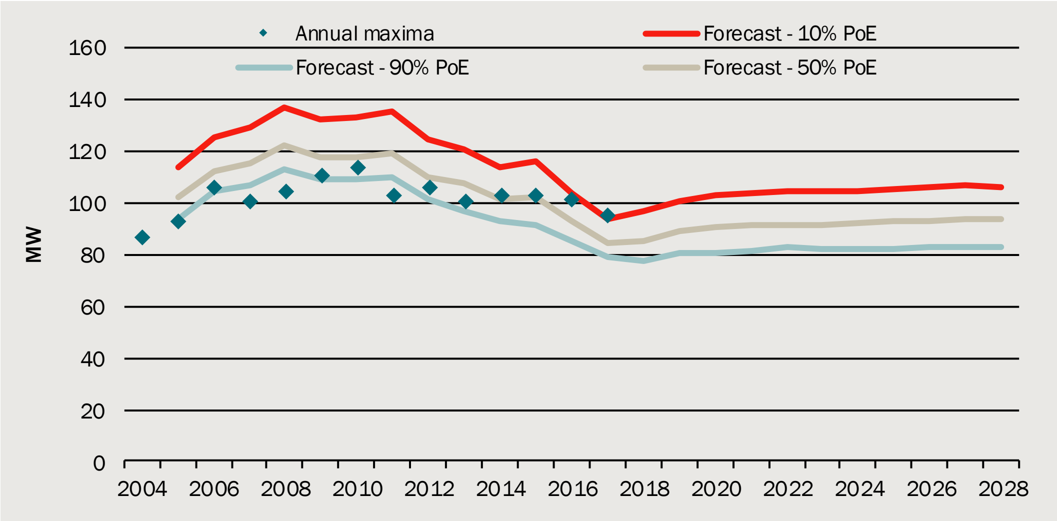
| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 22-07-04 17:30 | 318.0 | 8.5 | 0.8 | 11.4 | 8.7 |
| 10-08-05 17:30 | 332.9 | 5.7 | 2.7 | 7.7 | 8.9 |
| 19-07-06 18:00 | 337.8 | 9.1 | 5.1 | 11.0 | 8.8 |
| 17-07-07 18:00 | 348.2 | 4.5 | 4.1 | 9.8 | 7.5 |
| 12-08-08 18:00 | 337.2 | 8.3 | 5.4 | 12.0 | 9.2 |
| 10-06-09 17:30 | 351.2 | 7.7 | 4.7 | 11.1 | 9.7 |
| 14-07-10 17:00 | 353.4 | 9.6 | 7.1 | 12.8 | 10.4 |
| 21-06-11 17:30 | 345.7 | 7.8 | 7.1 | 13.6 | 11.6 |
| 30-07-12 18:00 | 339.1 | 9.4 | 7.1 | 13.1 | 9.7 |
| 09-07-13 18:00 | 323.7 | 7.7 | 1.9 | 13.5 | 9.4 |
| 23-07-14 18:00 | 325.0 | 6.9 | 2.9 | 8.3 | 10.9 |
| 14-07-15 17:30 | 346.2 | 8.7 | 4.7 | 9.9 | 8.4 |
| 12-07-16 18:00 | 349.5 | 5.3 | 4.4 | 13.2 | 9.8 |
| 08-06-17 18:00 | 342.7 | 8.8 | 4.8 | 12.4 | 10.2 |
| **Summer** | | | | | |
| 04-03-04 15:30 | 312.3 | 35.7 | 16.2 | 35.7 | 18.0 |
| 25-01-05 15:00 | 335.9 | 35.9 | 16.3 | 36.6 | 21.3 |
| 20-01-06 13:30 | 362.0 | 37.5 | 17.3 | 37.5 | 20.3 |
| 23-03-07 14:30 | 360.1 | 36.9 | 15.4 | 37.4 | 18.6 |
| 17-03-08 15:30 | 411.4 | 40.3 | 16.9 | 40.4 | 22.8 |
| 29-01-09 13:30 | 437.0 | 43.2 | 18.7 | 44.5 | 24.5 |
| 11-01-10 16:00 | 419.8 | 41.4 | 13.2 | 42.0 | 21.2 |
| 01-02-11 11:00 | 371.6 | 37.5 | 16.3 | 38.4 | 21.6 |
| 17-01-12 15:00 | 377.7 | 34.2 | 22.0 | 35.5 | 20.0 |
| 04-01-13 16:30 | 414.3 | 41.6 | 17.8 | 41.8 | 21.4 |
| 16-01-14 15:00 | 440.6 | 40.4 | 19.6 | 42.1 | 24.1 |
| 03-01-15 15:00 | 381.3 | 38.0 | 19.6 | 38.4 | 21.7 |
| 13-01-16 15:30 | 410.9 | 41.2 | 14.7 | 43.0 | 21.1 |
| 08-02-17 17:30 | 393.7 | 34.9 | 17.4 | 36.1 | 21.8 |
| 18-01-18 17:30 | 427.8 | 37.1 | 13.6 | 40.1 | 22.0 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.

*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

# HOTS66

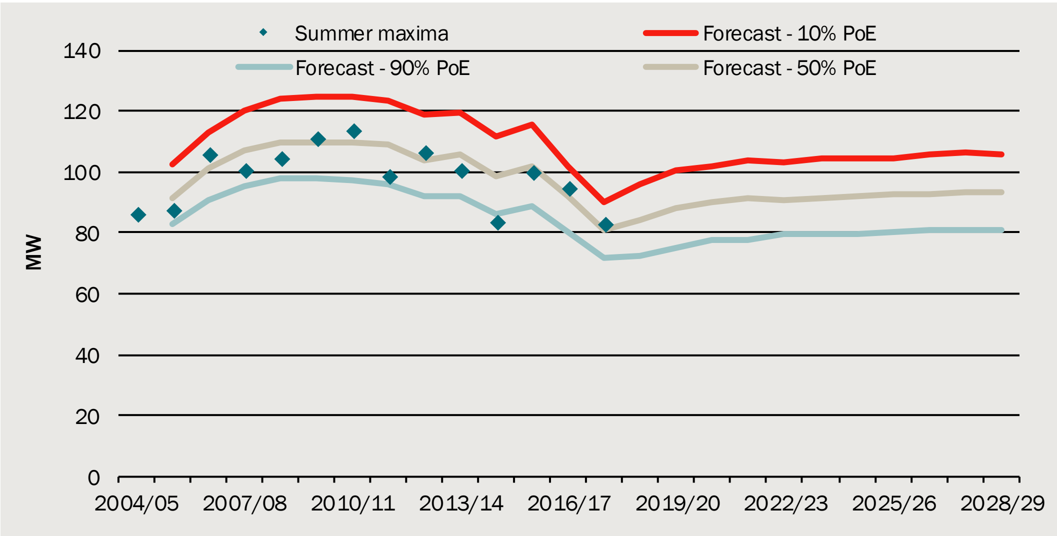
## 3.94 HOTS66 annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

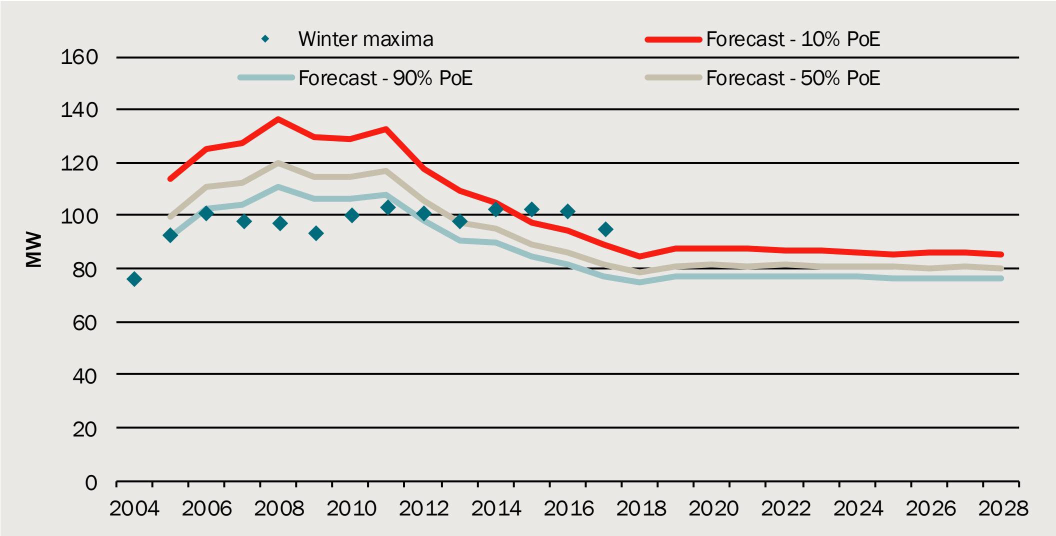
## 3.95 HOTS66 summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.96 HOTS66 winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.97 HOTS66 maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 72.5 | 75.1 | 77.7 | 78.0 | 79.6 | 79.5 | 79.5 | 80.1 | 81.0 | 81.0 | 81.2 |
| 50% PoE | 83.9 | 88.0 | 89.8 | 91.4 | 90.9 | 91.4 | 91.8 | 92.5 | 93.0 | 93.3 | 93.6 |
| 10% PoE | 96.3 | 100.6 | 102.2 | 103.6 | 103.5 | 104.3 | 104.2 | 104.8 | 105.9 | 106.5 | 105.9 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 74.7 | 77.0 | 77.3 | 77.4 | 77.2 | 77.1 | 76.7 | 76.5 | 76.4 | 76.3 | 76.0 |
| 50% PoE | 78.6 | 80.8 | 81.2 | 81.2 | 81.3 | 81.1 | 80.9 | 80.5 | 80.5 | 80.6 | 80.1 |
| 10% PoE | 84.6 | 87.4 | 87.3 | 87.4 | 86.6 | 86.7 | 86.3 | 85.5 | 86.1 | 86.1 | 85.4 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 77.7 | 80.4 | 80.9 | 81.4 | 82.6 | 82.2 | 81.9 | 82.0 | 82.8 | 82.8 | 82.8 |
| 50% PoE | 85.2 | 88.8 | 90.3 | 91.8 | 91.2 | 91.8 | 92.1 | 92.8 | 93.2 | 93.5 | 93.9 |
| 10% PoE | 96.6 | 101.0 | 102.6 | 104.0 | 104.2 | 104.5 | 104.4 | 105.1 | 105.9 | 106.5 | 105.9 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.98 HOTS66 maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 32.6 | 33.2 | 34.8 | 34.3 | 34.0 | 32.0 | 30.4 | 29.3 | 29.0 | 27.9 | 27.4 |
| 50% PoE | 43.5 | 45.5 | 46.4 | 47.2 | 44.8 | 43.5 | 42.2 | 41.2 | 40.4 | 39.7 | 39.2 |
| 10% PoE | 55.3 | 57.5 | 58.2 | 58.9 | 56.8 | 55.8 | 54.1 | 53.0 | 52.7 | 52.4 | 51.0 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 34.9 | 35.3 | 34.8 | 34.1 | 32.0 | 30.0 | 28.1 | 26.2 | 24.8 | 23.8 | 22.8 |
| 50% PoE | 38.7 | 39.0 | 38.6 | 37.8 | 36.0 | 34.0 | 32.1 | 30.1 | 28.8 | 27.9 | 26.8 |
| 10% PoE | 44.6 | 45.4 | 44.5 | 43.8 | 41.1 | 39.4 | 37.4 | 35.0 | 34.3 | 33.3 | 31.9 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 37.5 | 38.2 | 37.9 | 37.6 | 36.8 | 34.6 | 32.8 | 31.2 | 30.7 | 29.6 | 29.0 |
| 50% PoE | 44.7 | 46.3 | 46.9 | 47.5 | 45.0 | 43.8 | 42.5 | 41.5 | 40.6 | 39.8 | 39.6 |
| 10% PoE | 55.7 | 58.0 | 58.7 | 59.2 | 57.5 | 56.0 | 54.2 | 53.2 | 52.7 | 52.4 | 51.1 |

*Note:* All forecasts are in MW.
*Source:* Powercor terminal station data, The CIE.

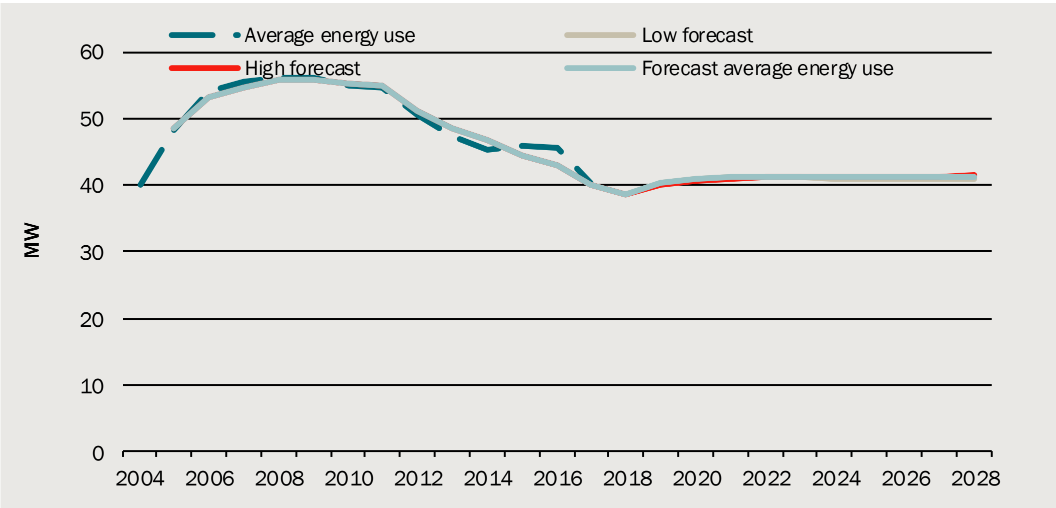
The average demand model was constraining the price elasticity to zero. When the model was estimated without restriction the income elasticity was very large, while constraining the income elasticity resulted in a positive price elasticity.

### 3.99 HOTS66 average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE constrained ECM | 0.0 |
| Income | AEMO constrained ECM | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

### 3.100 HOTS66 average demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

### 3.101 HOTS66 predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 103.9 | 110.7 | 113.1 | 98.6 | 106.0 | 100.1 | 82.9 | 99.5 | 94.1 | 82.8 |
| 90% PoE | 98.3 | 97.7 | 97.1 | 96.0 | 92.0 | 92.4 | 86.2 | 88.5 | 80.2 | 71.6 |
| 50% PoE | 110.0 | 110.0 | 109.6 | 109.0 | 104.2 | 106.0 | 98.4 | 101.6 | 91.8 | 80.7 |
| 10% PoE | 124.1 | 124.7 | 124.7 | 123.5 | 118.8 | 119.7 | 111.8 | 115.5 | 101.8 | 89.9 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 97.2 | 93.1 | 99.8 | 102.7 | 101.0 | 98.1 | 102.4 | 102.3 | 101.1 | 94.9 |
| 90% PoE | 111.0 | 106.1 | 106.7 | 107.9 | 98.1 | 90.9 | 89.9 | 84.3 | 81.6 | 77.4 |
| 50% PoE | 120.1 | 114.4 | 114.6 | 116.7 | 105.9 | 97.0 | 95.0 | 89.1 | 86.0 | 81.7 |
| 10% PoE | 136.1 | 129.7 | 128.7 | 133.0 | 117.3 | 109.3 | 104.6 | 97.5 | 94.3 | 89.0 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 103.9 | 110.7 | 113.1 | 102.7 | 106.0 | 100.1 | 102.4 | 102.3 | 101.1 | 94.9 |
| 90% PoE | 112.6 | 109.1 | 109.1 | 110.2 | 101.2 | 97.1 | 93.3 | 91.2 | 85.2 | 79.2 |
| 50% PoE | 122.0 | 117.9 | 117.8 | 118.9 | 109.7 | 107.8 | 101.2 | 102.4 | 93.0 | 84.2 |
| 10% PoE | 136.8 | 132.6 | 133.1 | 135.4 | 124.2 | 120.8 | 114.0 | 116.3 | 103.8 | 93.8 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.102 HOTS66 average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.381 |
| Winter | 0.229 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

### 3.103 HOTS66 details of actual maxima

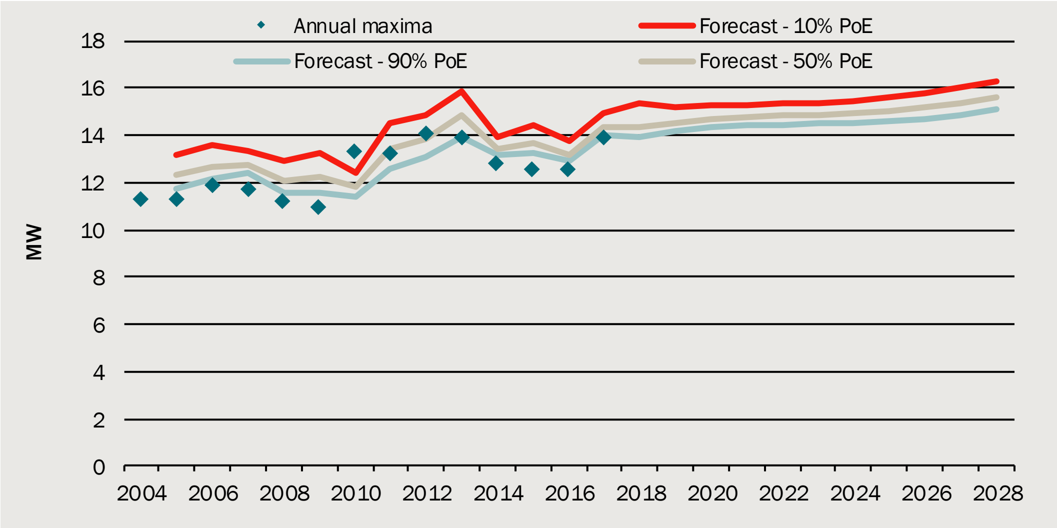
| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 19-08-04 1:00 | 64.1 | 1.5 | -1.9 | 14.0 | 10.9 |
| 22-06-05 8:30 | 64.4 | 3.3 | 1.3 | 10.3 | 8.9 |
| 11-08-06 1:00 | 75.6 | 3.4 | -2.3 | 14.1 | 8.2 |
| 10-07-07 8:30 | 69.8 | 1.0 | -0.5 | 12.3 | 6.9 |
| 25-08-08 9:00 | 73.0 | 5.3 | -0.5 | 12.9 | 6.8 |
| 12-08-09 9:00 | 70.6 | 5.8 | 2.6 | 15.4 | 9.0 |
| 21-07-10 10:00 | 71.3 | 6.8 | 1.2 | 13.8 | 7.2 |
| 07-06-11 9:30 | 70.2 | 9.7 | 2.9 | 12.4 | 7.8 |
| 06-07-12 23:00 | 73.4 | 0.9 | -1.3 | 12.5 | 7.2 |
| 25-06-13 23:00 | 79.3 | 3.7 | 0.9 | 14.7 | 9.2 |
| 22-07-14 23:30 | 72.8 | -1.0 | -1.3 | 12.1 | 6.7 |
| 14-07-15 23:30 | 83.6 | 1.3 | 1.3 | 9.8 | 8.2 |
| 05-08-16 23:30 | 67.1 | 4.7 | 1.1 | 12.6 | 8.4 |
| 30-06-17 23:30 | 65.6 | -0.1 | -0.1 | 11.7 | 8.2 |
| **Summer** | | | | | |
| 05-02-04 15:30 | 59.3 | 36.1 | 9.8 | 36.9 | 23.5 |
| 25-01-05 14:00 | 66.3 | 35.7 | 18.9 | 36.9 | 23.8 |
| 03-03-06 15:00 | 64.3 | 34.4 | 13.5 | 34.9 | 21.1 |
| 21-02-07 14:30 | 79.8 | 32.6 | 15.4 | 34.6 | 23.9 |
| 17-03-08 15:00 | 80.4 | 39.0 | 19.6 | 39.0 | 26.6 |
| 29-01-09 15:00 | 90.9 | 41.9 | 27.4 | 43.8 | 30.2 |
| 11-01-10 14:30 | 86.2 | 32.4 | 21.3 | 42.0 | 24.7 |
| 04-02-11 13:00 | 88.4 | 33.3 | 22.2 | 33.8 | 25.9 |
| 24-01-12 15:30 | 77.2 | 35.8 | 14.2 | 36.5 | 25.4 |
| 29-11-12 15:30 | 78.4 | 40.4 | 20.5 | 41.5 | 23.3 |
| 16-01-14 16:00 | 93.8 | 42.9 | 24.9 | 42.9 | 25.3 |
| 07-01-15 14:30 | 79.5 | 34.6 | 20.2 | 38.1 | 25.5 |
| 23-02-16 15:30 | 69.7 | 38.5 | 19.4 | 40.3 | 22.2 |
| 10-02-17 17:30 | 71.0 | 38.9 | 17.9 | 39.8 | 24.8 |
| 28-01-18 18:00 | 77.4 | 40.3 | 22.8 | 41.5 | 25.5 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.

*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

# KGTS22

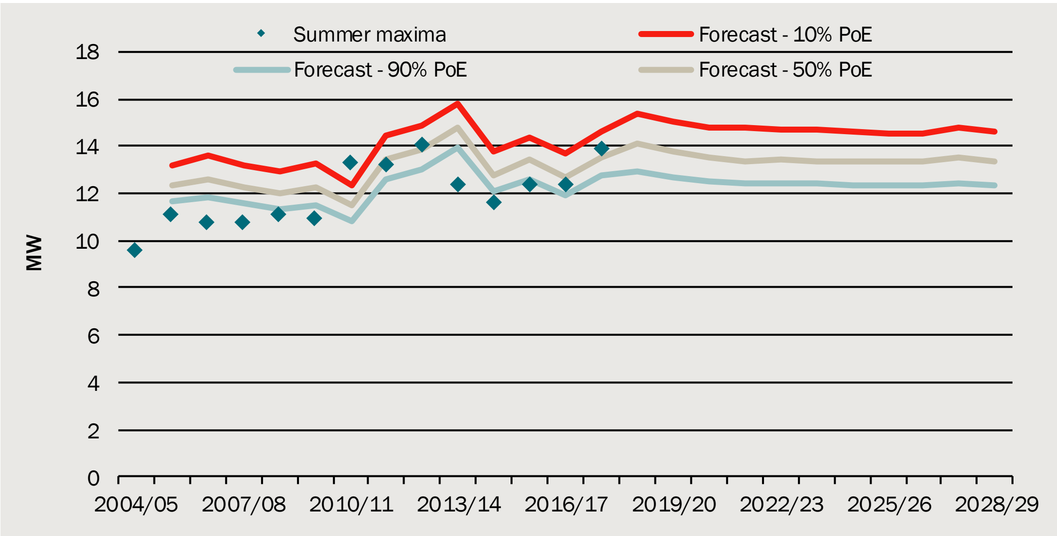
### 3.104 KGTS22 annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

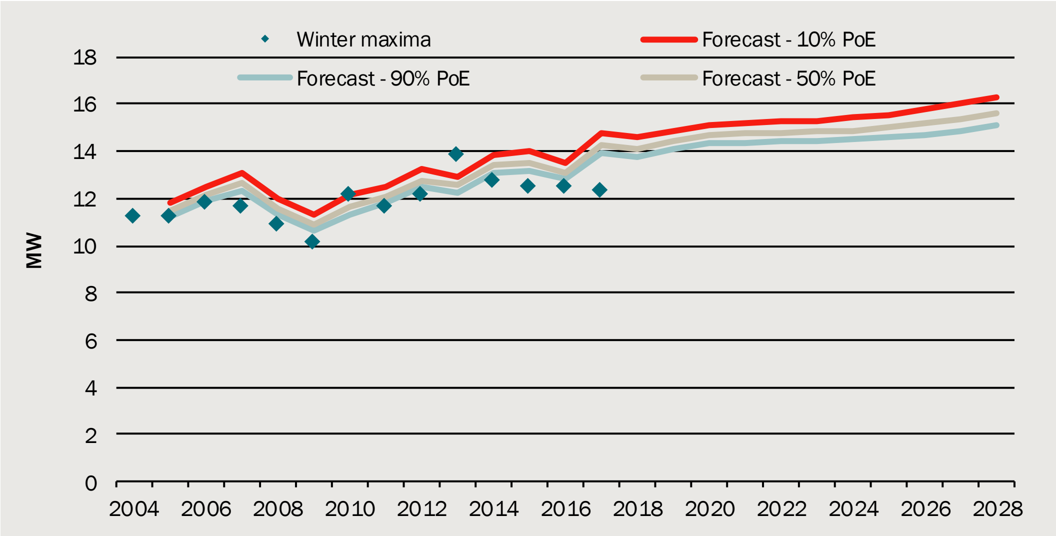
### 3.105 KGTS22 summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.106 KGTS22 winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.107 KGTS22 maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 12.9 | 12.7 | 12.5 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.5 | 12.4 |
| 50% PoE | 14.1 | 13.8 | 13.6 | 13.4 | 13.4 | 13.4 | 13.4 | 13.3 | 13.4 | 13.5 | 13.4 |
| 10% PoE | 15.4 | 15.0 | 14.8 | 14.8 | 14.7 | 14.7 | 14.6 | 14.5 | 14.5 | 14.8 | 14.6 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 13.8 | 14.1 | 14.3 | 14.4 | 14.4 | 14.5 | 14.5 | 14.6 | 14.7 | 14.8 | 15.1 |
| 50% PoE | 14.1 | 14.4 | 14.6 | 14.7 | 14.8 | 14.8 | 14.9 | 15.0 | 15.2 | 15.3 | 15.6 |
| 10% PoE | 14.6 | 14.9 | 15.1 | 15.2 | 15.3 | 15.3 | 15.4 | 15.5 | 15.8 | 16.0 | 16.3 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 13.9 | 14.2 | 14.3 | 14.4 | 14.4 | 14.5 | 14.5 | 14.6 | 14.7 | 14.8 | 15.1 |
| 50% PoE | 14.4 | 14.5 | 14.7 | 14.8 | 14.8 | 14.9 | 14.9 | 15.0 | 15.2 | 15.4 | 15.6 |
| 10% PoE | 15.4 | 15.2 | 15.3 | 15.3 | 15.4 | 15.4 | 15.5 | 15.6 | 15.8 | 16.0 | 16.3 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.108 KGTS22 maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 9.6 | 9.3 | 9.1 | 8.9 | 8.9 | 8.8 | 8.7 | 8.7 | 8.6 | 8.7 | 8.5 |
| 50% PoE | 10.8 | 10.4 | 10.1 | 9.9 | 9.9 | 9.8 | 9.7 | 9.6 | 9.6 | 9.7 | 9.6 |
| 10% PoE | 12.0 | 11.7 | 11.4 | 11.3 | 11.2 | 11.1 | 11.0 | 10.8 | 10.8 | 11.0 | 10.8 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 10.4 | 10.7 | 10.9 | 10.9 | 10.9 | 10.9 | 10.8 | 10.9 | 11.0 | 11.0 | 11.3 |
| 50% PoE | 10.8 | 11.1 | 11.2 | 11.3 | 11.3 | 11.2 | 11.2 | 11.3 | 11.4 | 11.6 | 11.8 |
| 10% PoE | 11.2 | 11.5 | 11.7 | 11.7 | 11.8 | 11.7 | 11.8 | 11.8 | 12.0 | 12.3 | 12.5 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 10.6 | 10.8 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 11.0 | 11.1 | 11.3 |
| 50% PoE | 11.0 | 11.2 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.4 | 11.6 | 11.8 |
| 10% PoE | 12.0 | 11.8 | 11.9 | 11.8 | 11.8 | 11.8 | 11.8 | 11.9 | 12.1 | 12.3 | 12.5 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

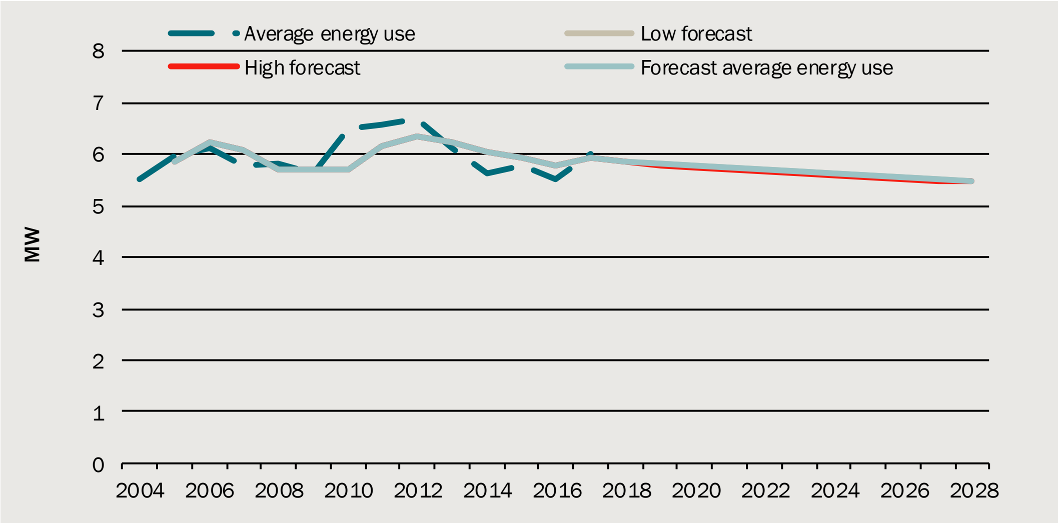
Both the CIE model and the fixed income elasticity parameter model resulted in a positive price elasticity, which is inconsistent with economic theory. The price elasticity was therefore set to zero.

### 3.109 KGTS22 average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE constrained ECM | 0.0 |
| Income | AEMO constrained ECM | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

### 3.110 KGTS22 average demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.111 KGTS22 predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 11.2 | 10.9 | 13.3 | 13.2 | 14.0 | 12.4 | 11.7 | 12.4 | 12.4 | 13.9 |
| 90% PoE | 11.3 | 11.5 | 10.9 | 12.6 | 13.0 | 13.9 | 12.1 | 12.6 | 11.9 | 12.8 |
| 50% PoE | 12.0 | 12.3 | 11.5 | 13.4 | 13.9 | 14.8 | 12.8 | 13.4 | 12.7 | 13.5 |
| 10% PoE | 12.9 | 13.2 | 12.3 | 14.5 | 14.9 | 15.8 | 13.7 | 14.4 | 13.7 | 14.6 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 10.9 | 10.2 | 12.2 | 11.7 | 12.2 | 13.9 | 12.8 | 12.6 | 12.6 | 12.4 |
| 90% PoE | 11.3 | 10.6 | 11.3 | 11.8 | 12.5 | 12.2 | 13.1 | 13.2 | 12.8 | 14.0 |
| 50% PoE | 11.6 | 10.9 | 11.7 | 12.1 | 12.7 | 12.5 | 13.4 | 13.5 | 13.1 | 14.3 |
| 10% PoE | 12.0 | 11.3 | 12.1 | 12.5 | 13.2 | 12.9 | 13.8 | 14.0 | 13.5 | 14.8 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 11.2 | 10.9 | 13.3 | 13.2 | 14.0 | 13.9 | 12.8 | 12.6 | 12.6 | 13.9 |
| 90% PoE | 11.6 | 11.5 | 11.4 | 12.6 | 13.1 | 13.9 | 13.1 | 13.3 | 12.9 | 14.0 |
| 50% PoE | 12.1 | 12.3 | 11.8 | 13.4 | 13.9 | 14.8 | 13.5 | 13.7 | 13.2 | 14.3 |
| 10% PoE | 12.9 | 13.2 | 12.4 | 14.5 | 14.9 | 15.8 | 14.0 | 14.4 | 13.8 | 14.9 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.112 KGTS22 average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.700 |
| Winter | 0.683 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

### 3.113 KGTS22 details of actual maxima

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 21-07-04 1:00 | 11.3 | 2.0 | -0.8 | 13.6 | 7.1 |
| 11-08-05 0:30 | 11.2 | 1.4 | -0.5 | 11.8 | 8.0 |
| 27-06-06 1:00 | 11.9 | 2.8 | -0.4 | 15.5 | 9.0 |
| 18-07-07 1:00 | 11.7 | 1.1 | -1.5 | 9.4 | 4.4 |
| 23-08-08 1:00 | 10.9 | 2.6 | 0.8 | 14.3 | 8.4 |
| 12-06-09 23:00 | 10.2 | 8.0 | 1.5 | 11.0 | 8.0 |
| 02-07-10 23:00 | 12.2 | 3.3 | -0.4 | 11.2 | 6.5 |
| 10-06-11 23:00 | 11.7 | 7.0 | 5.6 | 15.5 | 9.0 |
| 06-07-12 23:00 | 12.2 | 0.5 | -2.3 | 14.0 | 7.2 |
| 19-08-13 23:30 | 13.9 | 2.8 | 2.4 | 12.2 | 10.3 |

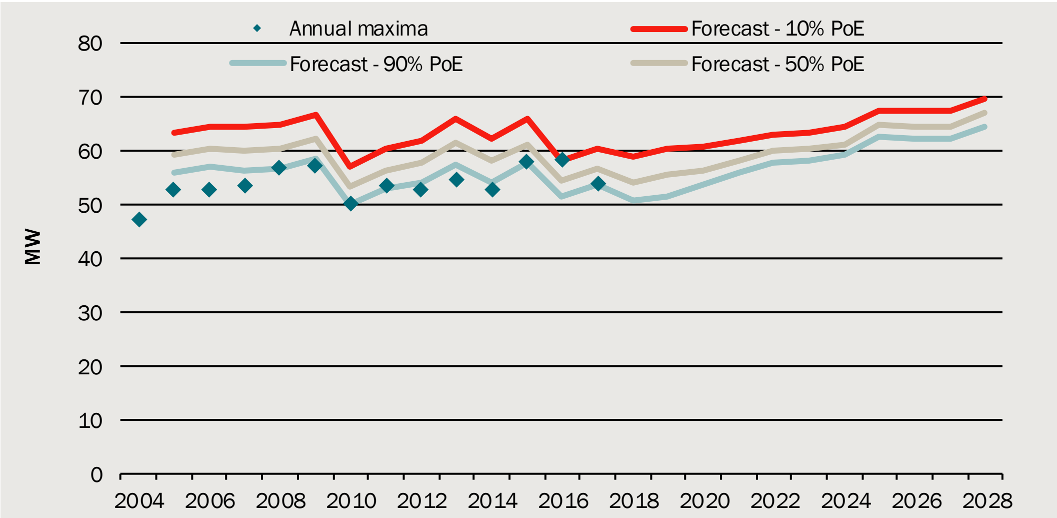
| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| 22-07-14 23:30 | 12.8 | -0.6 | -1.0 | 9.7 | 7.3 |
| 28-07-15 23:30 | 12.6 | 5.1 | 2.1 | 12.7 | 8.2 |
| 24-06-16 23:30 | 12.6 | 3.2 | 3.2 | 10.1 | 7.6 |
| 30-06-17 23:30 | 12.4 | -0.7 | -0.7 | 12.5 | 8.2 |
| **Summer** | | | | | |
| 14-02-04 22:30 | 10.5 | 36.6 | 20.9 | 45.3 | 29.5 |
| 23-12-04 23:00 | 9.6 | 29.7 | 15.7 | 39.3 | 20.9 |
| 31-12-05 22:30 | 11.1 | 33.4 | 23.5 | 44.7 | 24.2 |
| 16-01-07 23:00 | 10.8 | 31.5 | 22.3 | 41.5 | 26.9 |
| 31-12-07 23:00 | 10.8 | 30.8 | 22.6 | 40.8 | 24.4 |
| 29-01-09 15:30 | 11.2 | 42.1 | 30.1 | 43.0 | 32.8 |
| 11-01-10 15:30 | 10.9 | 41.8 | 23.8 | 43.0 | 27.2 |
| 31-12-10 16:00 | 13.3 | 41.0 | 22.0 | 41.0 | 22.0 |
| 02-01-12 16:30 | 13.2 | 39.6 | 22.4 | 40.0 | 26.0 |
| 07-01-13 17:00 | 14.0 | 42.4 | 18.1 | 43.3 | 28.5 |
| 15-01-14 17:00 | 12.4 | 44.0 | 25.8 | 44.2 | 29.6 |
| 03-01-15 17:30 | 11.7 | 41.5 | 23.8 | 42.3 | 28.4 |
| 13-01-16 16:30 | 12.4 | 42.3 | 26.5 | 44.4 | 27.4 |
| 09-02-17 18:00 | 12.4 | 43.9 | 26.6 | 45.1 | 28.9 |
| 29-01-18 16:00 | 13.9 | 34.7 | 23.4 | 39.3 | 22.9 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.

*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

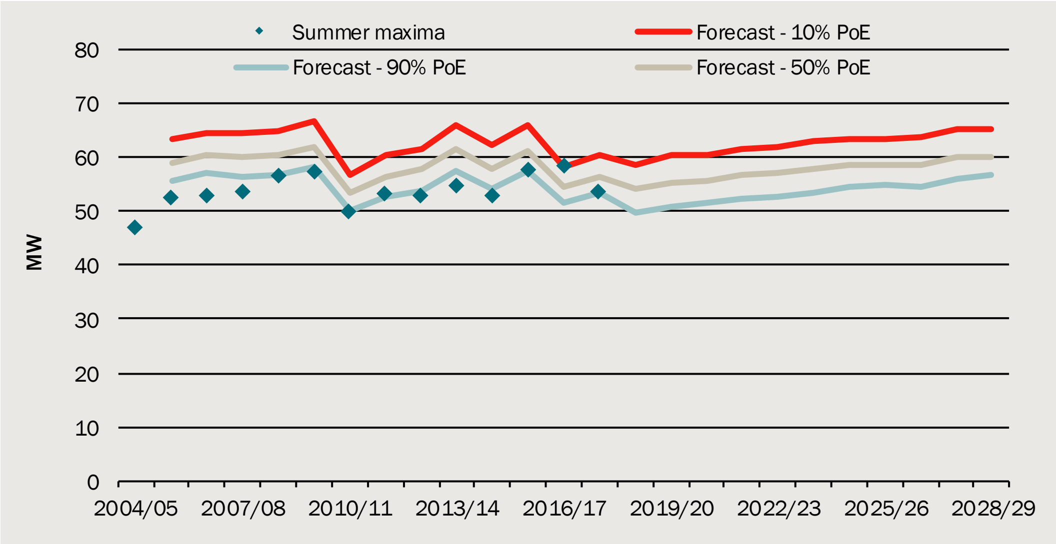
## *KGTS66*

### 3.114 KGTS66 annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

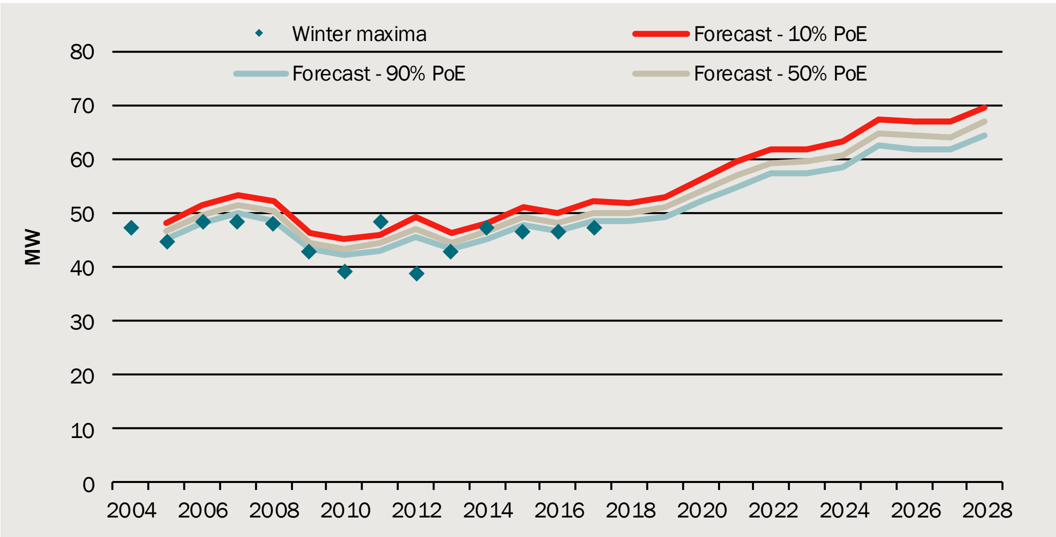
### 3.115 KGTS66 summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.116 KGTS66 winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.117 KGTS66 maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 49.7 | 50.8 | 51.5 | 52.3 | 52.5 | 53.4 | 54.4 | 54.8 | 54.7 | 56.1 | 56.8 |
| 50% PoE | 54.1 | 55.5 | 55.8 | 56.8 | 57.1 | 57.9 | 58.5 | 58.6 | 58.5 | 59.9 | 60.3 |
| 10% PoE | 58.7 | 60.4 | 60.6 | 61.6 | 62.0 | 62.9 | 63.4 | 63.6 | 63.6 | 65.1 | 65.2 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 48.7 | 49.5 | 52.2 | 55.0 | 57.4 | 57.5 | 58.5 | 62.5 | 62.0 | 61.8 | 64.3 |
| 50% PoE | 50.2 | 51.1 | 54.2 | 56.9 | 59.3 | 59.6 | 60.6 | 64.8 | 64.3 | 64.1 | 66.9 |
| 10% PoE | 52.0 | 52.9 | 56.4 | 59.5 | 62.0 | 62.0 | 63.5 | 67.4 | 67.2 | 67.1 | 69.6 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 50.6 | 51.7 | 53.7 | 55.9 | 57.8 | 58.1 | 59.1 | 62.6 | 62.2 | 62.1 | 64.4 |
| 50% PoE | 54.1 | 55.5 | 56.2 | 58.2 | 60.0 | 60.3 | 61.3 | 64.9 | 64.6 | 64.4 | 67.0 |
| 10% PoE | 58.7 | 60.4 | 60.6 | 61.9 | 63.0 | 63.5 | 64.4 | 67.6 | 67.4 | 67.4 | 69.7 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.118 KGTS66 maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 38.9 | 39.1 | 39.5 | 39.9 | 39.4 | 39.5 | 39.9 | 39.6 | 39.0 | 39.9 | 40.2 |
| 50% PoE | 43.3 | 43.7 | 43.7 | 44.3 | 43.9 | 44.0 | 44.0 | 43.4 | 42.7 | 43.7 | 43.6 |
| 10% PoE | 47.9 | 48.7 | 48.5 | 49.2 | 48.8 | 49.0 | 48.9 | 48.4 | 47.9 | 48.9 | 48.6 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 37.9 | 37.8 | 40.2 | 42.5 | 44.2 | 43.6 | 44.0 | 47.3 | 46.2 | 45.5 | 47.7 |
| 50% PoE | 39.4 | 39.3 | 42.1 | 44.5 | 46.1 | 45.8 | 46.1 | 49.6 | 48.6 | 47.9 | 50.2 |
| 10% PoE | 41.2 | 41.2 | 44.3 | 47.1 | 48.8 | 48.1 | 49.0 | 52.2 | 51.5 | 50.9 | 53.0 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 39.8 | 39.9 | 41.6 | 43.5 | 44.7 | 44.2 | 44.6 | 47.4 | 46.4 | 45.9 | 47.8 |
| 50% PoE | 43.3 | 43.7 | 44.1 | 45.7 | 46.9 | 46.5 | 46.8 | 49.7 | 48.8 | 48.2 | 50.4 |
| 10% PoE | 47.9 | 48.7 | 48.5 | 49.4 | 49.8 | 49.6 | 49.9 | 52.4 | 51.6 | 51.2 | 53.1 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

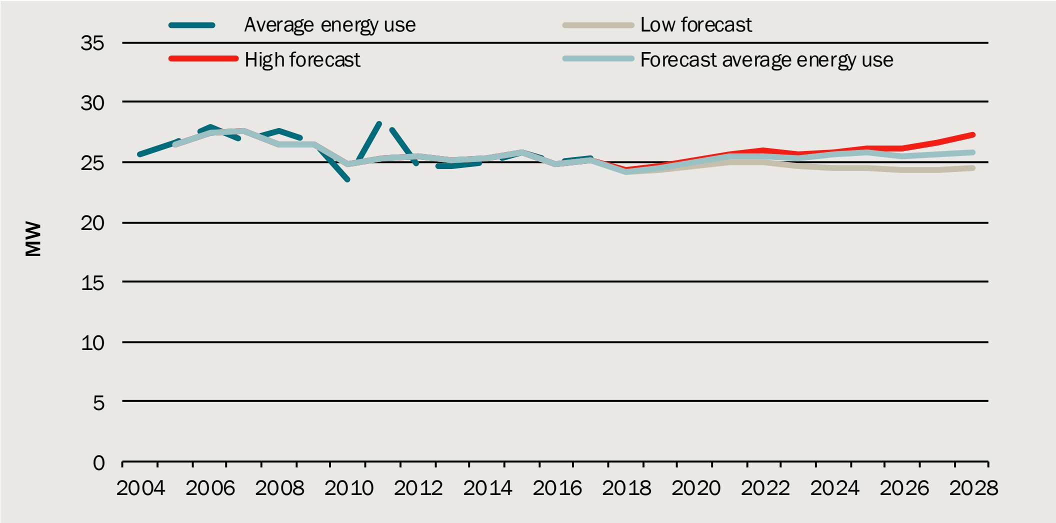
The average demand model was estimated using the long run relationship only, as the coefficient on the error correction term was less than -1.

### 3.119 KGTS66 average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate long run model only | -0.1789 |
| Income | The CIE estimate long run model only | 0.5247 |

*Source:* Powercor terminal station data, The CIE.

## 3.120 KGTS66 average demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

## 3.121 KGTS66 predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 56.7 | 57.2 | 50.1 | 53.3 | 52.8 | 54.6 | 52.8 | 57.9 | 58.3 | 53.7 |
| 90% PoE | 56.6 | 58.4 | 50.0 | 52.8 | 53.9 | 57.5 | 54.2 | 57.7 | 51.6 | 53.5 |
| 50% PoE | 60.4 | 62.1 | 53.3 | 56.4 | 57.7 | 61.5 | 58.0 | 61.2 | 54.6 | 56.6 |
| 10% PoE | 64.9 | 66.6 | 56.9 | 60.6 | 61.7 | 66.0 | 62.2 | 65.9 | 58.2 | 60.4 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 47.9 | 43.0 | 39.0 | 48.4 | 38.7 | 42.7 | 47.3 | 46.6 | 46.6 | 47.1 |
| 90% PoE | 48.7 | 43.2 | 42.1 | 43.2 | 45.8 | 43.3 | 45.3 | 47.7 | 46.8 | 48.5 |
| 50% PoE | 50.3 | 44.6 | 43.5 | 44.4 | 47.2 | 44.6 | 46.6 | 49.2 | 48.1 | 50.1 |
| 10% PoE | 52.3 | 46.3 | 45.2 | 46.0 | 49.1 | 46.2 | 48.3 | 51.2 | 50.0 | 52.2 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 56.7 | 57.2 | 50.1 | 53.3 | 52.8 | 54.6 | 52.8 | 57.9 | 58.3 | 53.7 |
| 90% PoE | 56.6 | 58.4 | 50.0 | 52.8 | 53.9 | 57.5 | 54.2 | 57.7 | 51.6 | 53.5 |
| 50% PoE | 60.4 | 62.1 | 53.3 | 56.4 | 57.7 | 61.5 | 58.0 | 61.2 | 54.6 | 56.6 |
| 10% PoE | 64.9 | 66.6 | 56.9 | 60.6 | 61.7 | 66.0 | 62.2 | 65.9 | 58.2 | 60.4 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

## 3.122 KGTS66 average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.691 |
| Winter | 0.738 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

### 3.123 KGTS66 details of actual maxima

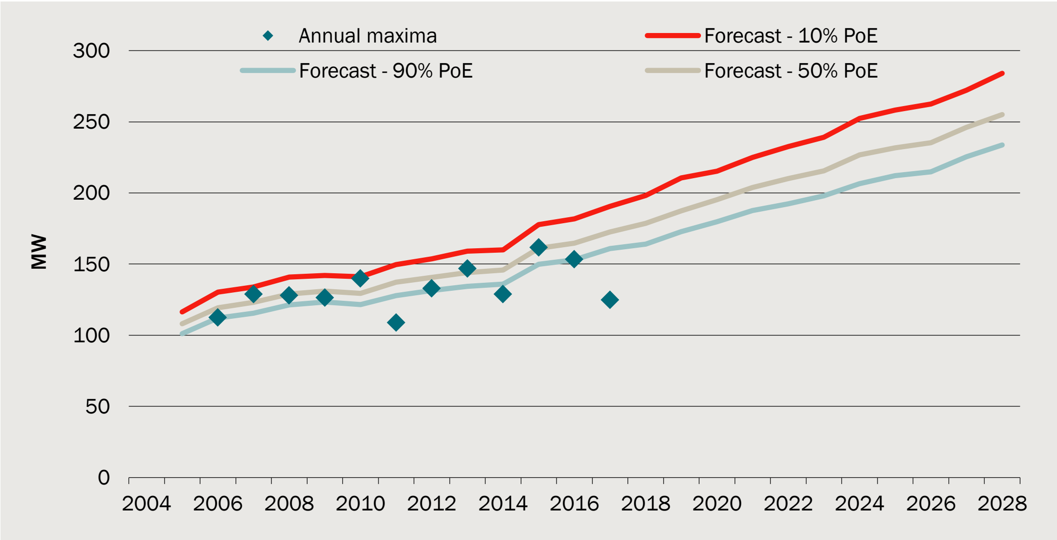
| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 21-07-04 1:00 | 47.3 | 2.0 | -0.8 | 13.6 | 7.1 |
| 03-06-05 1:00 | 44.8 | 1.1 | -1.2 | 16.8 | 8.8 |
| 15-06-06 1:00 | 48.2 | -1.4 | -4.0 | 14.2 | 6.4 |
| 18-07-07 1:00 | 48.5 | 1.1 | -1.5 | 9.4 | 4.4 |
| 23-08-08 1:00 | 47.9 | 2.6 | 0.8 | 14.3 | 8.4 |
| 11-06-09 1:00 | 43.0 | 3.1 | -0.1 | 11.0 | 8.0 |
| 07-07-10 1:00 | 39.0 | 1.3 | -0.4 | 15.0 | 6.5 |
| 15-07-11 1:00 | 48.4 | 3.4 | -0.4 | 13.7 | 7.8 |
| 05-07-12 23:00 | 38.7 | 1.3 | 0.8 | 13.2 | 7.2 |
| 20-08-13 0:00 | 42.7 | 2.8 | 0.2 | 13.1 | 10.3 |
| 01-08-14 23:30 | 47.3 | 2.4 | 2.4 | 11.5 | 8.1 |
| 15-07-15 23:30 | 46.6 | 4.7 | 1.5 | 9.0 | 8.9 |
| 24-06-16 23:30 | 46.6 | 3.2 | 3.2 | 10.1 | 7.6 |
| 30-06-17 23:30 | 47.1 | -0.7 | -0.7 | 12.5 | 8.2 |
| **Summer** | | | | | |
| 14-02-04 16:00 | 47.1 | 44.8 | 20.9 | 45.3 | 29.5 |
| 11-01-05 15:00 | 47.1 | 39.8 | 20.7 | 40.6 | 24.7 |
| 10-01-06 15:30 | 52.6 | 41.0 | 20.0 | 43.2 | 26.5 |
| 05-02-07 15:30 | 52.9 | 41.3 | 18.5 | 41.6 | 22.8 |
| 10-01-08 15:30 | 53.4 | 40.7 | 16.0 | 40.7 | 25.4 |
| 28-01-09 15:30 | 56.7 | 42.3 | 23.3 | 43.1 | 26.6 |
| 11-01-10 15:30 | 57.2 | 41.8 | 23.8 | 43.0 | 27.2 |
| 01-02-11 15:30 | 50.1 | 40.3 | 21.6 | 40.4 | 28.6 |
| 24-12-11 15:30 | 53.3 | 35.6 | 18.7 | 36.9 | 24.2 |
| 07-01-13 16:30 | 52.8 | 42.7 | 18.1 | 43.3 | 28.5 |
| 30-01-14 16:00 | 54.6 | 41.5 | 18.3 | 41.7 | 30.4 |
| 07-01-15 16:00 | 52.8 | 39.5 | 21.9 | 40.0 | 28.4 |
| 13-01-16 16:30 | 57.9 | 42.3 | 26.5 | 44.4 | 27.4 |
| 09-02-17 16:00 | 58.3 | 45.0 | 26.6 | 45.1 | 28.9 |
| 08-02-18 15:30 | 53.7 | 40.1 | 20.0 | 42.2 | 27.2 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.
*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

## KTS East

The summer and annual models appear to slightly overestimate peak demand, while the winter model performs well.

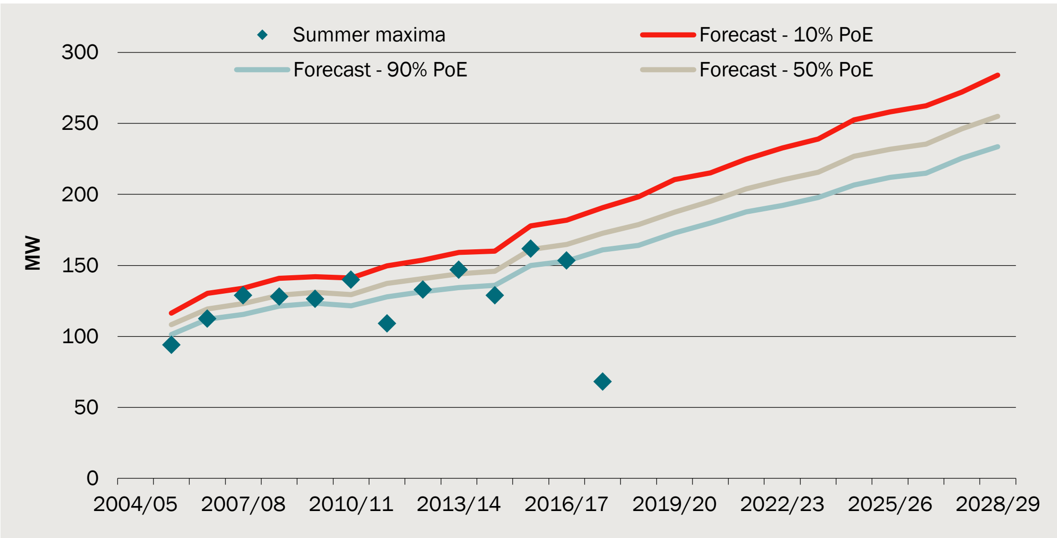
### 3.124 KTS East annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

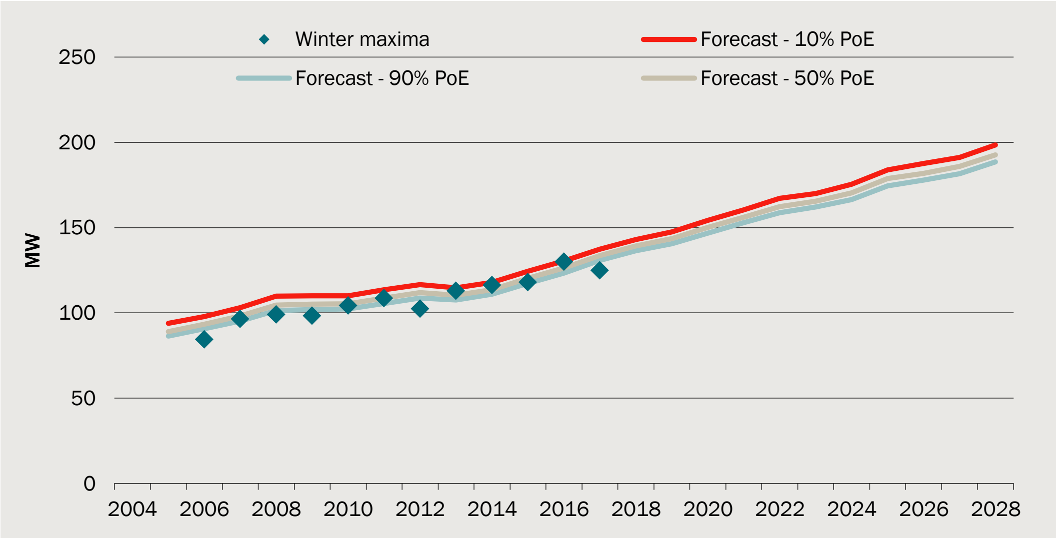
### 3.125 KTS East summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.126 KTS East winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.127 KTS East maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 164.0 | 172.9 | 179.8 | 187.7 | 192.3 | 197.9 | 206.6 | 212.1 | 214.8 | 225.5 | 233.6 |
| 50% PoE | 178.6 | 187.4 | 195.2 | 203.9 | 210.2 | 215.5 | 226.7 | 231.8 | 235.4 | 246.2 | 255.1 |
| 10% PoE | 198.3 | 210.5 | 215.3 | 224.9 | 232.7 | 239.1 | 252.4 | 258.2 | 262.4 | 272.1 | 284.0 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 136.4 | 140.6 | 146.7 | 153.0 | 158.8 | 162.0 | 166.5 | 174.5 | 177.9 | 181.7 | 188.5 |
| 50% PoE | 139.3 | 143.5 | 150.1 | 156.1 | 162.3 | 165.5 | 170.3 | 178.8 | 181.7 | 185.8 | 192.8 |
| 10% PoE | 143.0 | 147.4 | 154.3 | 160.5 | 167.2 | 170.0 | 175.4 | 183.9 | 187.5 | 191.2 | 198.5 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 164.0 | 172.9 | 179.8 | 187.7 | 192.3 | 197.9 | 206.6 | 212.1 | 214.8 | 225.5 | 233.6 |
| 50% PoE | 178.6 | 187.4 | 195.2 | 203.9 | 210.2 | 215.5 | 226.7 | 231.8 | 235.4 | 246.2 | 255.1 |
| 10% PoE | 198.3 | 210.5 | 215.3 | 224.9 | 232.7 | 239.1 | 252.4 | 258.2 | 262.4 | 272.1 | 284.0 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.128 KTS East maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 167.2 | 171.6 | 177.6 | 184.6 | 188.3 | 193.2 | 201.0 | 204.7 | 206.0 | 215.3 | 221.6 |
| 50% PoE | 181.8 | 186.1 | 193.0 | 200.7 | 206.3 | 210.8 | 221.1 | 224.3 | 226.6 | 236.0 | 243.0 |
| 10% PoE | 201.4 | 209.3 | 213.1 | 221.8 | 228.7 | 234.3 | 246.8 | 250.7 | 253.6 | 262.0 | 272.0 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 139.8 | 139.6 | 145.0 | 150.4 | 155.6 | 158.2 | 162.1 | 168.4 | 170.6 | 173.3 | 178.5 |
| 50% PoE | 142.6 | 142.6 | 148.4 | 153.6 | 159.2 | 161.7 | 165.9 | 172.6 | 174.5 | 177.4 | 182.8 |
| 10% PoE | 146.3 | 146.5 | 152.6 | 157.9 | 164.0 | 166.2 | 171.0 | 177.8 | 180.3 | 182.8 | 188.5 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 167.2 | 171.6 | 177.6 | 184.6 | 188.3 | 193.2 | 201.0 | 204.7 | 206.0 | 215.3 | 221.6 |
| 50% PoE | 181.8 | 186.1 | 193.0 | 200.7 | 206.3 | 210.8 | 221.1 | 224.3 | 226.6 | 236.0 | 243.0 |
| 10% PoE | 201.4 | 209.3 | 213.1 | 221.8 | 228.7 | 234.3 | 246.8 | 250.7 | 253.6 | 262.0 | 272.0 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

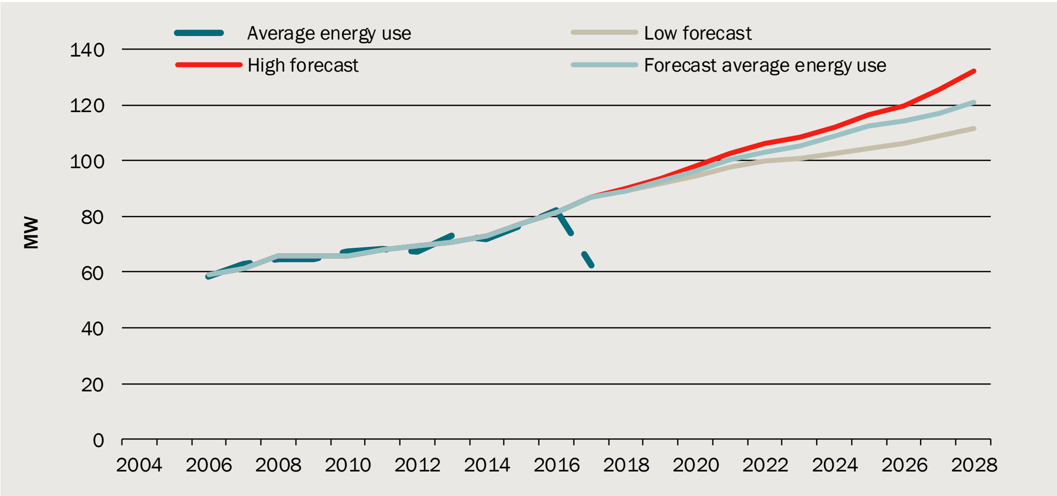
The average demand model was estimated using the long run relationship only, as the coefficient on the error correction term was less than -1.

### 3.129 KTS East average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate long run model only | -0.1729 |
| Income | The CIE estimate long run model only | 0.4806 |

*Source:* Powercor terminal station data, The CIE.

### 3.130 KTS East average demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.131 KTS East predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 127.9 | 126.3 | 139.9 | 109.0 | 132.9 | 146.9 | 128.9 | 161.8 | 153.3 | 68.2 |
| 90% PoE | 121.2 | 123.4 | 121.5 | 127.8 | 131.5 | 134.4 | 135.9 | 149.8 | 152.9 | 161.0 |
| 50% PoE | 129.0 | 131.1 | 129.4 | 137.4 | 140.8 | 144.1 | 145.8 | 161.1 | 164.8 | 172.7 |
| 10% PoE | 140.8 | 142.0 | 141.2 | 149.7 | 153.6 | 159.0 | 159.9 | 177.8 | 181.9 | 190.6 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 99.1 | 98.3 | 104.3 | 108.5 | 102.5 | 113.0 | 116.3 | 117.9 | 129.9 | 124.8 |
| 90% PoE | 101.4 | 101.9 | 102.4 | 105.5 | 108.7 | 107.5 | 110.9 | 117.3 | 123.3 | 130.7 |
| 50% PoE | 104.6 | 105.1 | 105.4 | 108.6 | 111.8 | 110.3 | 113.5 | 120.3 | 126.2 | 133.7 |
| 10% PoE | 109.8 | 109.9 | 110.0 | 113.5 | 116.6 | 114.7 | 117.9 | 124.5 | 130.4 | 137.3 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 127.9 | 126.3 | 139.9 | 109.0 | 132.9 | 146.9 | 128.9 | 161.8 | 153.3 | 124.8 |
| 90% PoE | 121.3 | 123.4 | 121.5 | 127.8 | 131.5 | 134.4 | 135.9 | 149.8 | 152.9 | 161.0 |
| 50% PoE | 129.0 | 131.1 | 129.4 | 137.4 | 140.8 | 144.1 | 145.8 | 161.1 | 164.8 | 172.7 |
| 10% PoE | 140.8 | 142.0 | 141.2 | 149.7 | 153.6 | 159.0 | 159.9 | 177.8 | 181.9 | 190.6 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.132 KTS East average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.834 |
| Winter | 0.921 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

### 3.133 KTS East details of actual maxima

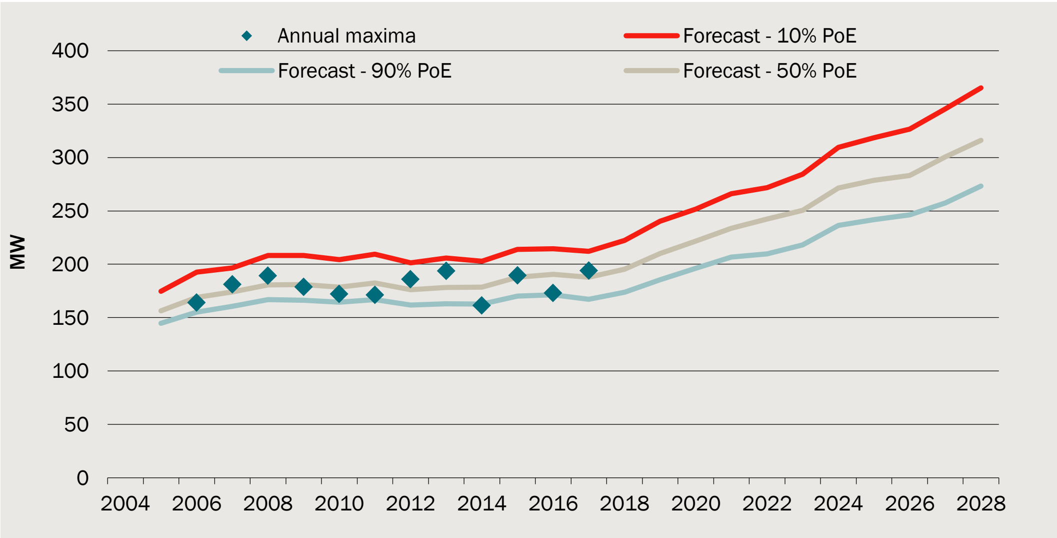
| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 21-07-06 9:00 | 84.3 | 4.9 | 0.5 | 14.9 | 8.3 |
| 17-07-07 13:00 | 96.3 | 5.5 | 3.1 | 8.5 | 7.0 |
| 21-08-08 13:00 | 99.1 | 7.4 | 4.6 | 9.5 | 8.2 |
| 10-06-09 9:00 | 98.3 | 5.9 | 4.5 | 9.3 | 9.6 |
| 10-08-10 11:00 | 104.3 | 6.6 | 3.8 | 9.1 | 8.3 |
| 08-06-11 9:00 | 108.5 | 6.0 | 4.2 | 10.3 | 9.0 |
| 08-08-12 13:00 | 102.5 | 8.2 | 7.3 | 9.2 | 9.3 |
| 24-06-13 10:00 | 113.0 | 5.3 | 1.1 | 11.0 | 7.5 |

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| 23-07-14 8:00 | 116.3 | 0.7 | -0.3 | 11.9 | 10.6 |
| 14-07-15 17:00 | 117.9 | 6.3 | 5.3 | 9.1 | 8.1 |
| 13-07-16 8:00 | 129.9 | 4.4 | 3.3 | 10.2 | 9.4 |
| 03-08-17 9:00 | 124.8 | 4.2 | 1.3 | 8.1 | 8.4 |
| **Summer** | | | | | |
| 24-02-06 16:00 | 94.0 | 34.9 | 18.4 | 35.2 | 21.3 |
| 16-01-07 15:30 | 112.4 | 39.6 | 16.2 | 40.1 | 23.8 |
| 17-03-08 15:30 | 128.9 | 37.7 | 19.7 | 38.8 | 24.5 |
| 29-01-09 12:00 | 127.9 | 41.3 | 27.6 | 43.6 | 27.1 |
| 11-01-10 15:30 | 126.3 | 42.0 | 15.6 | 42.0 | 23.1 |
| 01-02-11 13:00 | 139.9 | 38.9 | 16.9 | 38.9 | 23.6 |
| 18-11-11 14:30 | 109.0 | 33.3 | 18.9 | 33.3 | 18.3 |
| 12-03-13 15:30 | 132.9 | 35.4 | 24.4 | 35.7 | 19.0 |
| 16-01-14 14:00 | 146.9 | 42.0 | 23.7 | 42.3 | 25.5 |
| 22-01-15 15:30 | 128.9 | 34.0 | 17.0 | 35.5 | 18.6 |
| 23-02-16 15:00 | 161.8 | 39.9 | 18.8 | 40.0 | 21.8 |
| 09-02-17 12:30 | 153.3 | 34.1 | 18.5 | 35.3 | 22.6 |
| 19-12-17 15:00 | 68.2 | 38.0 | 15.3 | 38.0 | 20.7 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.
*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

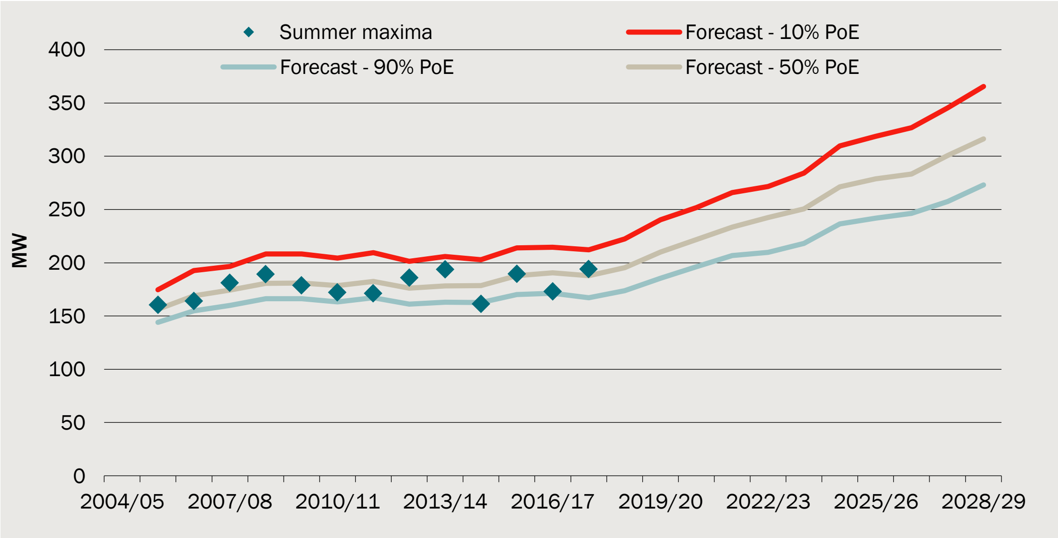
# *KTS West*

### 3.134 KTS West annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

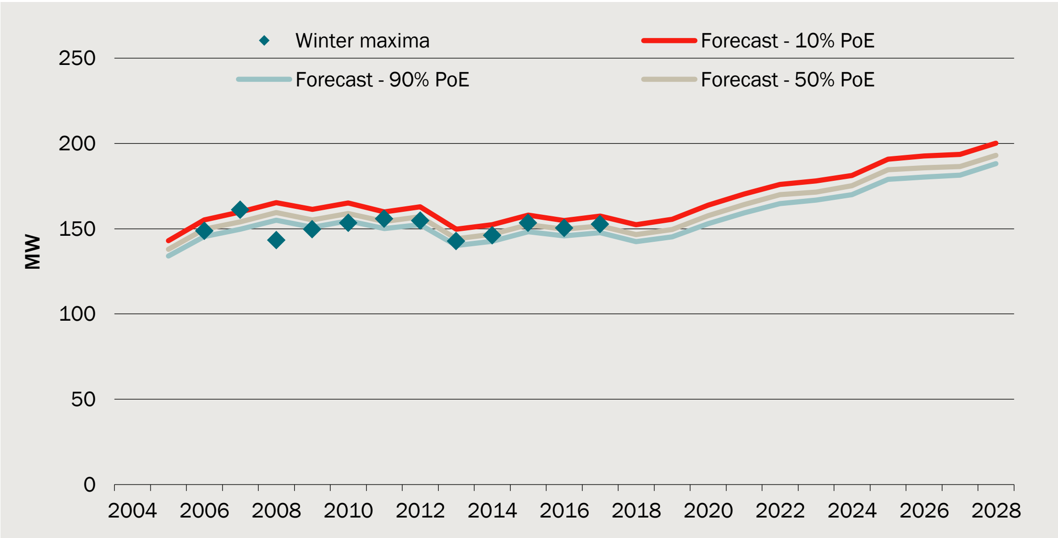
### 3.135 KTS West summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.136 KTS West winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.137 KTS West maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 173.6 | 185.6 | 196.4 | 206.6 | 209.7 | 218.1 | 236.4 | 241.7 | 246.2 | 257.4 | 273.2 |
| 50% PoE | 195.4 | 210.0 | 221.6 | 233.6 | 242.5 | 250.4 | 271.4 | 278.7 | 283.3 | 300.5 | 316.1 |
| 10% PoE | 222.3 | 240.3 | 251.7 | 266.0 | 271.6 | 284.3 | 309.5 | 318.6 | 326.7 | 345.4 | 365.4 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 142.4 | 145.2 | 152.9 | 159.4 | 164.8 | 166.7 | 169.9 | 179.0 | 180.2 | 181.5 | 188.2 |
| 50% PoE | 146.5 | 149.6 | 157.6 | 164.1 | 170.0 | 171.5 | 175.1 | 184.6 | 185.7 | 186.6 | 193.1 |
| 10% PoE | 152.3 | 155.5 | 163.7 | 170.4 | 176.0 | 178.1 | 181.3 | 190.8 | 192.7 | 193.7 | 200.2 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 173.6 | 185.6 | 196.4 | 206.6 | 209.7 | 218.1 | 236.4 | 241.7 | 246.2 | 257.4 | 273.2 |
| 50% PoE | 195.4 | 210.0 | 221.6 | 233.6 | 242.5 | 250.4 | 271.4 | 278.7 | 283.3 | 300.5 | 316.1 |
| 10% PoE | 222.3 | 240.3 | 251.7 | 266.0 | 271.6 | 284.3 | 309.5 | 318.6 | 326.7 | 345.4 | 365.4 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.138 KTS West maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 95.5 | 88.9 | 93.0 | 96.5 | 94.0 | 97.3 | 105.9 | 103.2 | 102.0 | 103.2 | 108.3 |
| 50% PoE | 117.2 | 113.4 | 118.3 | 123.4 | 126.8 | 129.6 | 140.9 | 140.2 | 139.0 | 146.4 | 151.2 |
| 10% PoE | 144.1 | 143.6 | 148.3 | 155.8 | 156.0 | 163.4 | 179.1 | 180.1 | 182.5 | 191.2 | 200.5 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 87.8 | 76.2 | 78.9 | 80.6 | 81.9 | 81.0 | 80.7 | 81.4 | 78.1 | 75.2 | 74.6 |
| 50% PoE | 91.9 | 80.6 | 83.5 | 85.3 | 87.1 | 85.7 | 85.9 | 86.9 | 83.6 | 80.2 | 79.5 |
| 10% PoE | 97.7 | 86.5 | 89.7 | 91.6 | 93.1 | 92.3 | 92.0 | 93.2 | 90.5 | 87.4 | 86.5 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 95.5 | 88.9 | 93.0 | 96.5 | 94.0 | 97.3 | 105.9 | 103.2 | 102.0 | 103.2 | 108.3 |
| 50% PoE | 117.2 | 113.4 | 118.3 | 123.4 | 126.8 | 129.6 | 140.9 | 140.2 | 139.0 | 146.4 | 151.2 |
| 10% PoE | 144.1 | 143.6 | 148.3 | 155.8 | 156.0 | 163.4 | 179.1 | 180.1 | 182.5 | 191.2 | 200.5 |

*Note:* All forecasts are in MW.
*Source:* Powercor terminal station data, The CIE.

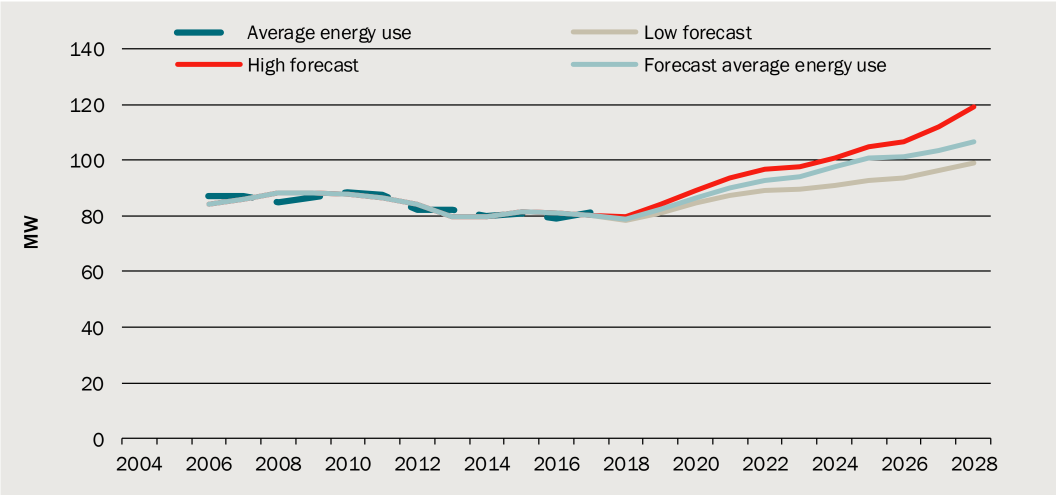
The average demand model was estimated using the long run relationship only, as the coefficient on the error correction term was less than -1.

### 3.139 KTS West average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate long run model only | -0.3114 |
| Income | AEMO constrained long run model only | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

## 3.140 KTS West average demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

## 3.141 KTS West predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 189.3 | 178.8 | 172.2 | 171.1 | 185.8 | 193.6 | 161.4 | 189.4 | 173.0 | 193.9 |
| 90% PoE | 166.3 | 166.2 | 163.3 | 167.0 | 161.1 | 163.1 | 162.7 | 170.2 | 171.3 | 167.1 |
| 50% PoE | 180.8 | 181.1 | 178.6 | 182.4 | 176.2 | 178.4 | 178.5 | 187.8 | 190.5 | 187.9 |
| 10% PoE | 208.3 | 208.2 | 204.4 | 209.3 | 201.3 | 205.7 | 202.8 | 213.9 | 214.5 | 212.1 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 143.2 | 149.7 | 153.3 | 155.9 | 154.7 | 142.8 | 146.0 | 153.4 | 150.4 | 152.6 |
| 90% PoE | 155.0 | 150.8 | 154.5 | 150.1 | 152.3 | 140.3 | 142.6 | 148.2 | 145.7 | 147.7 |
| 50% PoE | 159.6 | 155.1 | 159.0 | 154.2 | 157.0 | 144.2 | 146.8 | 152.3 | 149.7 | 151.7 |
| 10% PoE | 165.4 | 161.3 | 165.1 | 159.9 | 162.9 | 149.8 | 152.4 | 158.0 | 154.9 | 157.4 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 189.3 | 178.8 | 172.2 | 171.1 | 185.8 | 193.6 | 161.4 | 189.4 | 173.0 | 193.9 |
| 90% PoE | 166.7 | 166.3 | 164.4 | 167.0 | 161.8 | 163.1 | 162.7 | 170.2 | 171.3 | 167.1 |
| 50% PoE | 180.8 | 181.1 | 178.6 | 182.4 | 176.2 | 178.4 | 178.5 | 187.8 | 190.5 | 187.9 |
| 10% PoE | 208.3 | 208.2 | 204.4 | 209.3 | 201.3 | 205.7 | 202.8 | 213.9 | 214.5 | 212.1 |

*Note:* All forecasts are in MW.
*Source:* Powercor terminal station data, The CIE.

## 3.142 KTS West average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.766 |
| Winter | 0.633 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

### 3.143 KTS West details of actual maxima

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 19-07-06 18:00 | 148.8 | 8.5 | 1.9 | 9.6 | 8.3 |
| 17-07-07 18:00 | 161.1 | 3.8 | 3.1 | 8.5 | 7.0 |
| 21-08-08 18:00 | 143.2 | 6.6 | 4.6 | 9.5 | 8.2 |
| 10-06-09 18:00 | 149.7 | 5.5 | 4.5 | 9.3 | 9.6 |
| 18-08-10 18:00 | 153.3 | 8.7 | 6.3 | 10.2 | 9.6 |
| 07-06-11 18:00 | 155.9 | 5.9 | 4.4 | 9.8 | 9.0 |
| 21-06-12 17:30 | 154.7 | 8.7 | 8.4 | 10.2 | 8.7 |
| 24-06-13 18:00 | 142.8 | 6.8 | 1.1 | 11.0 | 7.5 |
| 01-08-14 18:30 | 146.0 | 5.6 | 4.2 | 8.7 | 9.1 |
| 14-07-15 18:00 | 153.4 | 6.1 | 5.3 | 9.1 | 8.1 |
| 24-06-16 18:00 | 150.4 | 5.2 | 3.9 | 8.7 | 8.1 |
| 03-08-17 18:00 | 152.6 | 6.9 | 1.3 | 8.1 | 8.4 |
| **Summer** | | | | | |
| 22-01-06 16:30 | 160.3 | 40.4 | 19.7 | 41.7 | 24.1 |
| 16-01-07 16:00 | 164.0 | 39.4 | 16.2 | 40.1 | 23.8 |
| 17-03-08 16:30 | 181.2 | 37.6 | 19.7 | 38.8 | 24.5 |
| 29-01-09 16:30 | 189.3 | 42.9 | 27.6 | 43.6 | 27.1 |
| 11-01-10 16:00 | 178.8 | 41.4 | 15.6 | 42.0 | 23.1 |
| 01-02-11 13:30 | 172.2 | 31.0 | 16.9 | 38.9 | 23.6 |
| 02-01-12 17:00 | 171.1 | 38.6 | 17.0 | 38.8 | 21.3 |
| 04-01-13 17:30 | 185.8 | 40.2 | 24.0 | 40.5 | 23.0 |
| 28-01-14 17:30 | 193.6 | 40.7 | 19.2 | 41.5 | 21.2 |
| 07-01-15 16:30 | 161.4 | 37.0 | 16.5 | 39.2 | 23.1 |
| 19-12-15 16:30 | 189.4 | 40.8 | 18.3 | 40.9 | 23.8 |
| 08-02-17 18:00 | 173.0 | 34.5 | 14.5 | 35.2 | 22.6 |
| 28-01-18 18:00 | 193.9 | 37.4 | 21.4 | 38.3 | 23.6 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.
*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

## *KTS (including KTS east and KTS west)*

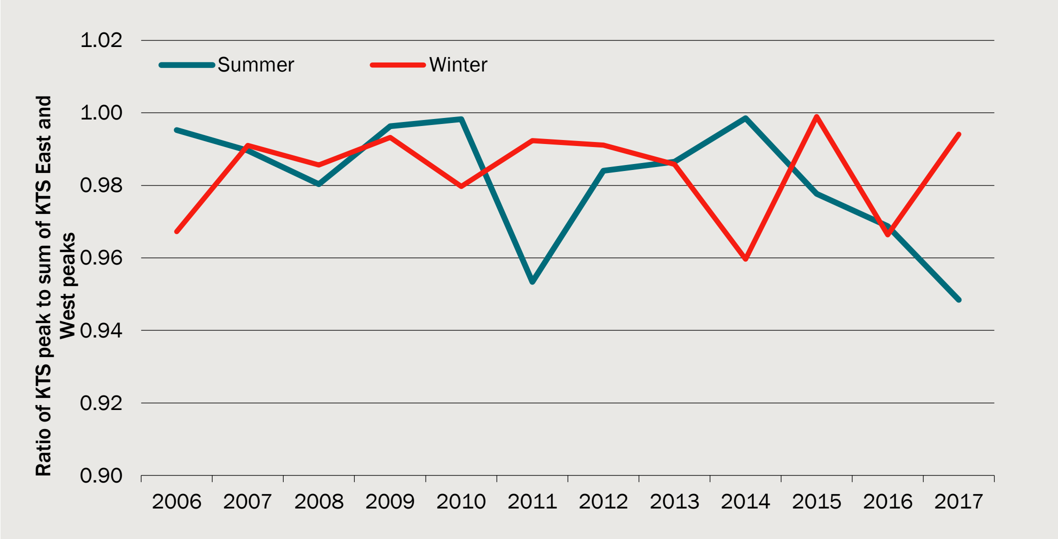
We have calculated forecasts of maximum demand for the KTS East and KTS West pooled together as KTS, by using the ratio between historical maxima for combined KTS demand and the sum of KTS East and KTS West maxima

$$KTS\ max_{t,s} = \frac{KTS\ max_{16/17,s}}{KTS\ E\ max_{16/17,s} + KTS\ W\ max_{16/17,s}} \times \left(KTS\ E\ max_{t,s} + KTS\ W\ max_{t,s}\right)$$

for some season *s* and forecast year *t*. The ratio of the KTS max to the sum of the KTS East and West maxima is approximately 99.8 per cent and 98.3 per cent for summer and winter respectively. The summer ratio is based on the ratio of the maxima in the 2016/17 summer and the winter ratio is based on the maxima in the 2016 winter.

This ratio fluctuates somewhat over time around a relatively narrow band; there is no obvious trend in the ratio overtime.

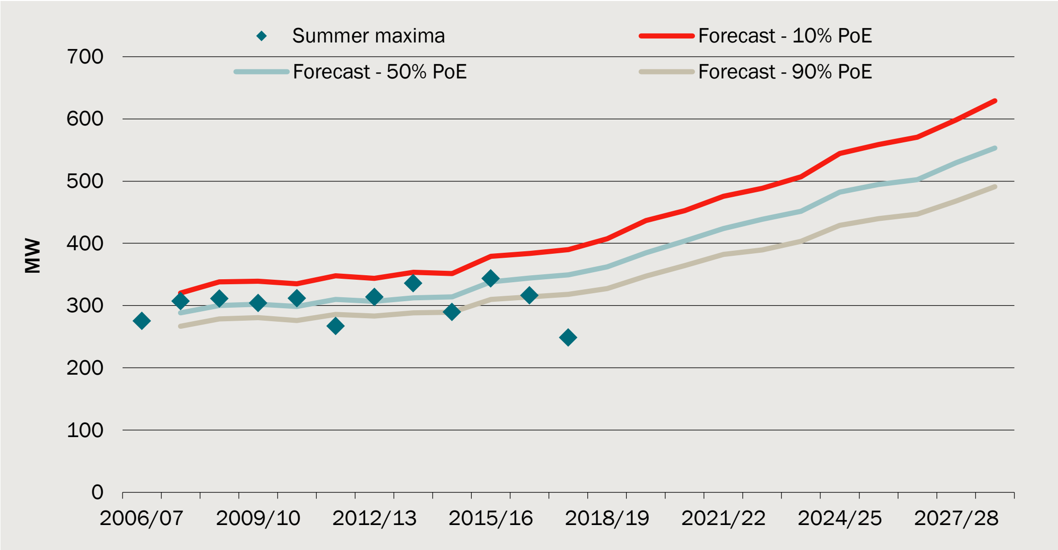
### 3.144 Ratio of KTS peak to sum of KTS East and West peaks




*Note:* The final values in each series are the values of the ratio used to forecast maximum demand for KTS. The ratio exceeds 1 in 2013, which is likely caused by the process of converting 15-minute demand data to 30-minute demand data.

*Data source:* The CIE, Powercor terminal station demand data.

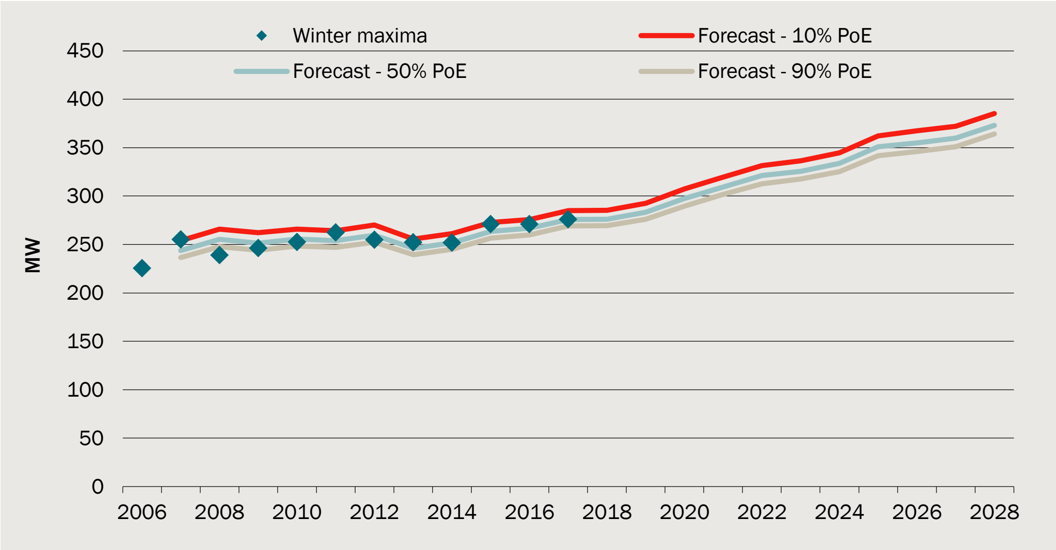
### 3.145 KTS annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

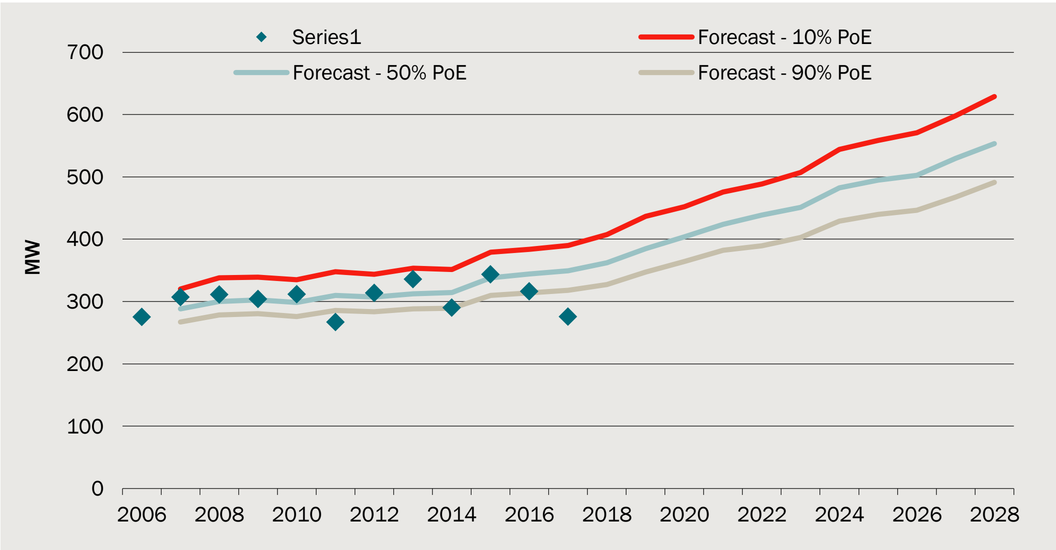
*Data source:* The CIE.

### 3.146 KTS summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

### 3.147 KTS winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

### 3.148 KTS maximum demand forecasts

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 327.1 | 347.2 | 364.4 | 382.1 | 389.4 | 403.1 | 429.1 | 439.7 | 446.7 | 467.8 | 491.0 |
| 50% PoE | 362.3 | 385.0 | 403.8 | 423.7 | 438.5 | 451.3 | 482.5 | 494.5 | 502.5 | 529.6 | 553.3 |
| 10% PoE | 407.4 | 436.7 | 452.3 | 475.6 | 488.5 | 507.0 | 544.4 | 558.8 | 570.7 | 598.2 | 629.1 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 269.4 | 276.2 | 289.5 | 301.8 | 312.6 | 317.7 | 325.1 | 341.7 | 346.0 | 351.0 | 364.0 |
| 50% PoE | 276.2 | 283.2 | 297.4 | 309.4 | 321.1 | 325.6 | 333.8 | 351.1 | 355.1 | 359.9 | 372.9 |
| 10% PoE | 285.3 | 292.7 | 307.3 | 319.7 | 331.6 | 336.4 | 344.7 | 362.2 | 367.4 | 372.0 | 385.2 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 327.1 | 347.2 | 364.4 | 382.1 | 389.4 | 403.1 | 429.1 | 439.7 | 446.7 | 467.8 | 491.0 |
| 50% PoE | 362.3 | 385.0 | 403.8 | 423.7 | 438.5 | 451.3 | 482.5 | 494.5 | 502.5 | 529.6 | 553.3 |
| 10% PoE | 407.4 | 436.7 | 452.3 | 475.6 | 488.5 | 507.0 | 544.4 | 558.8 | 570.7 | 598.2 | 629.1 |

*Note:* All forecasts are in MW.
*Source:* Powercor terminal station data, The CIE.

Summer peaks for KTS occur consistently between 3-6pm, while winter peaks consistently occur at 6-6:30pm. KTS peaks and the times are very similar to the KTS East and West peak historically, which could explain why the ratio of the KTS peak to the sum of the East and West peaks is so close to one.

### 3.149 KTS details of actual maxima

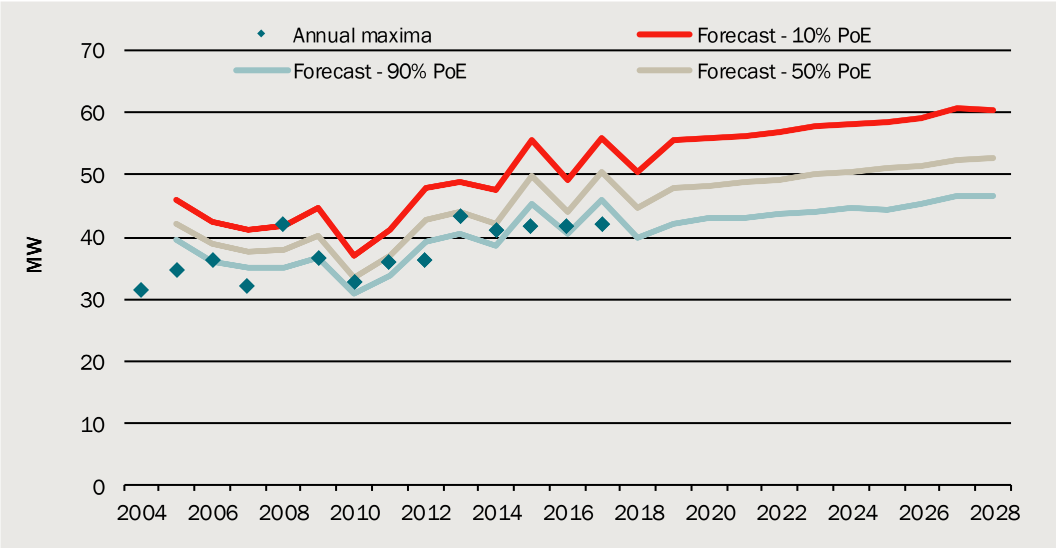
| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 19-07-06 18:00 | 225.5 | 8.5 | 1.9 | 9.6 | 8.3 |
| 17-07-07 18:00 | 255.1 | 3.8 | 3.1 | 8.5 | 7.0 |
| 21-08-08 18:00 | 238.8 | 6.6 | 4.6 | 9.5 | 8.2 |
| 10-06-09 18:00 | 246.2 | 5.5 | 4.5 | 9.3 | 9.6 |
| 18-08-10 18:00 | 252.4 | 8.7 | 6.3 | 10.2 | 9.6 |
| 07-06-11 18:00 | 262.4 | 5.9 | 4.4 | 9.8 | 9.0 |
| 20-06-12 17:30 | 254.8 | 10.9 | 3.0 | 11.2 | 8.7 |
| 24-06-13 18:00 | 252.1 | 6.8 | 1.1 | 11.0 | 7.5 |
| 17-07-14 18:00 | 251.7 | 6.1 | 4.8 | 11.4 | 8.4 |
| 14-07-15 18:00 | 271.1 | 6.1 | 5.3 | 9.1 | 8.1 |
| 12-07-16 18:00 | 270.9 | 6.8 | 5.3 | 12.4 | 9.4 |
| 03-08-17 18:00 | 275.8 | 6.9 | 1.3 | 8.1 | 8.4 |
| **Summer** | | | | | |
| 24-02-06 16:00 | 242.9 | 34.9 | 18.4 | 35.2 | 21.3 |
| 16-01-07 16:00 | 275.1 | 39.4 | 16.2 | 40.1 | 23.8 |
| 17-03-08 16:00 | 306.8 | 37.4 | 19.7 | 38.8 | 24.5 |
| 29-01-09 16:00 | 311.0 | 43.6 | 27.6 | 43.6 | 27.1 |
| 11-01-10 16:00 | 304.1 | 41.4 | 15.6 | 42.0 | 23.1 |
| 01-02-11 13:00 | 311.5 | 38.9 | 16.9 | 38.9 | 23.6 |
| 24-01-12 15:30 | 267.0 | 33.5 | 17.2 | 34.1 | 22.7 |
| 12-03-13 16:30 | 313.6 | 35.4 | 24.4 | 35.7 | 19.0 |

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| 28-01-14 17:30 | 335.9 | 40.7 | 19.2 | 41.5 | 21.2 |
| 07-01-15 16:30 | 289.8 | 37.0 | 16.5 | 39.2 | 23.1 |
| 13-01-16 16:30 | 343.3 | 40.7 | 15.3 | 42.2 | 22.2 |
| 08-02-17 17:30 | 316.0 | 35.0 | 14.5 | 35.2 | 22.6 |
| 28-01-18 18:00 | 248.5 | 37.4 | 21.4 | 38.3 | 23.6 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.
*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

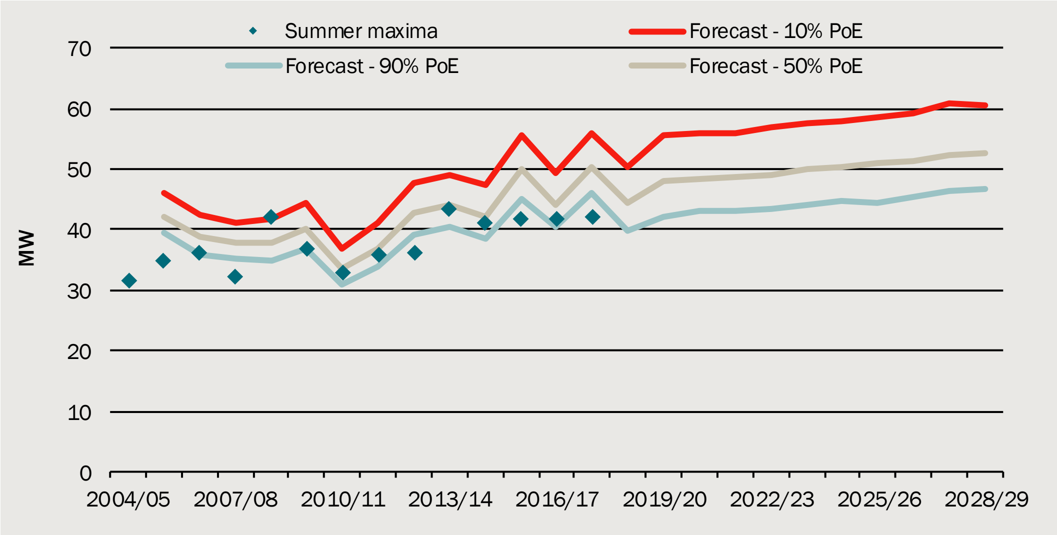
## *RCTS22*

### 3.150 RCTS22 annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

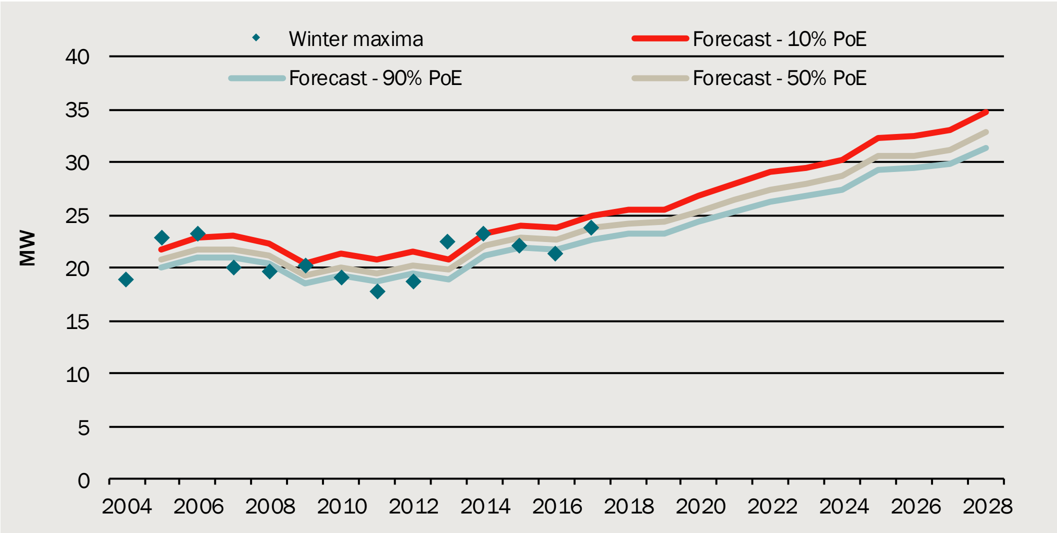
### 3.151 RCTS22 summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.152 RCTS22 winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.153 RCTS22 maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 39.9 | 42.2 | 43.1 | 43.1 | 43.6 | 44.1 | 44.8 | 44.5 | 45.4 | 46.6 | 46.6 |
| 50% PoE | 44.5 | 47.9 | 48.3 | 48.8 | 49.2 | 50.1 | 50.5 | 51.0 | 51.4 | 52.5 | 52.7 |
| 10% PoE | 50.5 | 55.5 | 55.9 | 56.1 | 56.9 | 57.7 | 58.1 | 58.6 | 59.2 | 60.7 | 60.4 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 23.3 | 23.3 | 24.3 | 25.3 | 26.3 | 26.8 | 27.4 | 29.2 | 29.4 | 29.8 | 31.3 |
| 50% PoE | 24.2 | 24.3 | 25.4 | 26.4 | 27.5 | 28.0 | 28.6 | 30.6 | 30.6 | 31.1 | 32.8 |
| 10% PoE | 25.5 | 25.6 | 26.8 | 28.0 | 29.1 | 29.5 | 30.2 | 32.3 | 32.4 | 33.0 | 34.8 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 39.9 | 42.2 | 43.1 | 43.1 | 43.6 | 44.1 | 44.8 | 44.5 | 45.4 | 46.6 | 46.6 |
| 50% PoE | 44.5 | 47.9 | 48.3 | 48.8 | 49.2 | 50.1 | 50.5 | 51.0 | 51.4 | 52.5 | 52.7 |
| 10% PoE | 50.5 | 55.5 | 55.9 | 56.1 | 56.9 | 57.7 | 58.1 | 58.6 | 59.2 | 60.7 | 60.4 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.154 RCTS22 maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 37.9 | 39.2 | 39.7 | 39.7 | 39.9 | 40.2 | 40.5 | 40.2 | 40.7 | 41.4 | 41.3 |
| 50% PoE | 41.0 | 43.0 | 43.2 | 43.5 | 43.6 | 44.1 | 44.3 | 44.5 | 44.6 | 45.3 | 45.3 |
| 10% PoE | 45.0 | 48.0 | 48.2 | 48.3 | 48.7 | 49.1 | 49.3 | 49.5 | 49.8 | 50.7 | 50.4 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 21.0 | 20.7 | 21.7 | 22.6 | 23.5 | 23.9 | 24.5 | 26.1 | 26.2 | 26.6 | 27.9 |
| 50% PoE | 21.9 | 21.8 | 22.8 | 23.7 | 24.7 | 25.1 | 25.7 | 27.5 | 27.5 | 27.9 | 29.4 |
| 10% PoE | 23.2 | 23.0 | 24.2 | 25.3 | 26.4 | 26.7 | 27.3 | 29.2 | 29.2 | 29.8 | 31.4 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 37.9 | 39.2 | 39.7 | 39.7 | 39.9 | 40.2 | 40.5 | 40.2 | 40.7 | 41.4 | 41.3 |
| 50% PoE | 41.0 | 43.0 | 43.2 | 43.5 | 43.6 | 44.1 | 44.3 | 44.5 | 44.6 | 45.3 | 45.3 |
| 10% PoE | 45.0 | 48.0 | 48.2 | 48.3 | 48.7 | 49.1 | 49.3 | 49.5 | 49.8 | 50.7 | 50.4 |

*Note:* All forecasts are in MW.

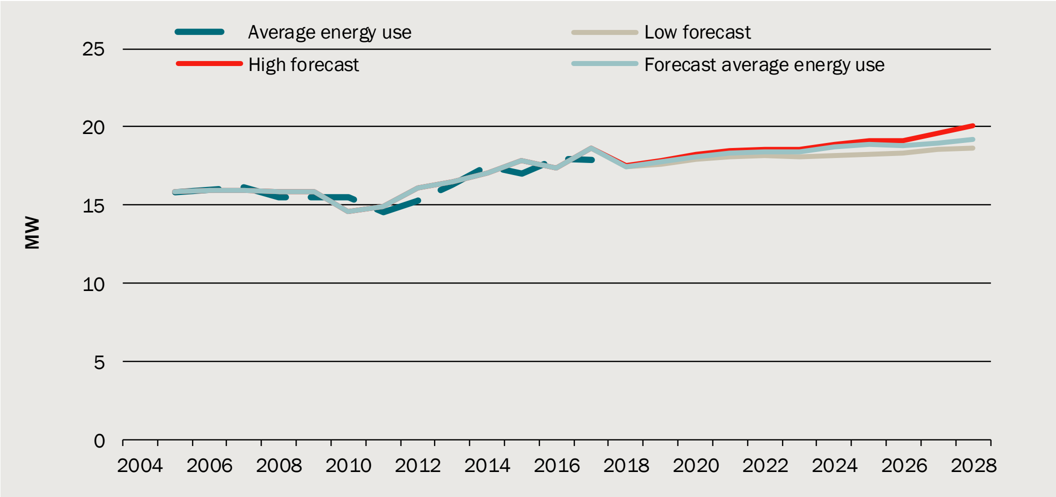
*Source:* Powercor terminal station data, The CIE.

### 3.155 RCTS22 average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate ECM | -0.0288 |
| Income | AEMO constrained ECM | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

### 3.156 RCTS22 average demand forecasts




*Data source:* Powercor terminal station data, The CIE.

### 3.157 RCTS22 predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 41.9 | 36.5 | 32.8 | 35.7 | 36.0 | 43.4 | 40.9 | 41.5 | 41.6 | 42.0 |
| 90% PoE | 34.9 | 36.8 | 30.9 | 33.8 | 39.2 | 40.5 | 38.7 | 45.2 | 40.4 | 46.0 |
| 50% PoE | 38.0 | 40.1 | 33.5 | 37.0 | 42.8 | 44.2 | 42.2 | 49.9 | 44.0 | 50.4 |
| 10% PoE | 41.8 | 44.5 | 37.0 | 41.2 | 47.9 | 48.9 | 47.5 | 55.7 | 49.2 | 55.9 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 19.5 | 20.1 | 19.0 | 17.6 | 18.7 | 22.3 | 23.1 | 22.1 | 21.2 | 23.8 |
| 90% PoE | 20.4 | 18.5 | 19.3 | 18.7 | 19.4 | 19.0 | 21.2 | 21.9 | 21.7 | 22.7 |
| 50% PoE | 21.2 | 19.2 | 20.1 | 19.5 | 20.3 | 19.8 | 22.1 | 22.8 | 22.7 | 23.7 |
| 10% PoE | 22.4 | 20.4 | 21.4 | 20.8 | 21.6 | 20.8 | 23.2 | 24.0 | 23.9 | 24.9 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 41.9 | 36.5 | 32.8 | 35.7 | 36.0 | 43.4 | 40.9 | 41.5 | 41.6 | 42.0 |
| 90% PoE | 34.9 | 36.8 | 30.9 | 33.8 | 39.2 | 40.5 | 38.7 | 45.2 | 40.4 | 46.0 |
| 50% PoE | 38.0 | 40.1 | 33.5 | 37.0 | 42.8 | 44.2 | 42.2 | 49.9 | 44.0 | 50.4 |
| 10% PoE | 41.8 | 44.5 | 37.0 | 41.2 | 47.9 | 48.9 | 47.5 | 55.7 | 49.2 | 55.9 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.158 RCTS22 average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.594 |
| Winter | 0.441 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

### 3.159 RCTS22 details of actual maxima

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 21-07-04 0:30 | 18.8 | 3.0 | -1.4 | 13.2 | 7.5 |
| 03-06-05 1:00 | 22.8 | 1.2 | -1.3 | 16.9 | 9.3 |
| 15-06-06 1:00 | 23.1 | -0.6 | -3.4 | 14.2 | 6.6 |
| 20-06-07 1:00 | 19.9 | 5.1 | 1.7 | 12.9 | 6.7 |
| 24-07-08 1:00 | 19.5 | 2.7 | -0.8 | 16.0 | 7.9 |
| 04-08-09 1:00 | 20.1 | 5.9 | 4.7 | 18.8 | 11.3 |
| 18-06-10 1:00 | 19.0 | 7.9 | 6.8 | 17.0 | 12.9 |
| 08-07-11 1:00 | 17.6 | 2.4 | -0.6 | 12.0 | 10.6 |
| 28-06-12 1:00 | 18.7 | -1.2 | -2.0 | 16.0 | 9.4 |
| 30-08-13 23:00 | 22.3 | 11.8 | 9.3 | 22.8 | 18.5 |
| 04-08-14 23:30 | 23.1 | 1.3 | -2.1 | 14.6 | 8.7 |
| 18-06-15 23:30 | 22.1 | 8.8 | 8.5 | 13.5 | 9.4 |
| 12-07-16 23:30 | 21.2 | 6.3 | 6.3 | 13.1 | 9.9 |
| 29-06-17 23:30 | 23.8 | 8.3 | 4.8 | 15.0 | 9.3 |
| **Summer** | | | | | |
| 14-02-04 11:00 | 38.3 | 40.3 | 25.1 | 45.3 | 31.3 |
| 24-02-05 0:30 | 31.3 | 28.0 | 18.7 | 31.0 | 24.1 |
| 28-01-06 15:30 | 34.7 | 40.2 | 25.0 | 40.3 | 29.8 |
| 03-02-07 13:00 | 36.1 | 37.9 | 18.7 | 39.7 | 25.8 |
| 10-01-08 23:00 | 32.1 | 31.9 | 21.0 | 41.3 | 26.7 |
| 07-02-09 12:30 | 41.9 | 45.0 | 26.3 | 46.1 | 26.1 |
| 10-01-10 14:00 | 36.5 | 43.3 | 21.8 | 44.0 | 28.0 |
| 03-02-11 14:00 | 32.8 | 37.4 | 26.1 | 38.6 | 29.2 |
| 25-02-12 13:30 | 35.7 | 36.7 | 22.1 | 37.5 | 26.2 |
| 24-02-13 15:30 | 36.0 | 36.4 | 19.1 | 36.6 | 27.0 |
| 08-02-14 15:30 | 43.4 | 42.3 | 20.1 | 42.4 | 28.8 |
| 28-02-15 16:30 | 39.1 | 39.1 | 23.0 | 39.9 | 24.8 |
| 06-03-16 15:00 | 39.8 | 40.2 | 25.1 | 40.6 | 30.8 |
| 11-02-17 16:00 | 39.5 | 43.5 | 26.8 | 43.6 | 30.7 |
| 08-02-18 15:30 | 41.2 | 41.7 | 23.1 | 43.0 | 29.0 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.

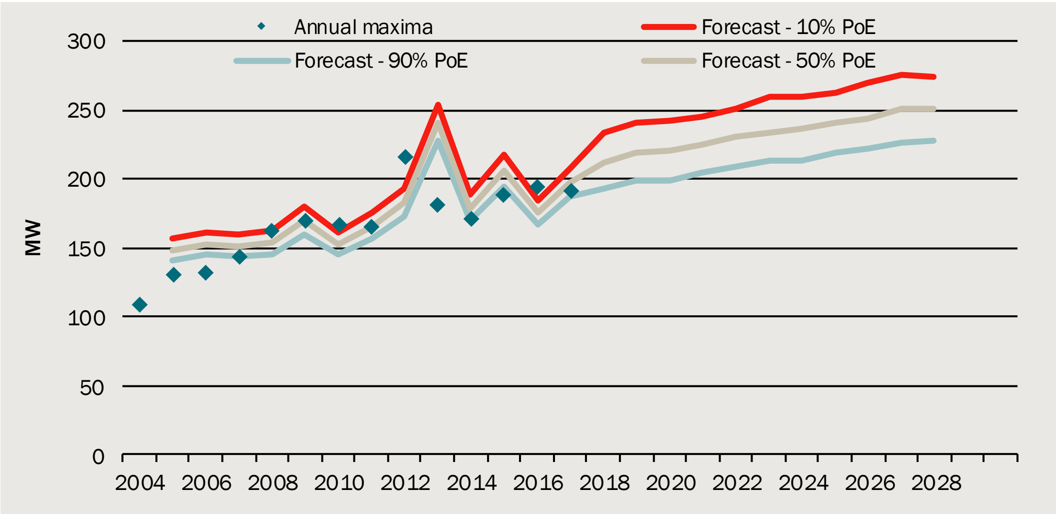
*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

# *RCTS66 and WETS*

Data for RCTS66 (Red Cliffs Terminal Station 66kV) and WETS (Wemen Terminal Station) were pooled. WETS was only commissioned in 2010 and there is insufficient data to take the same modelling approach of constructing average and maximum demand models.

We have constructed models of average quarterly demand and half-hourly demand (as per the standard modelling approach) for the pooled dataset. The forecasts for RCTS66 and WETS are then taken as a share of the pooled forecasts.

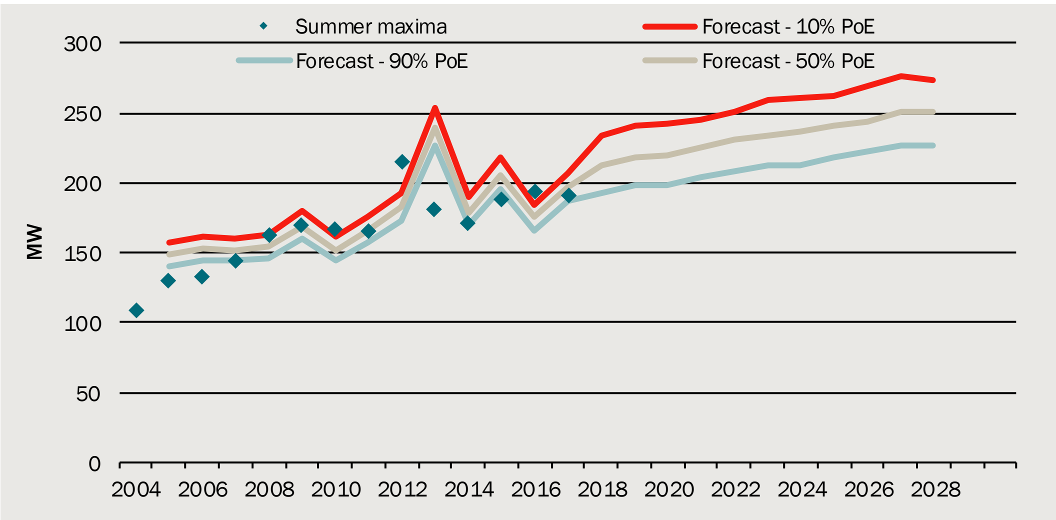
### 3.160 RCTS66/WETS annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

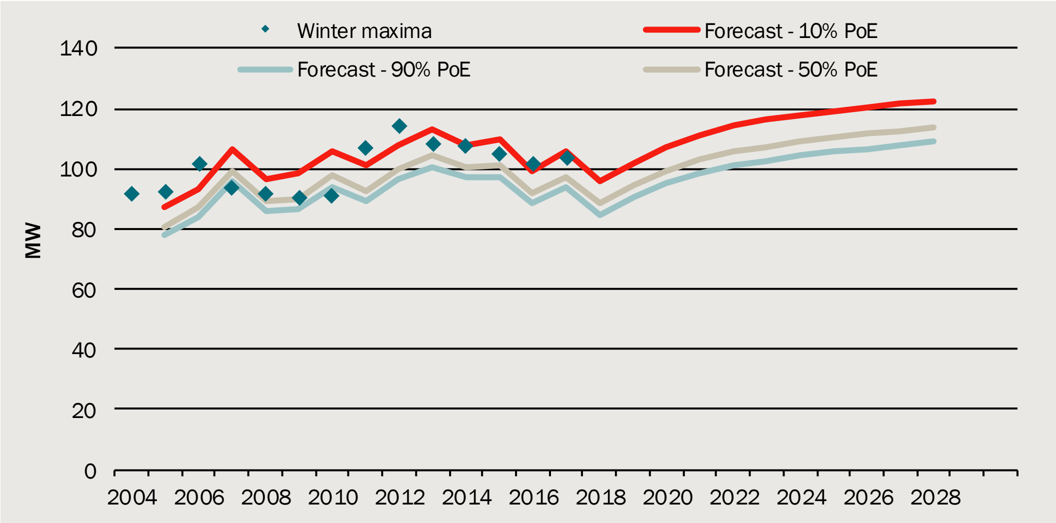
### 3.161 RCTS66/WETS summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.162 RCTS66/WETS winter maximum demand forecasts

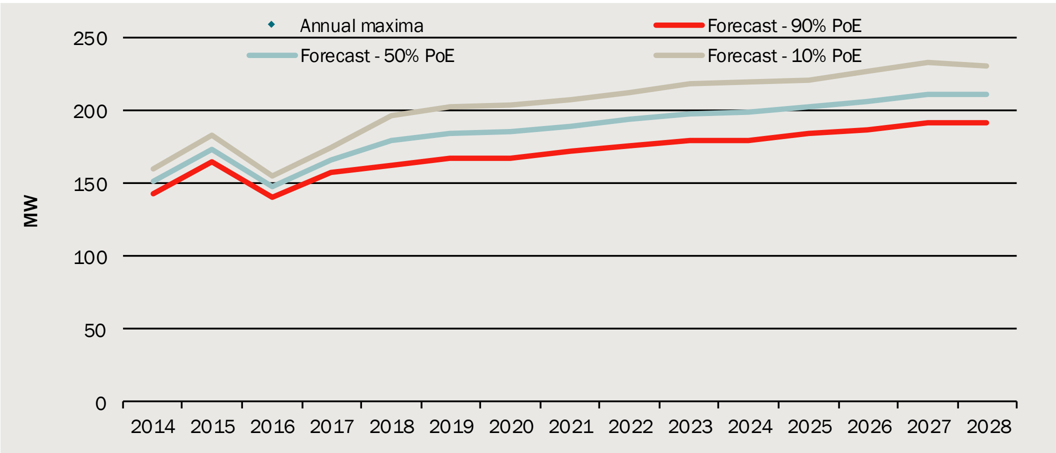



*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

The charts below show our annual, summer and winter PoE maximum demand forecasts for RCTS66 individually.

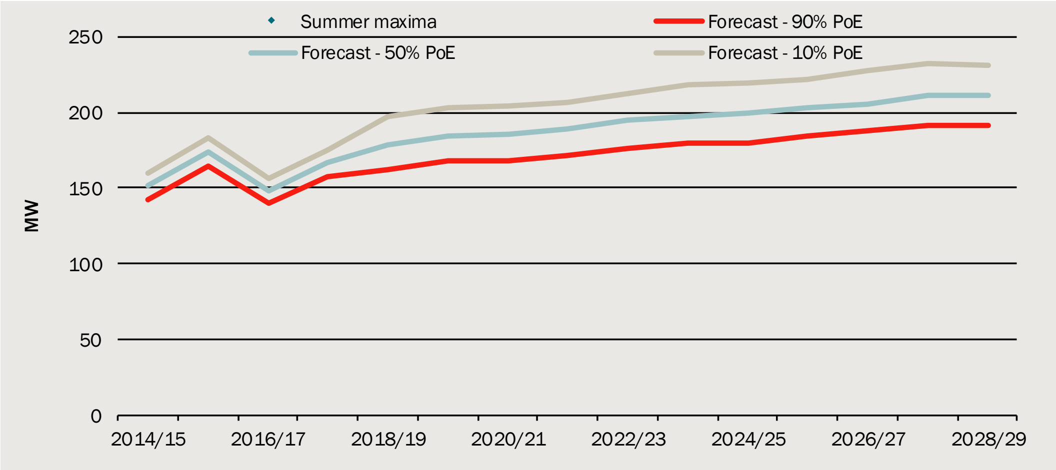
### 3.163 RCTS66 annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

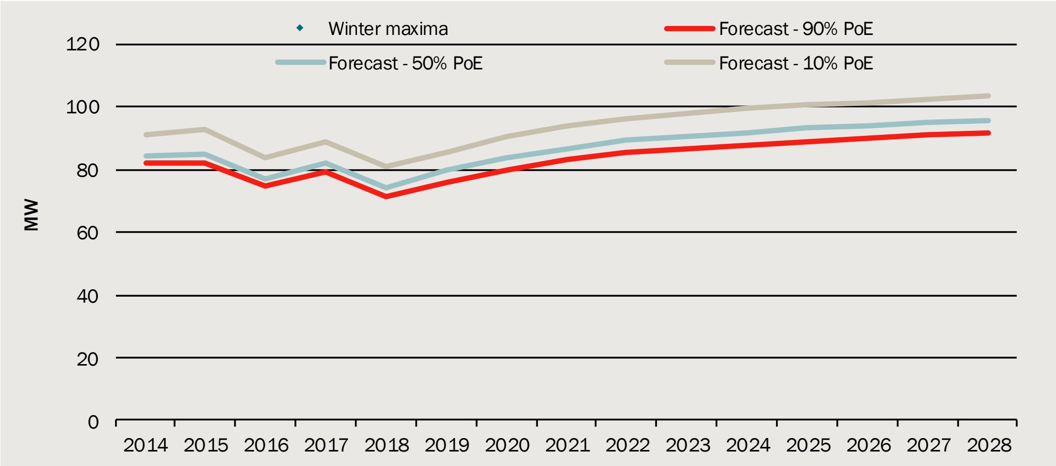
### 3.164 RCTS66 summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.165 RCTS66 winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.166 RCTS66 maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 162.5 | 168.0 | 167.9 | 172.0 | 175.9 | 179.8 | 179.9 | 184.7 | 187.5 | 191.5 | 191.9 |
| 50% PoE | 179.1 | 184.7 | 185.6 | 189.7 | 194.9 | 197.5 | 199.2 | 202.7 | 206.0 | 211.7 | 211.9 |
| 10% PoE | 197.2 | 203.2 | 204.1 | 207.2 | 212.0 | 218.7 | 219.5 | 221.5 | 227.5 | 232.8 | 231.2 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 71.3 | 76.1 | 80.0 | 82.9 | 85.3 | 86.5 | 87.9 | 89.0 | 90.0 | 90.8 | 91.7 |
| 50% PoE | 74.4 | 79.5 | 83.8 | 86.8 | 89.3 | 90.4 | 91.8 | 93.3 | 94.1 | 95.0 | 95.8 |
| 10% PoE | 80.8 | 85.6 | 90.4 | 93.7 | 96.2 | 98.0 | 99.4 | 100.4 | 101.5 | 102.4 | 103.3 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 162.5 | 168.0 | 167.9 | 172.0 | 175.9 | 179.8 | 179.9 | 184.7 | 187.5 | 191.5 | 191.9 |
| 50% PoE | 179.1 | 184.7 | 185.6 | 189.7 | 194.9 | 197.5 | 199.2 | 202.7 | 206.0 | 211.7 | 211.9 |
| 10% PoE | 197.2 | 203.2 | 204.1 | 207.2 | 212.0 | 218.7 | 219.5 | 221.5 | 227.5 | 232.8 | 231.2 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.167 RCTS66 maximum demand forecasts including post-modelling adjustments

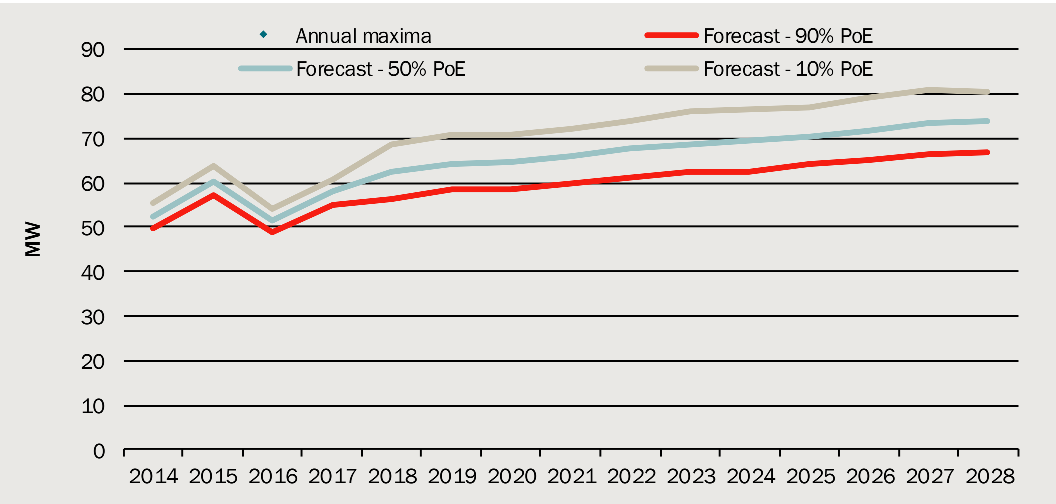
| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 152.9 | 147.6 | 147.3 | 151.2 | 154.7 | 158.3 | 158.1 | 162.4 | 164.9 | 168.5 | 168.5 |
| 50% PoE | 169.5 | 164.3 | 164.9 | 168.8 | 173.7 | 176.0 | 177.4 | 180.5 | 183.3 | 188.7 | 188.5 |
| 10% PoE | 187.6 | 182.9 | 183.5 | 186.4 | 190.9 | 197.2 | 197.7 | 199.3 | 204.9 | 209.8 | 207.9 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 61.6 | 55.8 | 59.4 | 62.1 | 64.1 | 65.0 | 66.1 | 66.7 | 67.3 | 67.8 | 68.4 |
| 50% PoE | 64.8 | 59.1 | 63.1 | 65.9 | 68.1 | 68.9 | 70.0 | 71.0 | 71.4 | 72.1 | 72.4 |
| 10% PoE | 71.1 | 65.2 | 69.8 | 72.8 | 75.0 | 76.5 | 77.6 | 78.2 | 78.9 | 79.5 | 80.0 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 152.9 | 147.6 | 147.3 | 151.2 | 154.7 | 158.3 | 158.1 | 162.4 | 164.9 | 168.5 | 168.5 |
| 50% PoE | 169.5 | 164.3 | 164.9 | 168.8 | 173.7 | 176.0 | 177.4 | 180.5 | 183.3 | 188.7 | 188.5 |
| 10% PoE | 187.6 | 182.9 | 183.5 | 186.4 | 190.9 | 197.2 | 197.7 | 199.3 | 204.9 | 209.8 | 207.9 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

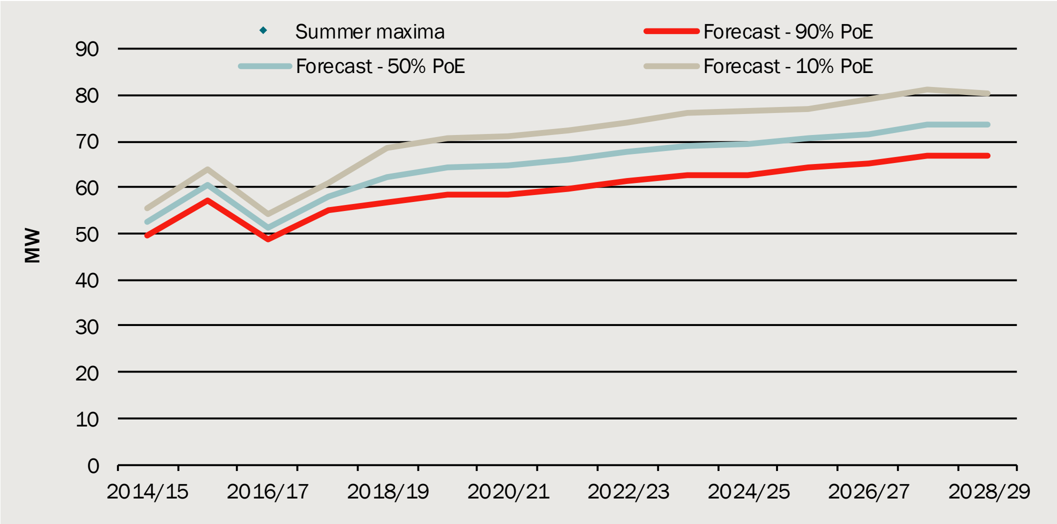
The charts below show our annual, summer and winter PoE maximum demand forecasts for WETS individually.

### 3.168 WETS annual maximum demand forecasts



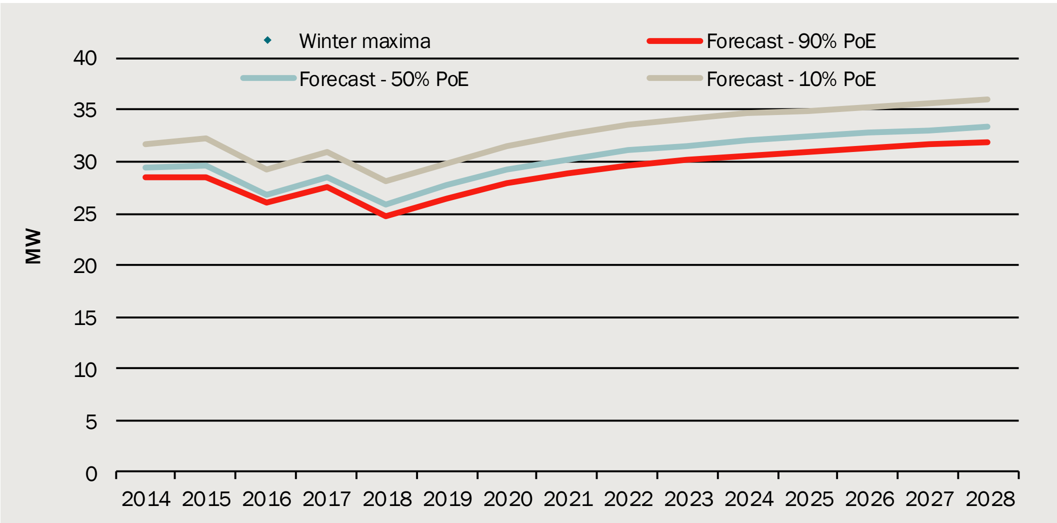

*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

### 3.169 WETS summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

### 3.170 WETS winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

### 3.171 WETS maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 56.6 | 58.5 | 58.5 | 59.9 | 61.2 | 62.6 | 62.6 | 64.3 | 65.3 | 66.6 | 66.8 |
| 50% PoE | 62.3 | 64.3 | 64.6 | 66.0 | 67.8 | 68.8 | 69.3 | 70.6 | 71.7 | 73.7 | 73.7 |
| 10% PoE | 68.7 | 70.7 | 71.1 | 72.1 | 73.8 | 76.1 | 76.4 | 77.1 | 79.2 | 81.0 | 80.5 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 24.8 | 26.5 | 27.9 | 28.9 | 29.7 | 30.1 | 30.6 | 31.0 | 31.3 | 31.6 | 31.9 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 50% PoE | 25.9 | 27.7 | 29.2 | 30.2 | 31.1 | 31.5 | 32.0 | 32.5 | 32.7 | 33.1 | 33.3 |
| 10% PoE | 28.1 | 29.8 | 31.5 | 32.6 | 33.5 | 34.1 | 34.6 | 35.0 | 35.3 | 35.7 | 36.0 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 56.6 | 58.5 | 58.5 | 59.9 | 61.2 | 62.6 | 62.6 | 64.3 | 65.3 | 66.6 | 66.8 |
| 50% PoE | 62.3 | 64.3 | 64.6 | 66.0 | 67.8 | 68.8 | 69.3 | 70.6 | 71.7 | 73.7 | 73.7 |
| 10% PoE | 68.7 | 70.7 | 71.1 | 72.1 | 73.8 | 76.1 | 76.4 | 77.1 | 79.2 | 81.0 | 80.5 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.172 WETS maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 26.2 | 24.7 | 24.1 | 23.7 | 22.8 | 22.0 | 21.1 | 20.2 | 19.4 | 18.8 | 18.0 |
| 50% PoE | 26.8 | 25.3 | 24.8 | 24.4 | 23.5 | 22.7 | 21.8 | 20.8 | 20.1 | 19.5 | 18.7 |
| 10% PoE | 27.4 | 26.0 | 25.4 | 25.0 | 24.2 | 23.4 | 22.6 | 21.5 | 20.9 | 20.3 | 19.5 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 2.6 | 2.0 | 2.2 | 2.3 | 1.8 | 1.1 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| 50% PoE | 3.3 | 2.7 | 3.0 | 3.1 | 2.7 | 1.9 | 1.3 | 0.5 | 0.0 | 0.0 | 0.0 |
| 10% PoE | 4.6 | 4.0 | 4.5 | 4.6 | 4.2 | 3.6 | 3.0 | 2.1 | 1.4 | 0.9 | 0.3 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 26.2 | 24.7 | 24.1 | 23.7 | 22.8 | 22.0 | 21.1 | 20.2 | 19.4 | 18.8 | 18.0 |
| 50% PoE | 26.8 | 25.3 | 24.8 | 24.4 | 23.5 | 22.7 | 21.8 | 20.8 | 20.1 | 19.5 | 18.7 |
| 10% PoE | 27.4 | 26.0 | 25.4 | 25.0 | 24.2 | 23.4 | 22.6 | 21.5 | 20.9 | 20.3 | 19.5 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

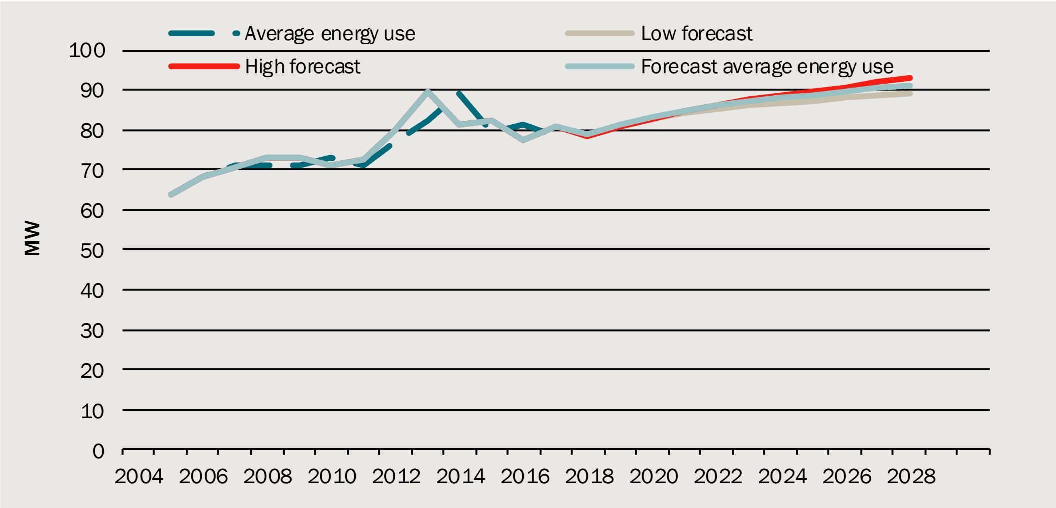
Both the CIE model and the fixed income elasticity parameter model resulted in a positive price elasticity, which is inconsistent with economic theory. The price elasticity was therefore set to zero.

### 3.173 RCTS66/WETS average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE constrained ECM | 0.0 |
| Income | AEMO constrained ECM | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

### 3.174 RCTS66/WETS average demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.175 RCTS66/WETS predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 161.8 | 169.7 | 165.9 | 164.5 | 215.5 | 181.1 | 171.3 | 188.1 | 193.2 | 190.4 |
| 90% PoE | 145.9 | 160.1 | 144.8 | 157.3 | 173.1 | 227.3 | 169.5 | 195.0 | 166.4 | 187.3 |
| 50% PoE | 153.9 | 169.2 | 152.3 | 166.1 | 183.2 | 240.3 | 179.2 | 206.2 | 175.2 | 197.4 |
| 10% PoE | 163.1 | 179.6 | 161.1 | 176.4 | 193.5 | 253.4 | 189.4 | 217.8 | 184.8 | 207.5 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 91.6 | 90.1 | 90.7 | 106.7 | 113.7 | 108.0 | 107.6 | 105.0 | 101.2 | 103.3 |
| 90% PoE | 85.7 | 86.8 | 94.0 | 89.4 | 96.8 | 100.6 | 97.1 | 97.3 | 88.4 | 93.9 |
| 50% PoE | 89.1 | 90.1 | 97.5 | 92.7 | 99.9 | 104.2 | 100.2 | 100.9 | 91.6 | 97.3 |
| 10% PoE | 96.6 | 98.3 | 105.7 | 101.2 | 107.5 | 113.0 | 107.8 | 109.7 | 99.4 | 105.5 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 161.8 | 169.7 | 165.9 | 164.5 | 215.5 | 181.1 | 171.3 | 188.1 | 193.2 | 190.4 |
| 90% PoE | 145.9 | 160.1 | 144.8 | 157.3 | 173.1 | 227.3 | 169.5 | 195.0 | 166.4 | 187.3 |
| 50% PoE | 153.9 | 169.2 | 152.3 | 166.1 | 183.2 | 240.3 | 179.2 | 206.2 | 175.2 | 197.4 |
| 10% PoE | 163.1 | 179.6 | 161.1 | 176.4 | 193.5 | 253.4 | 189.4 | 217.8 | 184.8 | 207.5 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.176 RCTS66/WETS average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.585 |
| Winter | 0.676 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

### 3.177 RCTS66/WETS details of actual maxima

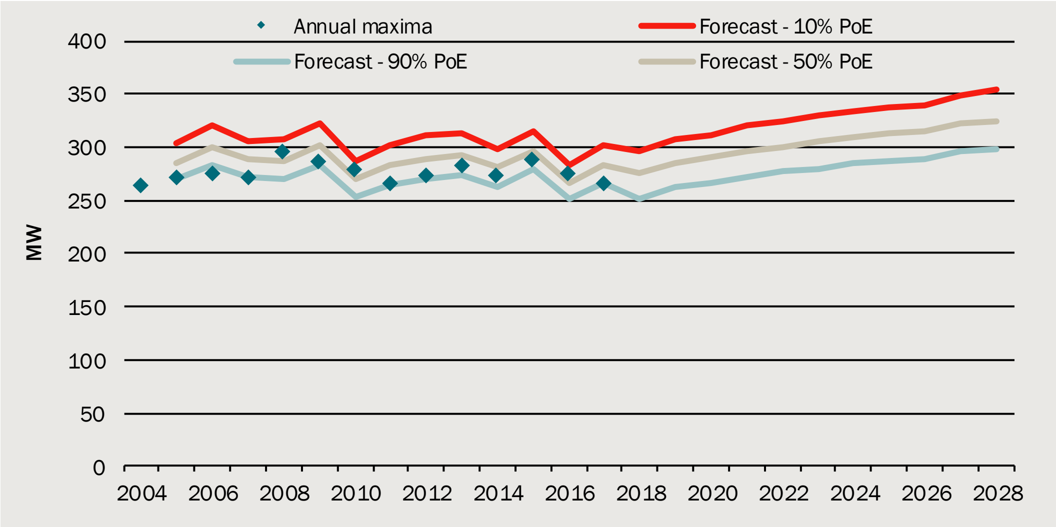
| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 22-07-04 0:30 | 91.5 | 3.8 | 1.8 | 15.8 | 10.2 |
| 03-06-05 0:30 | 92.2 | 1.8 | -1.3 | 16.9 | 9.3 |
| 14-06-06 1:00 | 101.4 | -0.5 | -2.9 | 14.1 | 6.6 |
| 19-07-07 1:00 | 93.4 | 3.2 | 0.5 | 12.3 | 6.9 |
| 12-08-08 1:00 | 91.6 | 4.9 | 3.3 | 14.0 | 9.6 |
| 08-07-09 1:00 | 90.1 | 2.4 | -1.0 | 16.1 | 9.3 |
| 09-07-10 1:00 | 90.7 | 3.8 | -0.4 | 17.4 | 10.6 |
| 01-06-11 1:00 | 106.7 | 3.4 | 3.1 | 20.1 | 11.3 |
| 28-06-12 1:00 | 113.7 | -1.2 | -2.0 | 16.0 | 9.4 |
| 25-07-13 23:00 | 108.0 | 6.4 | 0.8 | 14.3 | 11.2 |
| 04-08-14 23:30 | 107.6 | 1.3 | -2.1 | 14.6 | 8.7 |
| 15-07-15 23:30 | 105.0 | 2.7 | 1.5 | 10.8 | 9.9 |
| 12-07-16 23:30 | 101.2 | 6.3 | 6.3 | 13.1 | 9.9 |
| 07-06-17 23:30 | 103.3 | 3.2 | 1.8 | 14.8 | 9.1 |
| **Summer** | | | | | |
| 14-02-04 13:30 | 117.8 | 44.0 | 25.1 | 45.3 | 31.3 |
| 11-01-05 14:30 | 108.4 | 40.1 | 20.3 | 41.6 | 25.8 |
| 22-01-06 16:30 | 130.0 | 42.4 | 27.5 | 42.5 | 29.8 |
| 05-02-07 16:00 | 131.9 | 42.3 | 21.6 | 42.4 | 23.2 |
| 10-01-08 15:00 | 143.5 | 41.0 | 21.0 | 41.3 | 26.7 |
| 07-02-09 11:30 | 161.8 | 44.3 | 26.3 | 46.1 | 26.1 |
| 11-01-10 12:00 | 169.7 | 40.8 | 28.3 | 42.9 | 28.0 |
| 31-12-10 15:00 | 165.9 | 41.4 | 22.2 | 41.8 | 23.2 |
| 03-01-12 13:30 | 164.5 | 37.5 | 22.5 | 37.5 | 26.8 |
| 07-01-13 13:30 | 215.5 | 41.2 | 21.0 | 43.9 | 29.8 |
| 30-01-14 15:30 | 181.1 | 42.7 | 21.8 | 42.8 | 31.3 |
| 11-02-15 15:30 | 171.3 | 39.1 | 17.9 | 39.2 | 27.0 |
| 13-01-16 15:00 | 188.1 | 42.5 | 25.0 | 43.1 | 27.8 |
| 09-02-17 15:30 | 193.2 | 45.3 | 31.1 | 45.6 | 30.7 |
| 08-02-18 15:30 | 190.4 | 41.7 | 23.1 | 43.0 | 29.0 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.
*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

## *SHTS*

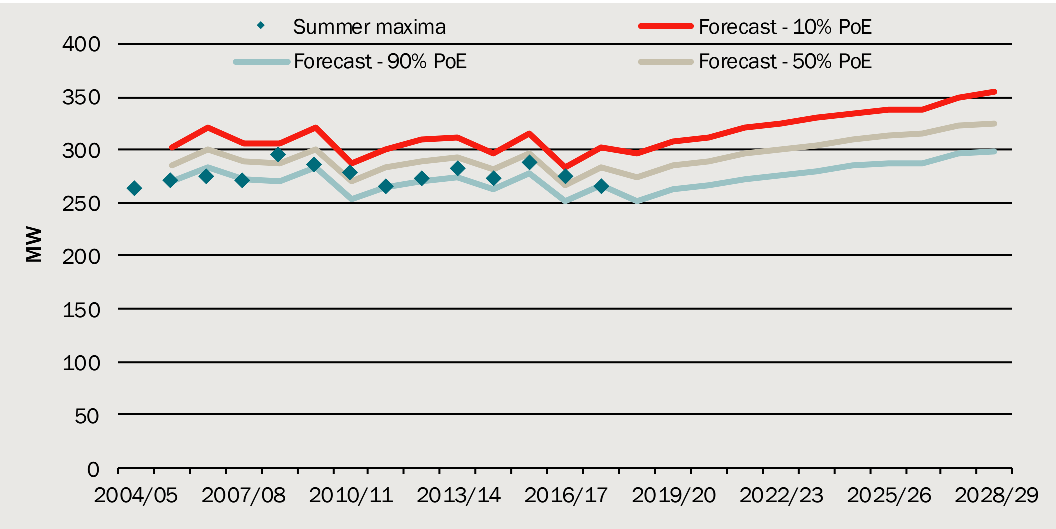
The annual and summer demand models for SHTS perform well and the winter model generally understates the peak demand, particularly in early years.

### 3.178 SHTS annual maximum demand forecasts



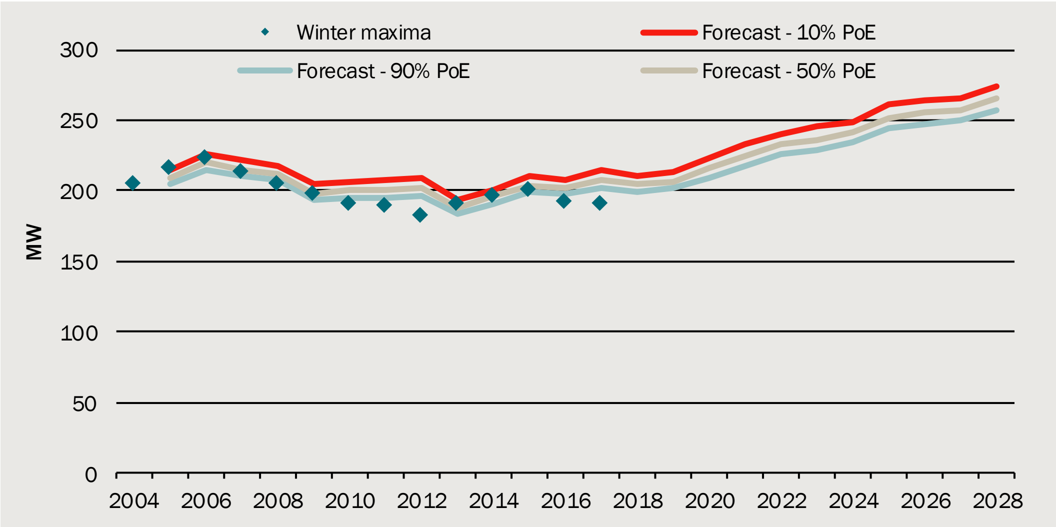

*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

### 3.179 SHTS summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

### 3.180 SHTS winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.181 SHTS maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 252.0 | 263.3 | 266.4 | 272.2 | 276.8 | 279.9 | 285.2 | 286.9 | 287.9 | 295.8 | 298.7 |
| 50% PoE | 274.9 | 285.9 | 289.9 | 296.3 | 300.5 | 304.9 | 310.0 | 314.1 | 314.9 | 323.0 | 325.1 |
| 10% PoE | 296.5 | 308.5 | 311.9 | 320.5 | 324.7 | 330.0 | 333.7 | 338.4 | 338.7 | 349.2 | 354.3 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 199.2 | 201.6 | 209.3 | 217.6 | 226.1 | 229.4 | 233.9 | 244.7 | 247.5 | 249.7 | 257.1 |
| 50% PoE | 204.2 | 206.6 | 215.5 | 224.3 | 232.6 | 236.4 | 240.9 | 252.0 | 255.2 | 257.4 | 265.0 |
| 10% PoE | 209.9 | 213.2 | 222.6 | 232.7 | 240.5 | 245.2 | 249.3 | 261.0 | 264.2 | 266.2 | 274.3 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 252.0 | 263.3 | 266.4 | 272.2 | 276.8 | 279.9 | 285.2 | 286.9 | 287.9 | 295.8 | 298.7 |
| 50% PoE | 274.9 | 285.9 | 289.9 | 296.3 | 300.5 | 304.9 | 310.0 | 314.1 | 314.9 | 323.0 | 325.1 |
| 10% PoE | 296.5 | 308.5 | 311.9 | 320.5 | 324.7 | 330.0 | 333.7 | 338.4 | 338.7 | 349.2 | 354.3 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.182 SHTS maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 245.5 | 251.8 | 253.6 | 258.1 | 261.4 | 263.2 | 267.3 | 266.8 | 266.4 | 273.0 | 274.5 |
| 50% PoE | 268.4 | 274.4 | 277.1 | 282.2 | 285.1 | 288.2 | 292.1 | 294.0 | 293.3 | 300.2 | 300.9 |
| 10% PoE | 290.0 | 297.0 | 299.1 | 306.4 | 309.3 | 313.3 | 315.8 | 318.4 | 317.2 | 326.5 | 330.1 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 184.4 | 182.0 | 188.3 | 195.3 | 202.5 | 204.5 | 207.8 | 216.5 | 217.8 | 218.8 | 224.7 |
| 50% PoE | 189.5 | 187.0 | 194.5 | 202.0 | 209.0 | 211.5 | 214.8 | 223.8 | 225.4 | 226.5 | 232.6 |
| 10% PoE | 195.2 | 193.5 | 201.6 | 210.4 | 216.9 | 220.3 | 223.2 | 232.8 | 234.4 | 235.3 | 241.9 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 245.5 | 251.8 | 253.6 | 258.1 | 261.4 | 263.2 | 267.3 | 266.8 | 266.4 | 273.0 | 274.5 |
| 50% PoE | 268.4 | 274.4 | 277.1 | 282.2 | 285.1 | 288.2 | 292.1 | 294.0 | 293.3 | 300.2 | 300.9 |
| 10% PoE | 290.0 | 297.0 | 299.1 | 306.4 | 309.3 | 313.3 | 315.8 | 318.4 | 317.2 | 326.5 | 330.1 |

*Note:* All forecasts are in MW.

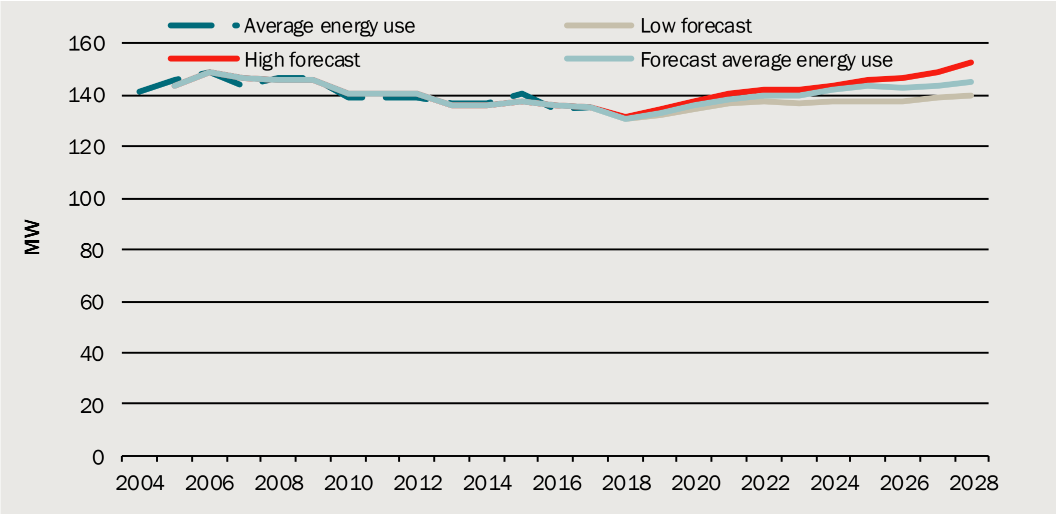
*Source:* Powercor terminal station data, The CIE.

### 3.183 SHTS average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate ECM | -0.1656 |
| Income | The CIE estimate ECM | 0.3150 |

*Source:* Powercor terminal station data, The CIE.

### 3.184 SHTS average demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.185 SHTS predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 295.3 | 285.9 | 278.0 | 264.9 | 273.0 | 282.4 | 273.3 | 288.3 | 275.5 | 265.7 |
| 90% PoE | 270.5 | 283.3 | 254.0 | 264.8 | 270.5 | 273.2 | 263.0 | 278.7 | 252.3 | 266.6 |
| 50% PoE | 287.2 | 301.1 | 270.6 | 282.7 | 289.1 | 293.5 | 280.8 | 296.9 | 267.3 | 283.5 |

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| 10% PoE | 306.9 | 321.8 | 287.8 | 301.1 | 310.6 | 312.3 | 297.4 | 314.9 | 283.2 | 302.1 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 205.8 | 198.4 | 192.1 | 189.6 | 183.3 | 192.1 | 196.6 | 201.0 | 193.5 | 191.7 |
| 90% PoE | 207.1 | 193.6 | 195.3 | 195.6 | 196.6 | 184.1 | 191.4 | 199.0 | 197.8 | 202.7 |
| 50% PoE | 212.2 | 198.4 | 200.4 | 200.5 | 202.2 | 187.9 | 196.0 | 203.3 | 202.2 | 208.2 |
| 10% PoE | 218.0 | 205.5 | 206.7 | 207.0 | 208.6 | 193.5 | 201.2 | 210.0 | 208.2 | 214.3 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 295.3 | 285.9 | 278.0 | 264.9 | 273.0 | 282.4 | 273.3 | 288.3 | 275.5 | 265.7 |
| 90% PoE | 270.5 | 283.3 | 254.0 | 264.8 | 270.5 | 273.2 | 263.0 | 278.7 | 252.3 | 266.6 |
| 50% PoE | 287.2 | 301.1 | 270.6 | 282.7 | 289.1 | 293.5 | 280.8 | 296.9 | 267.3 | 283.5 |
| 10% PoE | 306.9 | 321.8 | 287.8 | 301.1 | 310.6 | 312.3 | 297.4 | 314.9 | 283.2 | 302.1 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.186 SHTS average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.800 |
| Winter | 0.778 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

### 3.187 SHTS details of actual maxima

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 17-08-04 1:00 | 205.0 | 2.0 | 1.2 | 15.1 | 8.4 |
| 11-08-05 1:00 | 208.6 | 1.1 | -2.4 | 11.1 | 7.2 |
| 15-06-06 1:00 | 223.5 | -1.8 | -5.4 | 13.6 | 6.1 |
| 18-07-07 1:00 | 208.2 | 1.7 | -0.4 | 10.0 | 5.4 |
| 24-07-08 1:00 | 203.5 | -0.3 | -2.6 | 14.2 | 6.3 |
| 08-07-09 1:00 | 198.4 | 0.0 | -1.8 | 13.3 | 7.7 |
| 09-07-10 1:00 | 190.6 | 0.4 | -1.4 | 13.8 | 8.8 |
| 07-06-11 17:30 | 189.6 | 7.4 | 2.9 | 10.2 | 7.4 |
| 02-08-12 6:30 | 180.7 | -0.5 | -1.9 | 11.4 | 7.6 |
| 08-07-13 23:00 | 190.4 | 1.9 | 1.0 | 9.8 | 8.6 |
| 13-08-14 23:30 | 196.6 | 4.2 | 2.6 | 14.0 | 9.5 |
| 03-06-15 23:30 | 201.0 | 0.3 | -1.9 | 11.7 | 9.6 |
| 27-06-16 23:30 | 188.2 | 6.5 | 3.4 | 10.3 | 6.4 |
| 06-06-17 23:30 | 191.7 | 6.6 | 5.8 | 13.1 | 7.9 |

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Summer** | | | | | |
| 20-02-04 16:00 | 243.5 | 38.9 | 12.9 | 39.6 | 20.5 |
| 01-03-05 15:30 | 257.8 | 37.3 | 16.1 | 37.3 | 20.4 |
| 10-01-06 15:30 | 263.1 | 40.8 | 17.3 | 41.4 | 24.1 |
| 19-02-07 16:00 | 269.4 | 34.6 | 21.3 | 35.6 | 26.3 |
| 10-01-08 15:30 | 266.0 | 38.3 | 18.3 | 39.5 | 24.8 |
| 29-01-09 15:30 | 295.3 | 42.1 | 23.1 | 42.1 | 29.9 |
| 11-01-10 15:30 | 278.8 | 41.9 | 18.5 | 41.9 | 25.9 |
| 01-02-11 16:00 | 270.7 | 39.0 | 19.5 | 39.0 | 26.1 |
| 03-01-12 15:30 | 257.9 | 39.4 | 20.7 | 39.4 | 23.7 |
| 07-01-13 16:00 | 267.1 | 40.4 | 16.8 | 41.6 | 26.9 |
| 16-01-14 16:00 | 275.4 | 41.9 | 27.9 | 42.5 | 28.0 |
| 11-02-15 16:00 | 266.3 | 35.9 | 20.1 | 37.2 | 25.2 |
| 24-02-16 16:00 | 282.1 | 39.1 | 24.0 | 40.0 | 25.4 |
| 09-02-17 17:00 | 270.2 | 40.5 | 23.2 | 41.3 | 26.3 |
| 08-02-18 16:30 | 259.7 | 36.7 | 21.6 | 37.8 | 26.2 |

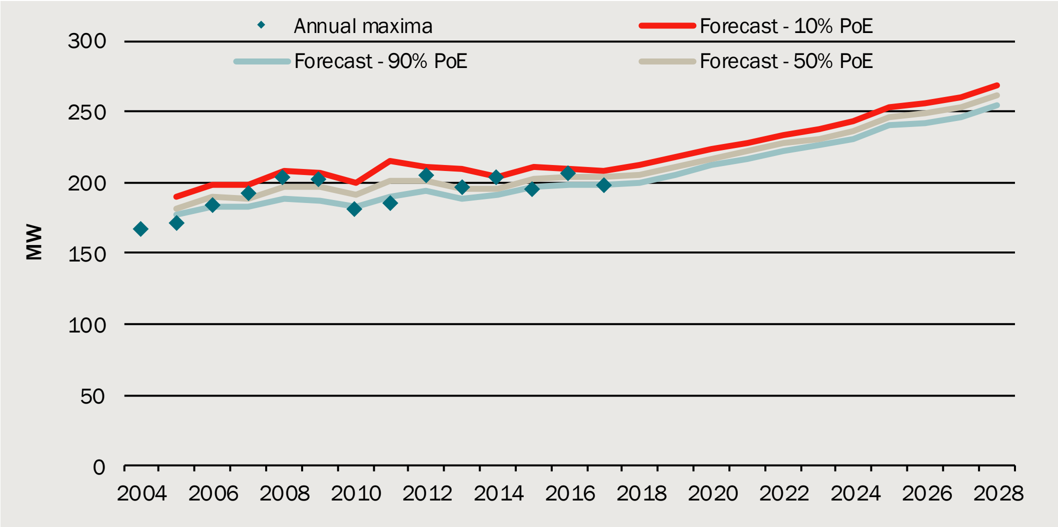
*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.

*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

## TGTS

The winter maximum demand model appears to overestimate peak demand, while the annual and summer models perform well.

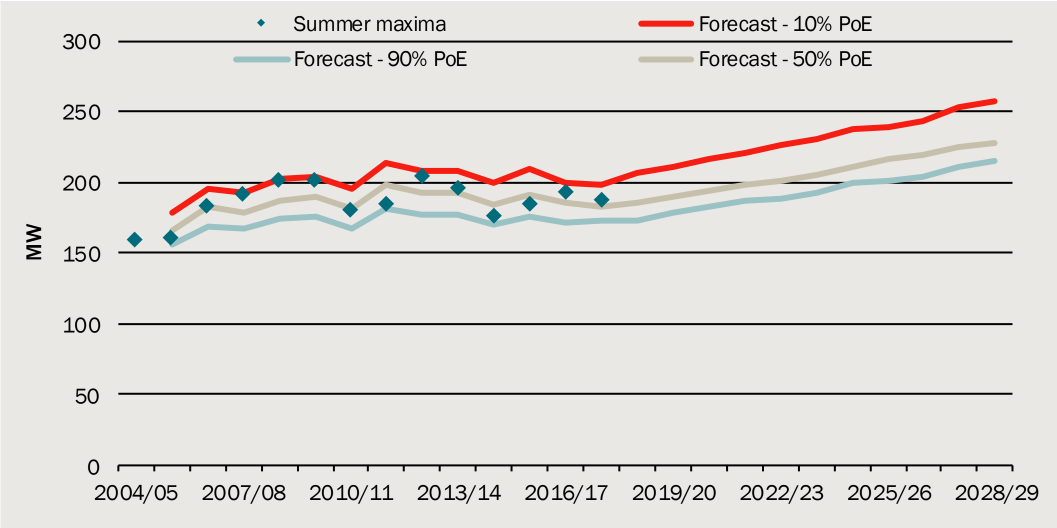
### 3.188 TGTS66 annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

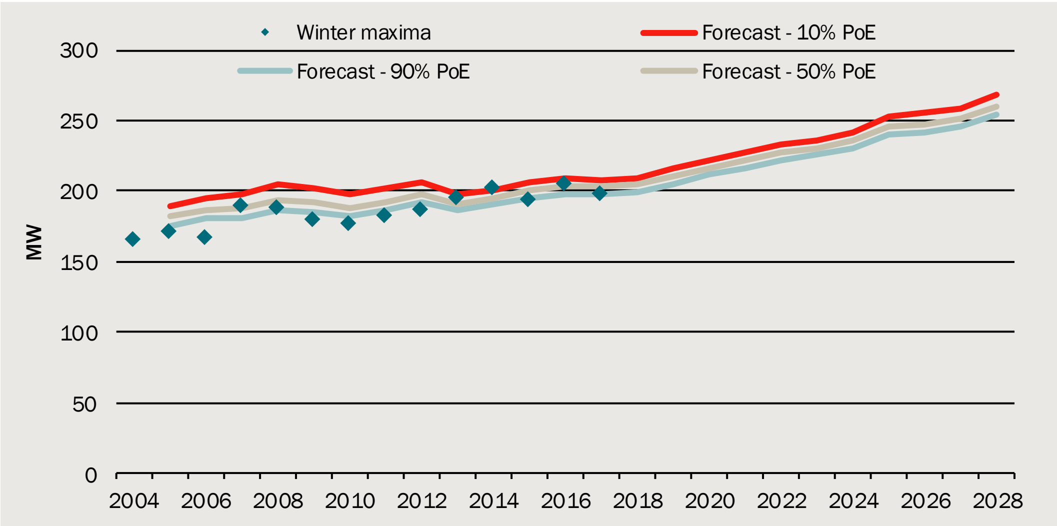
### 3.189 TGTS66 summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.190 TGTS66 winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 3.191 TGTS66 maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 173.4 | 179.5 | 183.3 | 186.9 | 189.0 | 193.3 | 199.8 | 201.1 | 204.4 | 211.5 | 214.9 |
| 50% PoE | 185.8 | 190.5 | 194.0 | 199.2 | 201.6 | 205.4 | 211.9 | 216.3 | 219.1 | 224.9 | 227.7 |
| 10% PoE | 206.5 | 211.1 | 217.0 | 221.1 | 226.3 | 230.7 | 238.3 | 240.1 | 243.9 | 252.8 | 257.8 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 199.8 | 205.3 | 211.6 | 216.8 | 222.2 | 225.4 | 230.8 | 239.9 | 242.2 | 246.2 | 254.4 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 50% PoE | 204.2 | 210.1 | 216.3 | 221.5 | 227.2 | 230.2 | 236.0 | 245.7 | 247.9 | 251.9 | 260.3 |
| 10% PoE | 209.7 | 215.8 | 222.3 | 227.4 | 233.2 | 235.9 | 241.9 | 252.6 | 255.5 | 258.5 | 267.9 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 200.1 | 205.7 | 211.8 | 217.1 | 222.6 | 225.8 | 231.2 | 240.3 | 242.4 | 246.6 | 254.8 |
| 50% PoE | 204.9 | 210.7 | 216.9 | 222.1 | 227.6 | 230.9 | 236.5 | 246.0 | 248.3 | 252.6 | 260.9 |
| 10% PoE | 211.8 | 217.4 | 223.7 | 228.5 | 234.0 | 237.2 | 243.7 | 252.8 | 256.3 | 260.7 | 268.7 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.192 TGTS66 maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 88.7 | 89.7 | 91.8 | 93.9 | 95.0 | 98.1 | 103.4 | 103.5 | 106.2 | 112.9 | 116.9 |
| 50% PoE | 99.5 | 99.3 | 101.2 | 104.7 | 106.0 | 108.7 | 113.9 | 116.8 | 119.1 | 124.7 | 128.2 |
| 10% PoE | 117.7 | 117.3 | 121.3 | 123.8 | 127.6 | 130.8 | 137.1 | 137.6 | 140.7 | 149.1 | 154.5 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 114.3 | 115.0 | 119.7 | 123.3 | 127.6 | 129.9 | 134.4 | 141.6 | 143.6 | 147.8 | 156.3 |
| 50% PoE | 118.4 | 119.5 | 124.0 | 127.6 | 132.2 | 134.3 | 139.1 | 146.9 | 148.8 | 153.0 | 161.7 |
| 10% PoE | 123.4 | 124.7 | 129.5 | 133.0 | 137.6 | 139.5 | 144.5 | 153.2 | 155.8 | 159.1 | 168.7 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 112.1 | 112.6 | 116.8 | 120.4 | 124.4 | 126.5 | 130.8 | 137.8 | 139.5 | 143.7 | 151.9 |
| 50% PoE | 116.2 | 117.0 | 121.3 | 124.7 | 128.8 | 131.0 | 135.5 | 142.8 | 144.6 | 149.0 | 157.2 |
| 10% PoE | 122.3 | 122.8 | 127.2 | 130.4 | 134.4 | 136.5 | 141.8 | 148.7 | 151.7 | 156.0 | 164.1 |

*Note:* All forecasts are in MW.

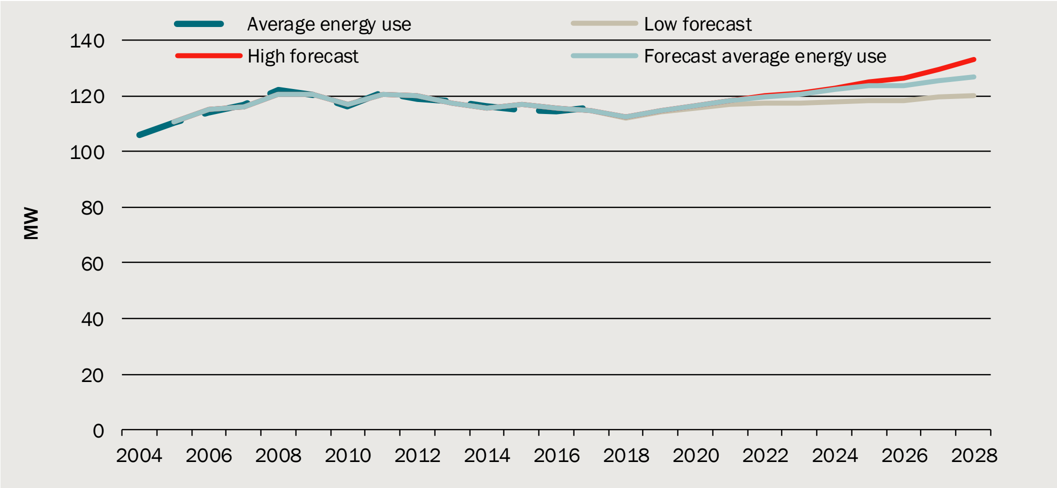
*Source:* Powercor terminal station data, The CIE.

### 3.193 TGTS66 average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate ECM | -0.0732 |
| Income | The CIE estimate ECM | 0.6947 |

*Source:* Powercor terminal station data, The CIE.

### 3.194 TGTS66 average demand forecasts




*Data source:* Powercor terminal station data, The CIE.

### 3.195 TGTS66 predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 202.7 | 202.6 | 180.8 | 185.1 | 205.2 | 196.4 | 176.7 | 184.9 | 193.4 | 187.8 |
| 90% PoE | 175.1 | 175.9 | 167.8 | 181.1 | 177.8 | 176.8 | 170.3 | 176.6 | 172.4 | 173.8 |
| 50% PoE | 187.3 | 189.8 | 181.6 | 197.9 | 192.6 | 192.4 | 185.1 | 191.6 | 185.6 | 182.7 |
| 10% PoE | 203.2 | 204.6 | 196.2 | 214.5 | 208.2 | 208.9 | 200.4 | 209.5 | 200.4 | 199.0 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 188.8 | 180.2 | 177.1 | 183.0 | 186.9 | 196.3 | 202.8 | 194.7 | 205.5 | 198.2 |
| 90% PoE | 187.0 | 185.2 | 182.3 | 186.8 | 192.2 | 186.8 | 190.2 | 195.4 | 198.3 | 198.4 |
| 50% PoE | 194.3 | 192.0 | 188.4 | 192.7 | 197.5 | 191.4 | 195.1 | 200.2 | 203.0 | 203.1 |
| 10% PoE | 205.5 | 201.9 | 198.0 | 202.6 | 206.7 | 197.6 | 200.9 | 206.3 | 208.9 | 208.4 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 202.7 | 202.6 | 180.8 | 185.1 | 205.2 | 196.4 | 202.8 | 194.7 | 205.5 | 198.2 |
| 90% PoE | 189.3 | 187.7 | 183.6 | 190.2 | 193.5 | 188.7 | 191.1 | 196.3 | 198.4 | 198.6 |
| 50% PoE | 196.8 | 196.3 | 190.8 | 201.1 | 200.6 | 195.8 | 196.3 | 202.0 | 203.4 | 203.4 |
| 10% PoE | 208.0 | 206.8 | 200.4 | 215.2 | 211.5 | 208.9 | 204.0 | 210.6 | 209.5 | 208.8 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 3.196 TGTS66 average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.570 |
| Winter | 0.529 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

### 3.197 TGTS66 details of actual maxima

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 18-08-04 0:30 | 166.5 | 3.2 | 1.0 | 11.7 | 8.1 |
| 28-06-05 7:30 | 167.0 | 2.7 | 1.4 | 13.8 | 8.4 |
| 27-06-06 17:30 | 166.4 | 8.6 | 3.8 | 11.4 | 8.7 |
| 25-06-07 17:30 | 168.8 | 9.1 | 5.6 | 10.7 | 9.2 |
| 16-07-08 8:00 | 179.2 | 4.3 | 3.6 | 12.9 | 8.5 |
| 14-07-09 18:00 | 168.6 | 7.4 | 3.9 | 10.4 | 8.9 |
| 05-07-10 17:30 | 174.0 | 8.4 | 2.9 | 10.6 | 7.6 |
| 26-07-11 8:00 | 173.9 | 6.9 | 4.3 | 11.4 | 8.6 |
| 05-07-12 23:00 | 180.0 | 6.8 | 2.9 | 12.1 | 8.1 |
| 08-07-13 23:00 | 182.2 | 2.6 | 2.0 | 12.1 | 9.5 |
| 21-07-14 23:30 | 188.9 | 3.5 | 2.0 | 11.1 | 7.4 |
| 31-08-15 23:30 | 180.2 | 4.1 | 3.0 | 10.9 | 8.4 |
| 14-06-16 23:30 | 175.4 | 4.0 | 3.2 | 13.6 | 8.4 |
| 03-08-17 23:30 | 180.2 | 4.9 | 2.1 | 8.2 | 7.9 |
| **Summer** | | | | | |
| 29-01-04 0:30 | 166.3 | 11.9 | 10.9 | 20.1 | 15.2 |
| 09-11-04 6:00 | 157.7 | 7.2 | 6.5 | 16.8 | 11.3 |
| 16-11-05 6:00 | 151.2 | 7.3 | 6.8 | 19.8 | 14.1 |
| 24-11-06 6:30 | 182.9 | 8.4 | 4.5 | 23.2 | 17.2 |
| 17-03-08 15:30 | 180.1 | 38.3 | 20.1 | 39.9 | 23.8 |
| 29-01-09 16:00 | 200.4 | 37.3 | 24.3 | 42.3 | 25.0 |
| 09-12-09 6:30 | 179.9 | 10.2 | 5.9 | 23.0 | 14.4 |
| 26-11-10 6:30 | 175.5 | 13.1 | 12.3 | 21.4 | 15.3 |
| 23-01-12 17:00 | 168.3 | 32.9 | 18.9 | 34.4 | 22.6 |
| 29-11-12 15:30 | 174.2 | 34.0 | 17.3 | 37.6 | 19.0 |
| 16-01-14 17:00 | 186.4 | 38.2 | 20.6 | 42.3 | 22.5 |
| 18-11-14 23:30 | 170.5 | 7.2 | 6.8 | 18.0 | 14.7 |
| 02-12-15 23:30 | 162.8 | 10.9 | 4.0 | 17.5 | 12.6 |
| 28-11-16 6:30 | 168.0 | 9.1 | 4.4 | 19.8 | 13.0 |
| 28-01-18 17:00 | 178.6 | 37.3 | 21.6 | 39.5 | 20.9 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.

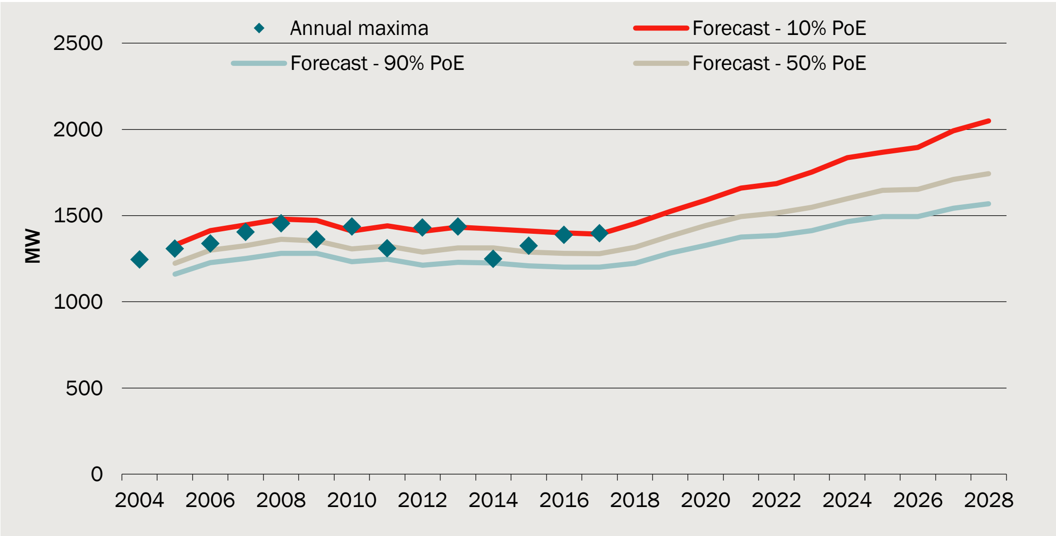
*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

# 4 CitiPower forecasts

## Total network forecasts

The annual and summer demand models for total CitiPower perform well and the winter model generally understates the peak demand, particularly in early years. Maximum demand forecasts for the Total CitiPower network are the coincident network-wide maxima, rather than the summation of individual terminal station maxima.

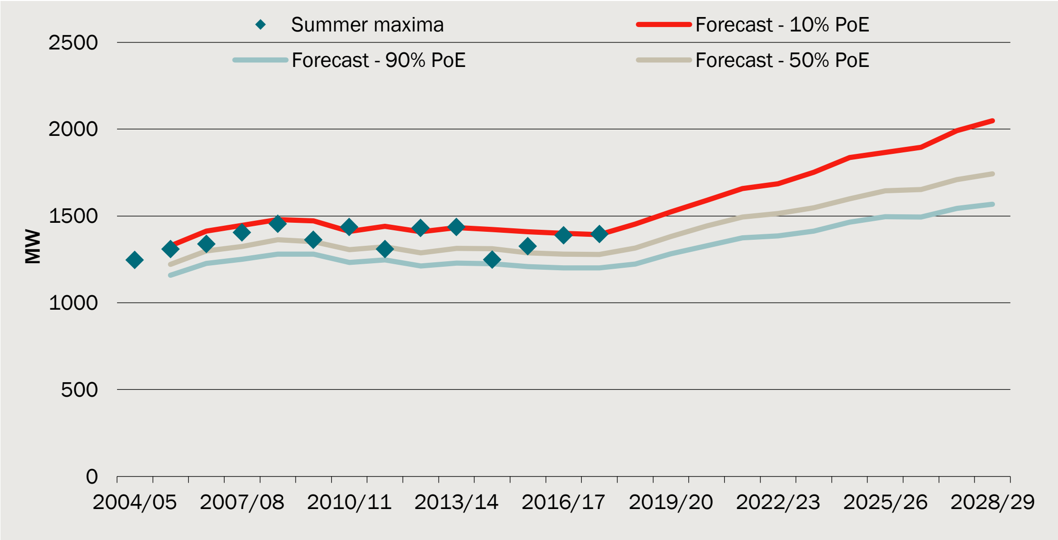
### 4.1 Total CitiPower annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

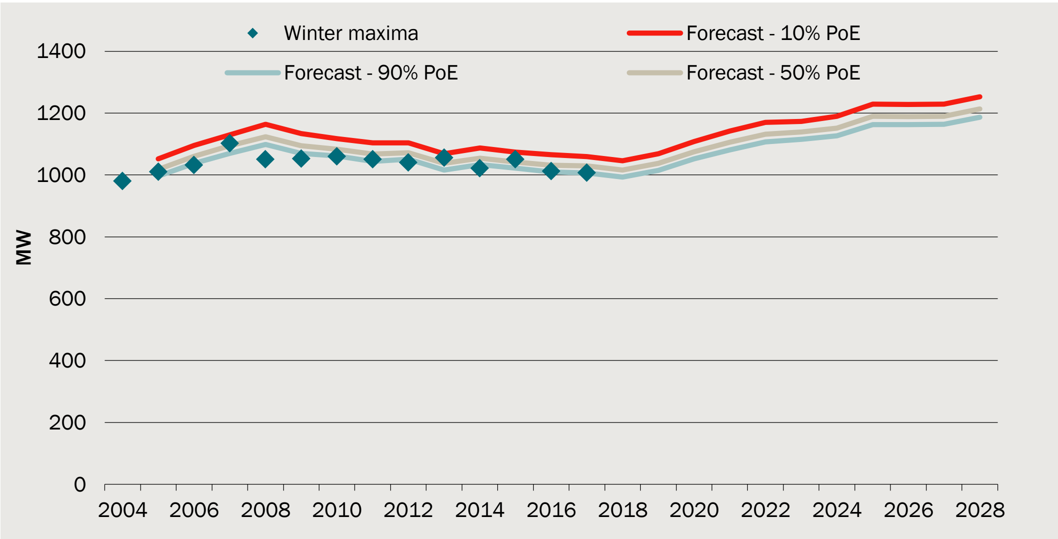
*Data source:* The CIE.

### 4.2 Total CitiPower summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

### 4.3 Total CitiPower winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 4.4 Total CitiPower maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 1222.9 | 1282.4 | 1327.3 | 1374.8 | 1384.7 | 1412.7 | 1465.4 | 1495.2 | 1493.7 | 1543.1 | 1568.5 |
| 50% PoE | 1316.0 | 1380.8 | 1442.8 | 1493.5 | 1513.9 | 1548.4 | 1598.3 | 1645.7 | 1652.6 | 1708.9 | 1742.2 |
| 10% PoE | 1453.3 | 1523.6 | 1589.5 | 1658.7 | 1684.8 | 1751.6 | 1836.6 | 1867.1 | 1895.2 | 1991.8 | 2048.9 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 993.5 | 1015.1 | 1051.8 | 1080.9 | 1106.9 | 1115.4 | 1126.9 | 1162.5 | 1162.2 | 1163.4 | 1186.2 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 50% PoE | 1016.1 | 1037.2 | 1074.7 | 1106.0 | 1132.1 | 1139.1 | 1151.6 | 1189.5 | 1188.6 | 1190.0 | 1213.4 |
| 10% PoE | 1045.7 | 1068.6 | 1108.2 | 1142.0 | 1169.6 | 1173.3 | 1189.7 | 1228.9 | 1227.9 | 1228.5 | 1252.4 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 1222.9 | 1282.4 | 1327.4 | 1374.8 | 1384.7 | 1412.7 | 1465.4 | 1495.2 | 1493.7 | 1543.1 | 1568.5 |
| 50% PoE | 1316.0 | 1380.8 | 1442.8 | 1493.5 | 1513.9 | 1548.4 | 1598.3 | 1645.7 | 1652.6 | 1708.9 | 1742.2 |
| 10% PoE | 1453.3 | 1523.6 | 1589.5 | 1658.7 | 1684.8 | 1751.6 | 1836.6 | 1867.1 | 1895.2 | 1991.8 | 2048.9 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 4.5 Total CitiPower maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 1237.7 | 1262.6 | 1300.5 | 1334.1 | 1332.4 | 1326.8 | 1365.7 | 1368.0 | 1346.4 | 1375.8 | 1376.7 |
| 50% PoE | 1329.2 | 1359.3 | 1414.0 | 1450.7 | 1459.4 | 1460.1 | 1496.3 | 1515.9 | 1502.5 | 1538.6 | 1547.4 |
| 10% PoE | 1464.2 | 1499.6 | 1558.2 | 1613.1 | 1627.3 | 1659.8 | 1730.4 | 1733.4 | 1740.9 | 1816.7 | 1848.7 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 980.4 | 1001.9 | 1034.0 | 1052.7 | 1067.2 | 1063.6 | 1042.1 | 1050.4 | 1030.0 | 1012.3 | 1010.1 |
| 50% PoE | 1002.6 | 1023.7 | 1056.6 | 1077.4 | 1092.0 | 1086.9 | 1066.5 | 1077.0 | 1055.9 | 1038.5 | 1036.8 |
| 10% PoE | 1031.8 | 1054.7 | 1089.6 | 1112.8 | 1129.0 | 1120.6 | 1104.1 | 1115.8 | 1094.7 | 1076.3 | 1075.2 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 1237.7 | 1262.6 | 1300.6 | 1334.1 | 1332.4 | 1326.8 | 1365.7 | 1368.0 | 1346.4 | 1375.8 | 1376.7 |
| 50% PoE | 1329.2 | 1359.3 | 1414.0 | 1450.7 | 1459.4 | 1460.1 | 1496.3 | 1515.9 | 1502.5 | 1538.6 | 1547.4 |
| 10% PoE | 1464.2 | 1499.6 | 1558.2 | 1613.1 | 1627.3 | 1659.8 | 1730.4 | 1733.4 | 1740.9 | 1816.7 | 1848.7 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

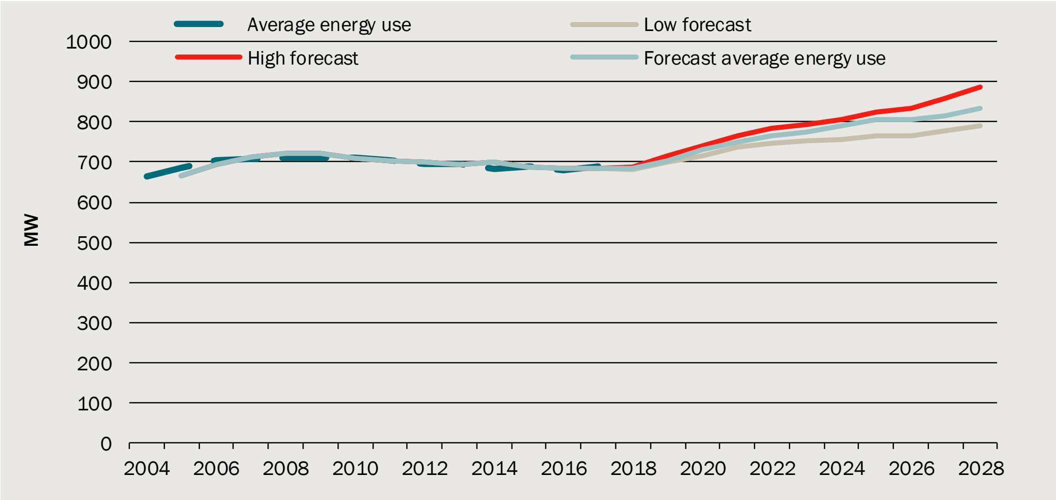
The average demand model was estimated using the long run relationship only, as the coefficient on the error correction term was less than -1.

### 4.6 Total CitiPower average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate long run model only | -0.1759 |
| Income | AEMO constrained long run model only | 0.1736 |

*Source:* CitiPower terminal station data, The CIE.

## 4.7 Total CitiPower average demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

## 4.8 Total CitiPower predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 1454.5 | 1362.2 | 1435.7 | 1308.9 | 1430.7 | 1435.9 | 1248.2 | 1325.1 | 1387.5 | 1396.1 |
| 90% PoE | 1280.3 | 1280.2 | 1231.8 | 1246.6 | 1211.9 | 1228.8 | 1224.8 | 1209.0 | 1200.1 | 1200.3 |
| 50% PoE | 1362.6 | 1352.7 | 1305.6 | 1322.8 | 1287.4 | 1313.0 | 1311.2 | 1287.3 | 1280.3 | 1278.6 |
| 10% PoE | 1479.6 | 1472.8 | 1411.2 | 1440.9 | 1409.4 | 1433.8 | 1422.4 | 1410.2 | 1399.9 | 1392.3 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 1050.2 | 1052.9 | 1060.2 | 1050.0 | 1040.0 | 1055.9 | 1021.2 | 1050.5 | 1012.3 | 1007.0 |
| 90% PoE | 1098.8 | 1069.3 | 1060.9 | 1044.0 | 1050.9 | 1015.7 | 1032.8 | 1021.6 | 1009.4 | 1006.7 |
| 50% PoE | 1123.9 | 1094.6 | 1083.5 | 1067.5 | 1071.8 | 1037.2 | 1054.2 | 1041.3 | 1031.3 | 1029.2 |
| 10% PoE | 1163.5 | 1134.1 | 1117.0 | 1103.5 | 1104.0 | 1068.1 | 1086.8 | 1073.3 | 1065.1 | 1059.4 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 1454.5 | 1362.2 | 1435.7 | 1308.9 | 1430.7 | 1435.9 | 1248.2 | 1325.1 | 1387.5 | 1396.1 |
| 90% PoE | 1280.3 | 1280.2 | 1232.0 | 1247.0 | 1211.9 | 1228.8 | 1225.0 | 1209.0 | 1200.1 | 1200.4 |
| 50% PoE | 1362.7 | 1353.2 | 1306.9 | 1324.1 | 1287.7 | 1313.0 | 1311.9 | 1287.3 | 1280.6 | 1278.7 |
| 10% PoE | 1479.6 | 1472.8 | 1411.2 | 1440.9 | 1409.4 | 1433.8 | 1422.4 | 1410.2 | 1399.9 | 1392.3 |

*Note:* All forecasts are in MW.
*Source:* Powercor terminal station data, The CIE.

## 4.9 Total CitiPower average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.888 |
| Winter | 0.885 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.
Source: Powercor terminal station data, The CIE.

### 4.10 Total CitiPower details of actual maxima

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 13-07-04 13:00 | 979.9 | 12.4 | 8.5 | 12.7 | 11.3 |
| 10-08-05 11:00 | 1010.3 | 7.9 | 4.7 | 10.1 | 10.2 |
| 05-06-06 9:30 | 1031.5 | 5.4 | 3.8 | 11.0 | 9.0 |
| 17-07-07 13:00 | 1101.7 | 6.1 | 5.0 | 9.6 | 8.4 |
| 29-07-08 9:00 | 1050.2 | 4.8 | 3.4 | 14.1 | 10.8 |
| 10-06-09 10:00 | 1052.9 | 8.0 | 5.7 | 12.5 | 11.1 |
| 29-06-10 13:00 | 1060.2 | 7.9 | 7.6 | 10.7 | 9.8 |
| 08-06-11 9:00 | 1050.0 | 6.8 | 5.1 | 11.6 | 11.2 |
| 08-08-12 13:00 | 1040.0 | 8.8 | 8.6 | 12.1 | 11.2 |
| 24-06-13 10:30 | 1055.9 | 5.7 | 2.2 | 12.0 | 9.1 |
| 04-08-14 9:00 | 1021.2 | 4.4 | 1.9 | 15.2 | 10.6 |
| 14-07-15 17:30 | 1050.5 | 7.3 | 6.7 | 9.7 | 9.4 |
| 27-06-16 11:00 | 1012.3 | 8.6 | 6.8 | 10.4 | 9.3 |
| 03-08-17 17:30 | 1007.0 | 8.5 | 3.1 | 8.9 | 9.7 |
| **Summer** | | | | | |
| 04-03-04 15:00 | 1158.8 | 33.7 | 19.1 | 34.4 | 19.5 |
| 01-03-05 13:30 | 1245.5 | 35.0 | 18.2 | 35.0 | 20.0 |
| 27-01-06 12:00 | 1308.0 | 34.5 | 21.5 | 35.0 | 25.2 |
| 23-03-07 13:00 | 1338.4 | 35.6 | 21.0 | 37.1 | 21.1 |
| 17-03-08 15:00 | 1404.9 | 37.8 | 20.9 | 37.8 | 25.6 |
| 29-01-09 12:00 | 1454.5 | 41.4 | 29.1 | 43.7 | 27.9 |
| 12-01-10 13:00 | 1362.2 | 32.3 | 17.6 | 34.8 | 24.7 |
| 01-02-11 13:00 | 1435.7 | 39.4 | 18.9 | 39.4 | 24.6 |
| 30-01-12 13:00 | 1308.9 | 31.4 | 16.5 | 31.8 | 22.0 |
| 12-03-13 15:00 | 1430.7 | 35.3 | 24.3 | 36.0 | 20.7 |
| 17-01-14 13:00 | 1435.9 | 41.2 | 23.6 | 43.1 | 26.3 |
| 22-01-15 15:00 | 1248.2 | 34.4 | 18.8 | 35.0 | 19.5 |
| 13-01-16 15:30 | 1325.1 | 40.7 | 17.0 | 41.6 | 22.2 |
| 09-02-17 12:30 | 1387.5 | 34.5 | 20.1 | 34.5 | 23.2 |
| 29-01-18 12:00 | 1396.1 | 33.2 | 18.9 | 33.2 | 19.5 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.

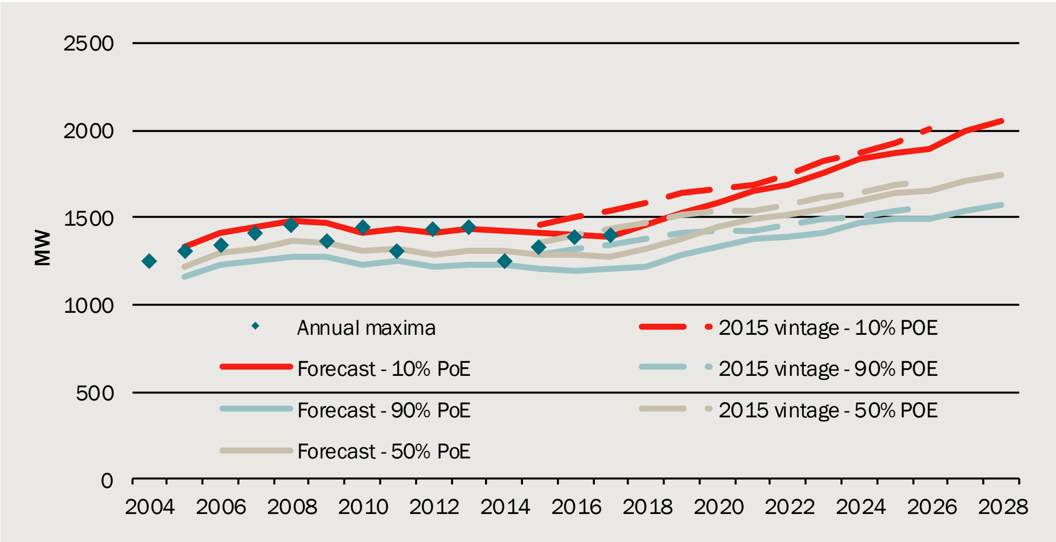
*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

## *Comparison to 2015 forecasts and AEMO forecasts*

In the following section we compared maximum demand forecasts to 2015 forecasts prepared by the CIE and 2018 forecasts prepared by AEMO.

The updated CIE forecasts are significantly lower than the 2015 forecasts, reflecting weaker demand than expected over the past few years. This is largely due to average demand forecasts from 2015 being significantly higher than actuals. Growth rates are also lower compared to the 2015 forecasts.

### 4.11 CitiPower maximum demand compared to 2015 forecasts

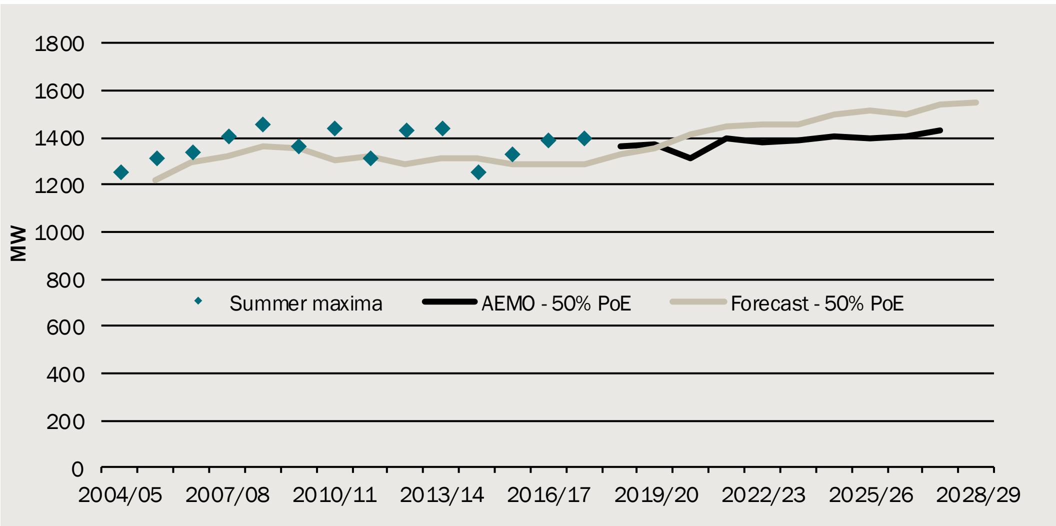



*Note:* Does not include block load adjustments.

*Data source:* CitiPower, The CIE.

The growth rates of the CIE forecast is slightly stronger than AEMO's (chart 4.12).

### 4.12 CitiPower maximum demand compared to AEMO

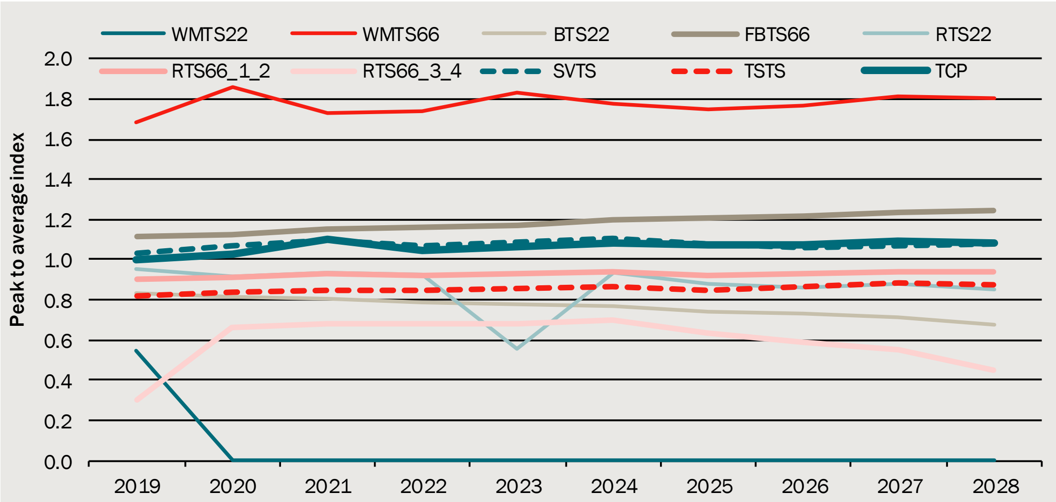



*Note:* Includes block load adjustments.

*Data source:* CitiPower, AEMO, The CIE.

Across terminal stations there is significant variation in the ratio of CIE forecasts to AEMO forecasts. The ratios are generally stable, indicating similar growth rates between the two sets of forecasts, however in some instances there are large differences between the level of forecasts. It is not immediately clear why there should be a level difference in forecasts. In some cases, the deviations in forecasts appear to be due to slight differences in the timing of block load transfers (i.e. for RTS22 in 2023, WMTS22 and RTS66 transformers 3 and 4).

#### 4.13 Ratio of CIE forecasts to AEMO forecasts




*Note:* Includes block load adjustments.

*Data source:* CitiPower, AEMO, The CIE.

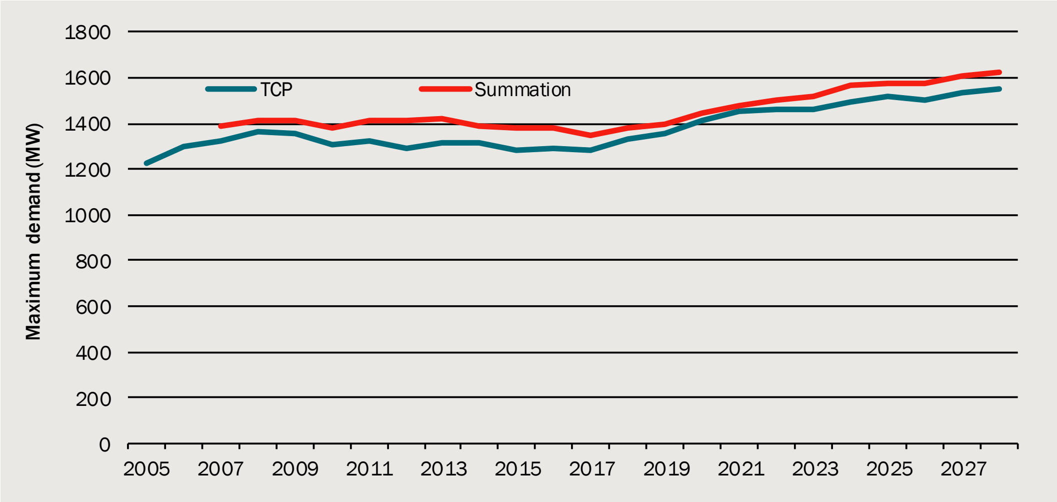
## *CitiPower reconciliation*

We reconcile the individual terminal station demand forecasts with the forecast for total CitiPower network demand. This provides a way to verify that the forecasts are sensible and that the individual terminal station forecasts are not biased.

The summation of terminal station maximum demand should be greater than total CitiPower maximum demand as peaks will occur at different times for different terminal stations. If individual terminal stations all peaked at the same time, the summation of individual terminal station maximum demand would be equal to the maximum demand for total CitiPower.

Chart 4.14 compares the summation of terminal station summation to the CitiPower maximum. Over the history the gap is relatively stable, however into the near future this closes significantly before widening later in the forecast horizon. These differences likely reflect differing treatment of trends in temperature sensitivity across terminal stations.

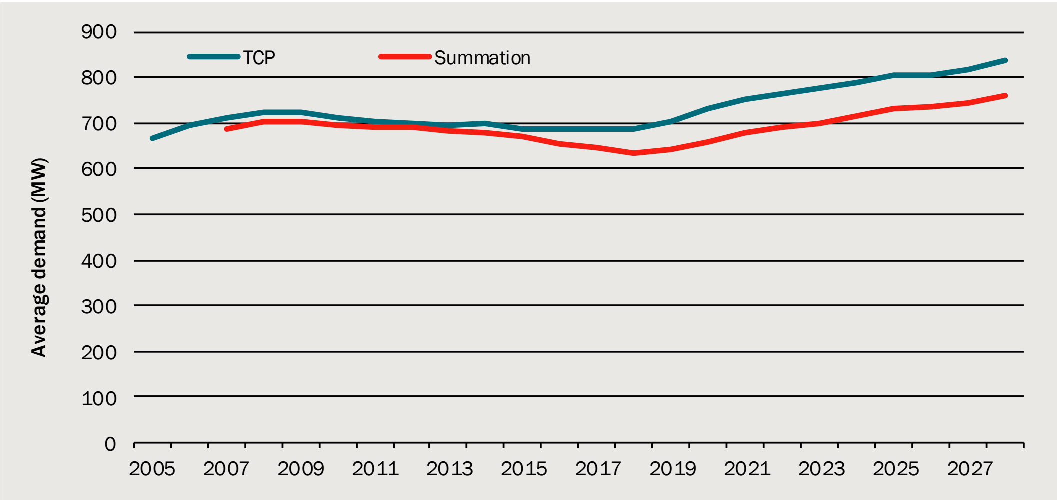
### 4.14 Sum of TS max demand reconciliation to total CitiPower




*Data source:* The CIE.

Chart 4.15 shows the comparison of the summation of terminal station average demand and CitiPower average demand. Differences between the summation of terminal station average demand and CitiPower average demand may be due to slight measurement error.

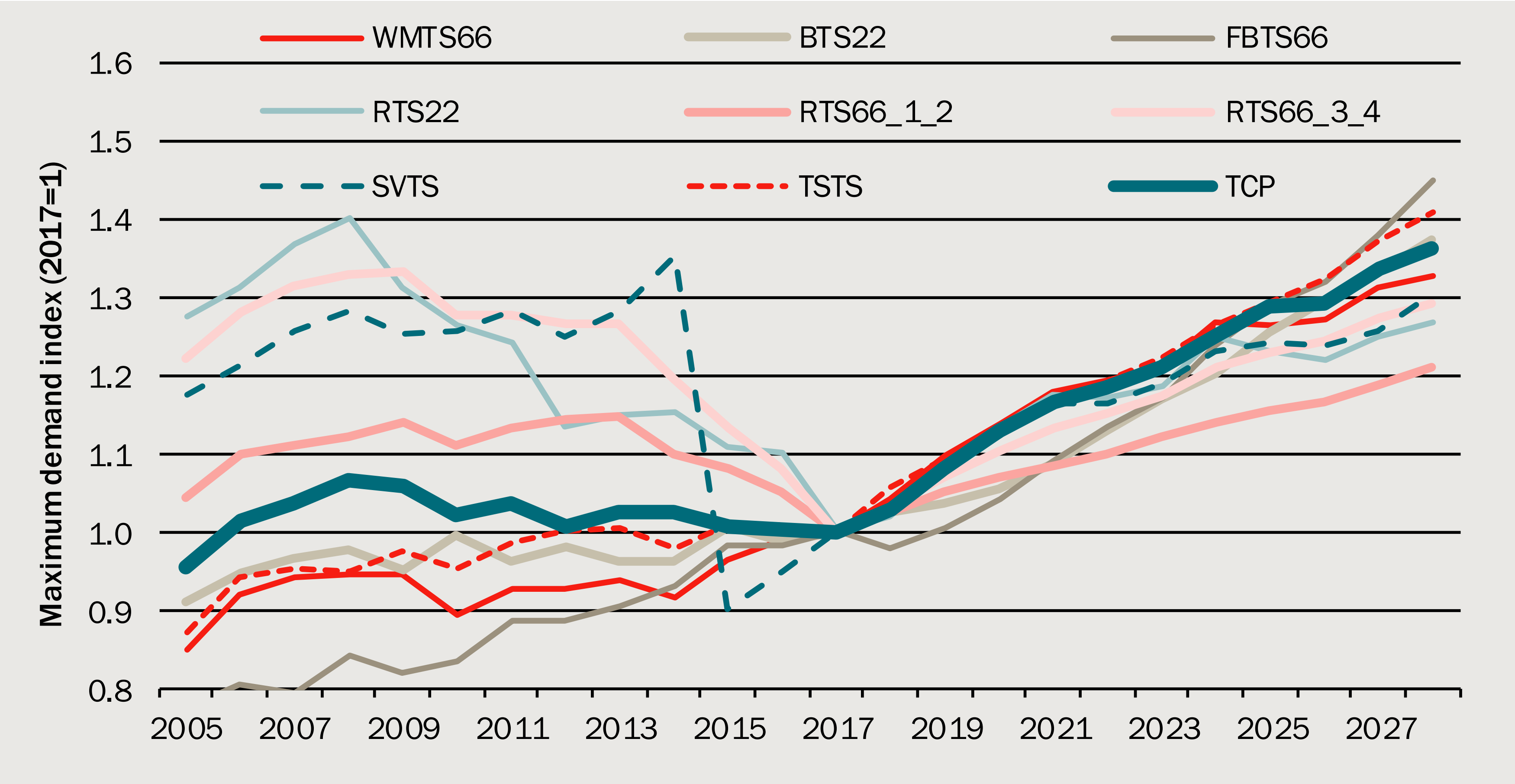
### 4.15 Sum of TS average demand reconciliation to total CitiPower




*Data source:* The CIE.

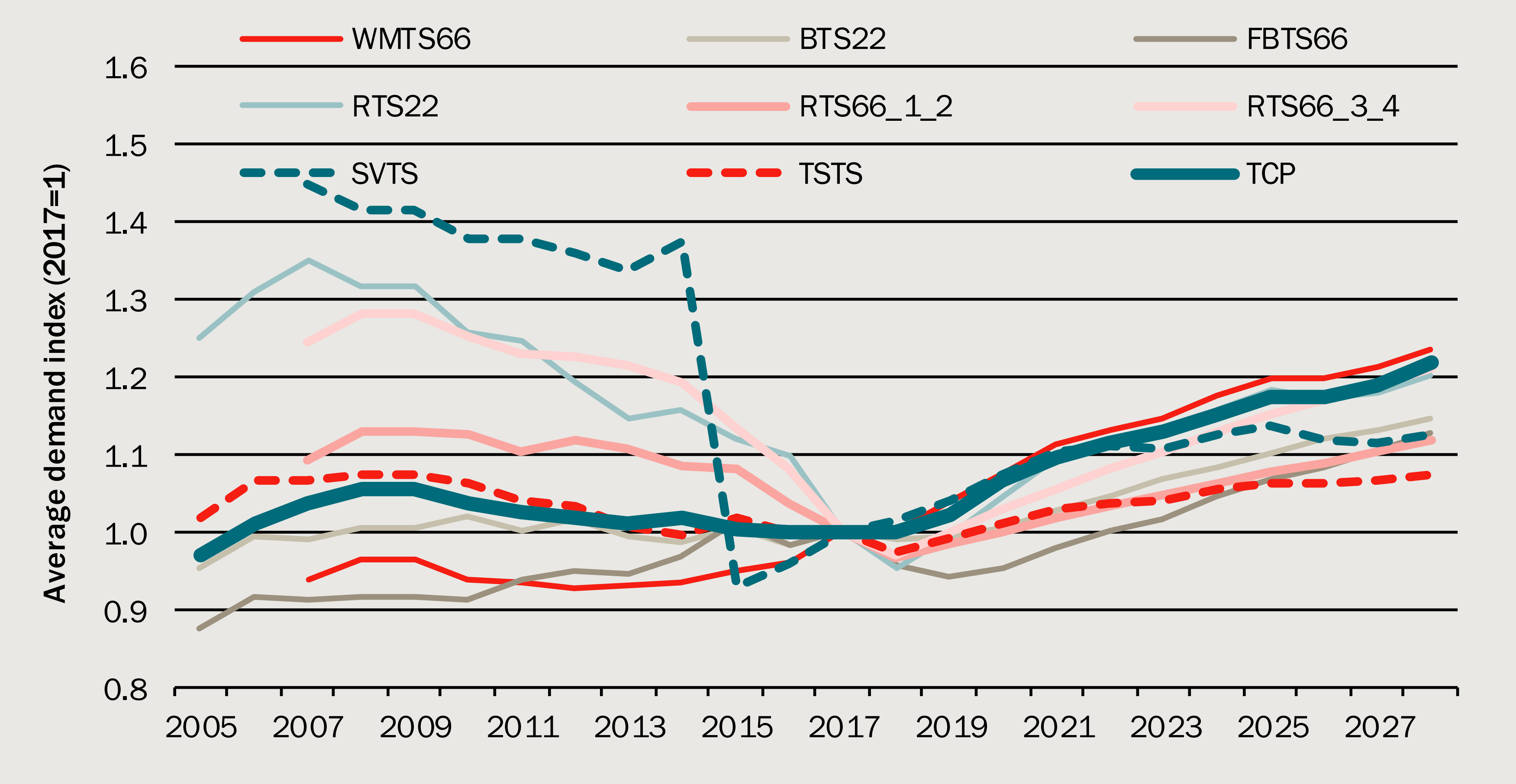
The following charts provide comparisons of actual and forecast maximum demand, average demand and the peak-to average ratio for total Powercor and individual terminal stations. CitiPower should be roughly around the average level of growth in each measure. From these charts it appears that CitiPower grows slightly stronger than the average, which may reflect the different treatments of temperature sensitivity across terminal stations.

**4.16 Maximum demand reconciliation – CitiPower**



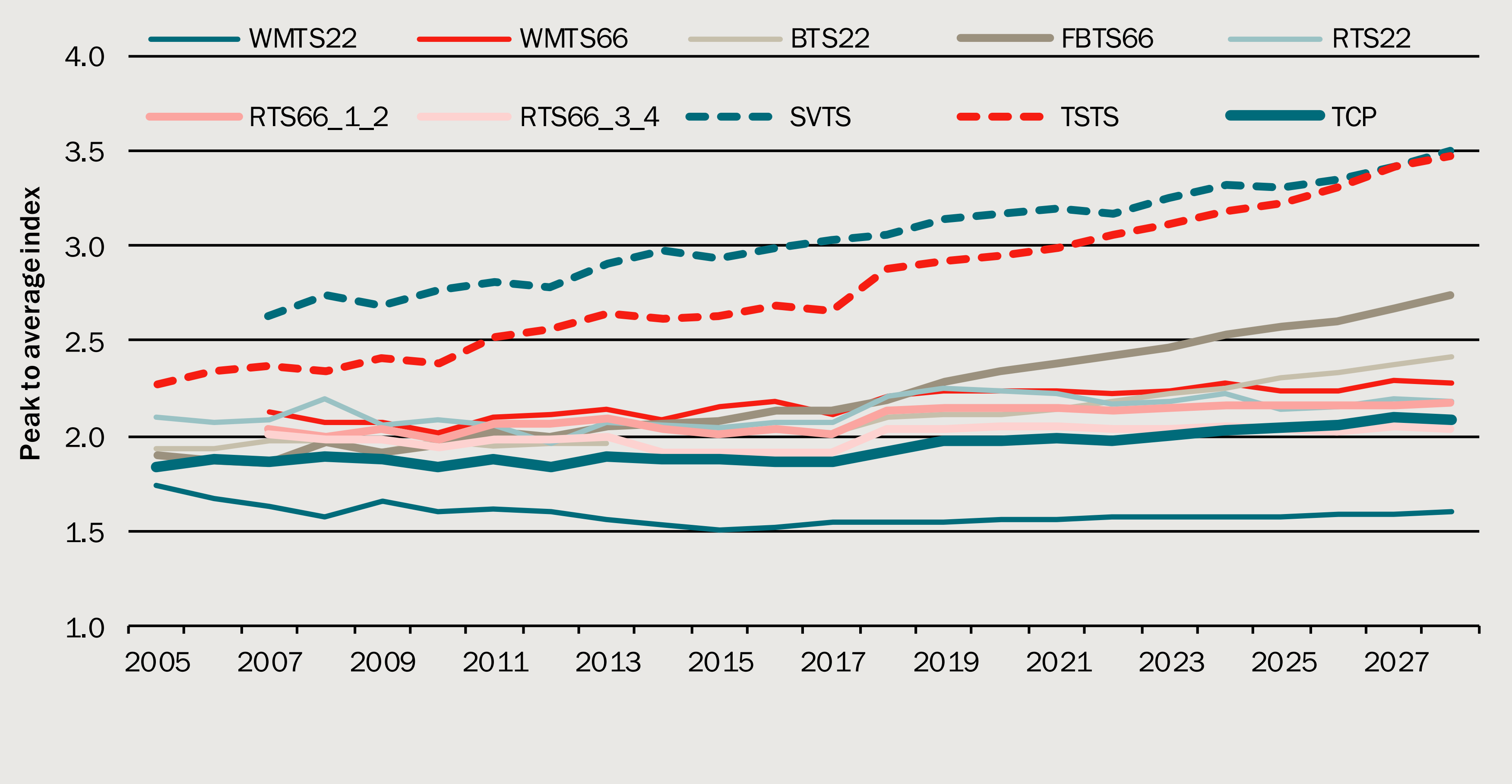

*Note:* WMTS22 exclude from graph.

### 4.17 Average demand reconciliation – CitiPower




*Note:* WMTS22 exlcuded from graph.

**4.18 Peak-to-average demand ratio reconciliation - CitiPower**




*Data source:* The CIE.

## *Differences between terminal stations*

Table 4.19 summarises the differences between terminal station forecasts for a range of forecast variables and the impact of income and electricity prices on average and maximum demand forecasts we have prepared.

Average and peak demand, before post modelling adjustments, is expected to grow across all terminal stations. This differs from the historical period, as electricity prices are expected to fall, whereas historically prices have increased strongly. Peak demand is expected to grow more rapidly than average, reflecting increasing temperature sensitivity in some cases, and increasing temperatures across terminal stations.

Overall maximum demand growth is lower following post-modelling adjustment for the CitiPower network, as negative block load adjustments (reduced industrial demand and solar PV etc.) than offsets positive block load adjustments (from new industrial demand and electric vehicles).

Per capita average demand is expected to remain relatively flat. Accordingly, average demand growth tends to reflect population growth (terminal stations with higher population growth tend to have higher average demand growth).

### 4.19 Impact of variables by TS relative to impact on total CitiPower

| Terminal Station | Average demand growth | Peak demand growth | Peak demand growth including post-modelling adjustments | Per capita average demand growth | Population growth |
|---|---|---|---|---|---|
| | Per cent | Per cent | Per cent | Per cent | Per cent |
| **Total CitiPower** | **2.0** | **2.8** | **1.5** | **0.3** | **1.7** |
| WMTS22 | 1.8 | 2.2 | NA | -1.6 | 1.8 |
| WMTS66 | 2.1 | 2.4 | 2.7 | 0.3 | 3.4 |
| BTS22 | 1.5 | 3.0 | -0.6 | -0.1 | 1.6 |
| BTS66 [a] | NA | NA | -0.5 | NA | 3.4 |
| FBTS66 | 1.7 | 4.0 | 3.3 | -0.7 | 2.4 |
| RTS22 | 2.4 | 2.2 | -5.4 | 0.4 | 2.0 |
| RTS66 1 & 2 | 1.5 | 1.7 | 1.0 | 0.2 | 1.3 |
| RTS66 3 & 4 | 2.3 | 2.3 | NA | 0.3 | 2.0 |
| SVTS | 1.1 | 2.4 | 0.5 | 0.3 | 0.8 |
| TSTS | 1.0 | 2.9 | 1.6 | 0.3 | 0.8 |

[a] Estimates for BTS66 are based on load transfers from other terminal stations. Terminal station specific average demand and maximum demand models are not estimated for BTS66.

*Note:* Growth rates are from 2018 to 2028 for all terminal stations except BTS66, which is calculated over 2019 to 2028.

*Source:* The CIE.

## *Terminal station forecasts reporting structure*

For each terminal station, we set out, in a consistent format:

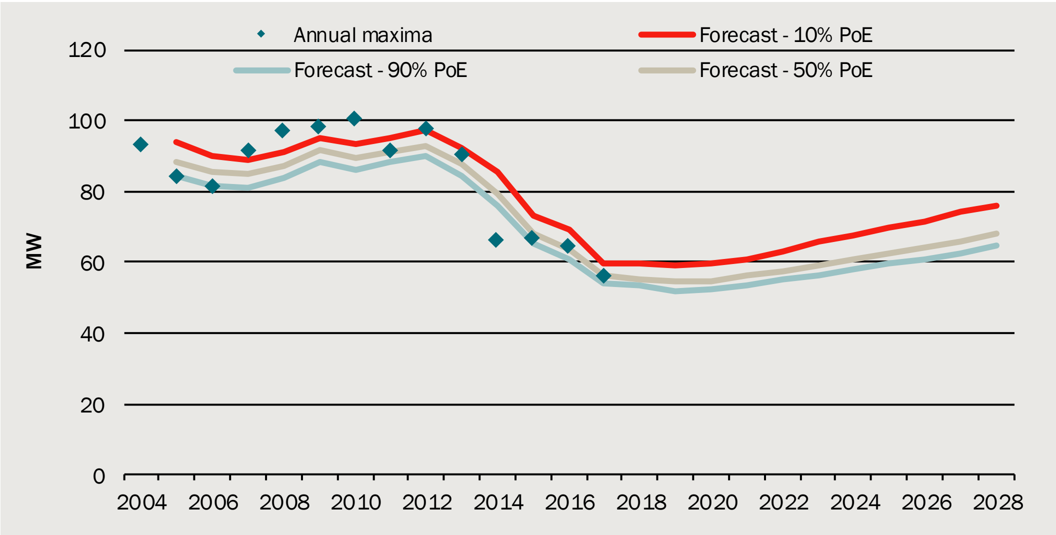
- charts showing forecasts of annual, summer and winter peak demand — these are before adjustments for block loads
- tables showing the annual, summer and winter forecasts prior to making post-modelling adjustments and after making post-modelling adjustments (post-modelling adjustments are made for industrial load, PV generation and block loads where applicable)
- the key coefficients used from the half hourly model and whether these are estimated for the terminal station or the AEMO coefficients for Victoria
- a chart of average demand forecasts
- a table showing actual and predicted maximum demand during the historical period
- the statistical average performance of the half hourly models, and
- a list of historical maxima that have occurred.

Where any other adjustments have been made these are detailed in the text.

## *WMTS22*

The average demand model for WMTS22 was estimated excluding data for 2014, due to load transfers between terminal stations.

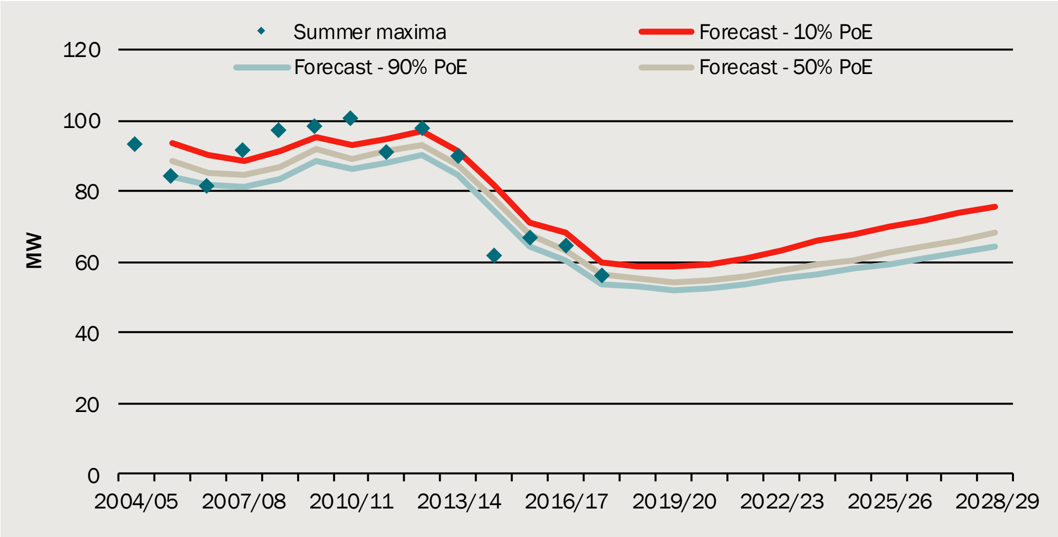
**4.20 WMTS22 annual maximum demand forecasts**




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

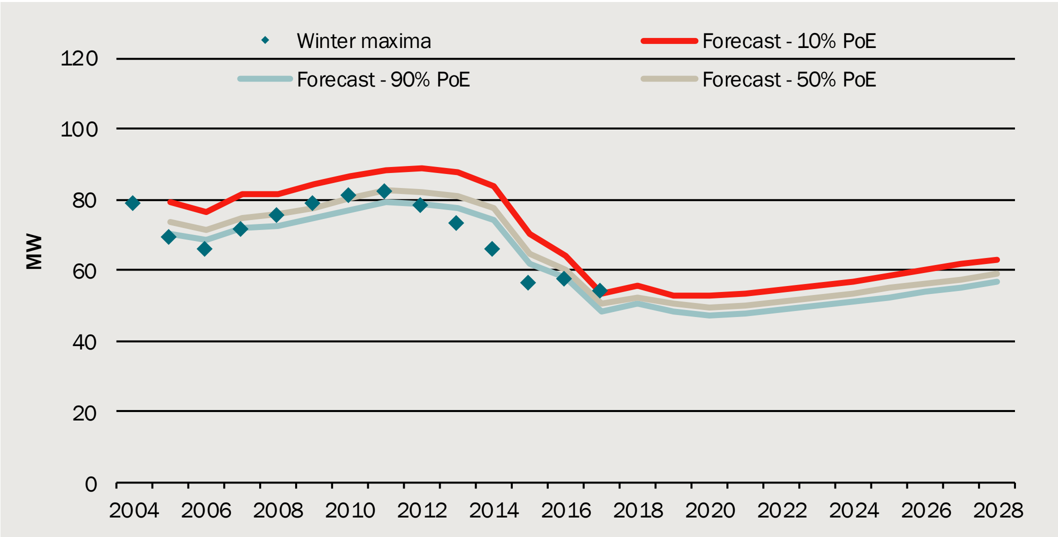
*Data source:* The CIE.

#### 4.21 WMTS22 summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

#### 4.22 WMTS22 winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

#### 4.23 WMTS22 maximum demand forecasts excluding post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 52.8 | 51.8 | 52.4 | 53.8 | 55.1 | 56.3 | 57.9 | 59.4 | 60.9 | 62.7 | 64.6 |
| 50% PoE | 55.0 | 54.2 | 54.6 | 56.0 | 57.6 | 59.3 | 60.5 | 62.3 | 64.2 | 65.9 | 68.1 |
| 10% PoE | 58.8 | 58.7 | 59.4 | 60.8 | 63.3 | 65.8 | 67.6 | 69.7 | 71.5 | 74.0 | 75.8 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 50.4 | 48.3 | 47.5 | 48.0 | 49.2 | 50.2 | 51.2 | 52.5 | 53.9 | 55.2 | 56.7 |
| 50% PoE | 52.5 | 50.4 | 49.6 | 50.2 | 51.4 | 52.5 | 53.5 | 55.0 | 56.2 | 57.6 | 59.2 |
| 10% PoE | 55.9 | 53.1 | 53.0 | 53.4 | 54.3 | 55.6 | 56.9 | 58.3 | 60.2 | 61.7 | 62.9 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 53.2 | 52.0 | 52.4 | 53.8 | 55.2 | 56.4 | 58.0 | 59.6 | 61.0 | 62.7 | 64.6 |
| 50% PoE | 55.4 | 54.4 | 54.8 | 56.1 | 57.7 | 59.4 | 60.7 | 62.4 | 64.3 | 66.0 | 68.2 |
| 10% PoE | 59.5 | 58.9 | 59.5 | 60.8 | 63.3 | 65.8 | 67.6 | 69.7 | 71.5 | 74.0 | 75.8 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 4.24 WMTS22 maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 35.6 | 20.0 | 20.0 | 20.0 | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 50% PoE | 37.7 | 21.5 | 20.0 | 20.0 | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10% PoE | 41.3 | 25.7 | 20.0 | 20.0 | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 35.8 | 41.5 | 24.8 | 20.0 | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 50% PoE | 37.9 | 43.6 | 26.8 | 20.0 | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10% PoE | 41.1 | 46.2 | 30.0 | 20.0 | 20.0 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 36.0 | 20.0 | 20.0 | 20.0 | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 50% PoE | 38.0 | 21.7 | 20.0 | 20.0 | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10% PoE | 41.9 | 25.9 | 20.0 | 20.0 | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

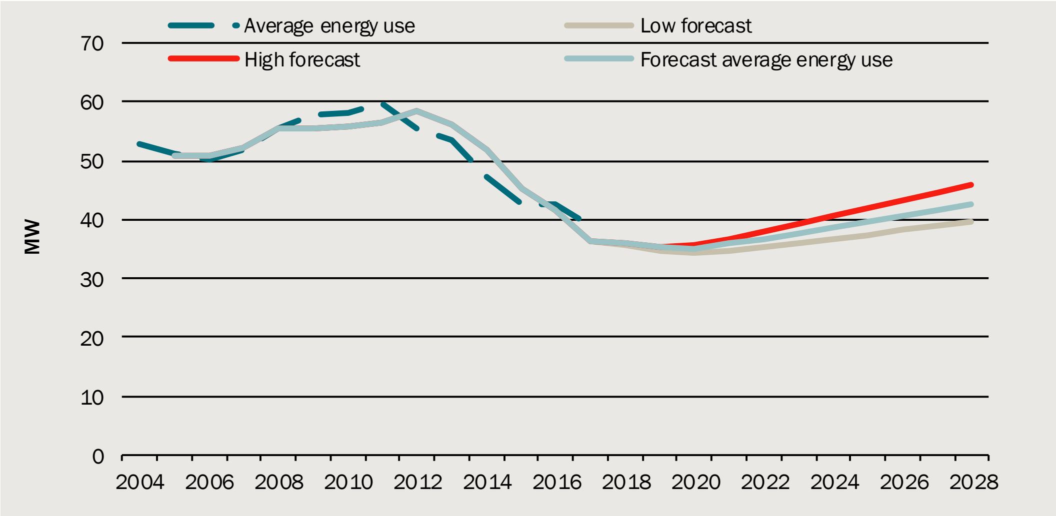
Both the CIE model and the fixed income elasticity parameter model resulted in a positive price elasticity, which is inconsistent with economic theory. The price elasticity was therefore set to zero.

### 4.25 WMTS22 average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE constrained ECM | 0.0 |
| Income | AEMO constrained ECM | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

### 4.26 WMTS22 average demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 4.27 WMTS22 predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 97.0 | 98.1 | 100.4 | 91.2 | 97.7 | 90.1 | 61.5 | 66.7 | 64.5 | 55.9 |
| 90% PoE | 83.5 | 88.3 | 86.1 | 88.0 | 90.1 | 84.3 | 74.6 | 64.5 | 60.2 | 53.8 |
| 50% PoE | 87.0 | 91.6 | 89.2 | 91.1 | 93.0 | 87.4 | 77.7 | 67.4 | 63.0 | 56.2 |
| 10% PoE | 91.2 | 95.1 | 92.8 | 94.6 | 97.0 | 91.4 | 81.7 | 71.3 | 68.4 | 59.8 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 75.7 | 79.3 | 81.3 | 82.3 | 78.2 | 73.3 | 66.0 | 56.8 | 57.5 | 54.5 |
| 90% PoE | 72.8 | 74.7 | 77.3 | 79.1 | 79.0 | 77.5 | 74.2 | 62.0 | 57.7 | 48.3 |
| 50% PoE | 76.0 | 77.9 | 80.5 | 82.5 | 82.2 | 80.9 | 77.4 | 64.8 | 60.0 | 50.6 |
| 10% PoE | 81.3 | 84.6 | 86.7 | 88.6 | 88.7 | 88.0 | 83.6 | 70.2 | 64.1 | 53.5 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 97.0 | 98.1 | 100.4 | 91.2 | 97.7 | 90.1 | 66.0 | 66.7 | 64.5 | 55.9 |
| 90% PoE | 83.6 | 88.4 | 86.2 | 88.2 | 90.2 | 84.6 | 76.2 | 65.2 | 60.7 | 53.9 |
| 50% PoE | 87.1 | 91.7 | 89.4 | 91.3 | 93.1 | 87.7 | 79.3 | 68.0 | 63.5 | 56.3 |
| 10% PoE | 91.2 | 95.1 | 93.2 | 95.3 | 97.2 | 92.5 | 85.4 | 73.1 | 69.3 | 59.9 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 4.28 WMTS22 average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.753 |
| Winter | 0.590 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

### 4.29 WMTS22 details of actual maxima

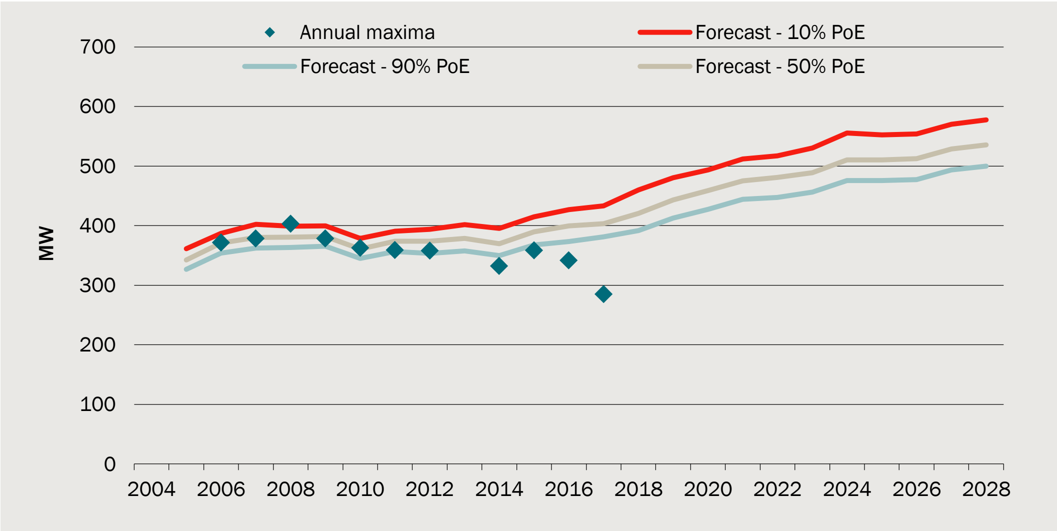
| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 15-06-04 9:30 | 79.3 | 11.8 | 9.0 | 14.9 | 11.6 |
| 27-07-05 16:00 | 69.2 | 15.3 | 10.3 | 16.9 | 13.8 |
| 20-06-06 8:30 | 65.9 | 3.3 | 3.0 | 13.7 | 10.4 |
| 05-06-07 7:30 | 71.7 | 5.5 | 5.5 | 14.3 | 11.8 |
| 25-08-08 8:30 | 75.7 | 4.8 | 3.2 | 13.4 | 10.3 |
| 17-06-09 9:00 | 79.3 | 8.8 | 6.2 | 13.1 | 10.1 |
| 10-08-10 13:00 | 81.3 | 9.3 | 6.4 | 11.1 | 10.3 |
| 08-06-11 8:30 | 82.3 | 5.9 | 5.1 | 11.6 | 11.2 |
| 02-08-12 8:30 | 78.2 | 5.0 | 3.2 | 12.0 | 10.7 |
| 10-07-13 9:00 | 73.3 | 4.5 | 3.4 | 14.9 | 11.6 |
| 11-08-14 9:00 | 66.0 | 7.7 | 6.0 | 12.7 | 11.3 |
| 10-06-15 8:30 | 56.8 | 10.1 | 7.7 | 12.9 | 11.7 |
| 13-07-16 8:30 | 57.5 | 6.0 | 4.7 | 11.9 | 10.8 |
| 28-06-17 7:30 | 54.5 | 8.7 | 8.7 | 14.0 | 9.8 |
| **Summer** | | | | | |
| 04-03-04 15:00 | 77.3 | 33.7 | 19.1 | 34.4 | 19.5 |
| 01-03-05 13:30 | 93.2 | 35.0 | 18.2 | 35.0 | 20.0 |
| 02-11-05 13:30 | 84.3 | 30.8 | 20.7 | 32.1 | 20.8 |
| 23-03-07 11:30 | 81.4 | 33.6 | 21.0 | 37.1 | 21.1 |
| 17-03-08 14:30 | 91.4 | 37.6 | 20.9 | 37.8 | 25.6 |
| 29-01-09 15:00 | 97.0 | 43.7 | 29.1 | 43.7 | 27.9 |
| 10-11-09 14:00 | 98.1 | 34.5 | 20.3 | 36.1 | 23.6 |
| 01-02-11 12:30 | 100.4 | 38.8 | 18.9 | 39.4 | 24.6 |
| 29-11-11 13:00 | 91.2 | 32.9 | 19.4 | 34.5 | 19.0 |
| 12-03-13 12:30 | 97.7 | 34.0 | 24.3 | 36.0 | 20.7 |
| 16-01-14 11:00 | 90.1 | 40.0 | 27.6 | 43.2 | 26.3 |
| 22-01-15 15:00 | 61.5 | 34.4 | 18.8 | 35.0 | 19.5 |
| 23-02-16 12:30 | 66.7 | 37.2 | 18.3 | 39.1 | 21.5 |
| 09-02-17 12:30 | 64.5 | 34.5 | 20.1 | 34.5 | 23.2 |
| 19-12-17 15:00 | 55.9 | 36.3 | 15.9 | 36.4 | 21.5 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.
*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

## *WMTS66*

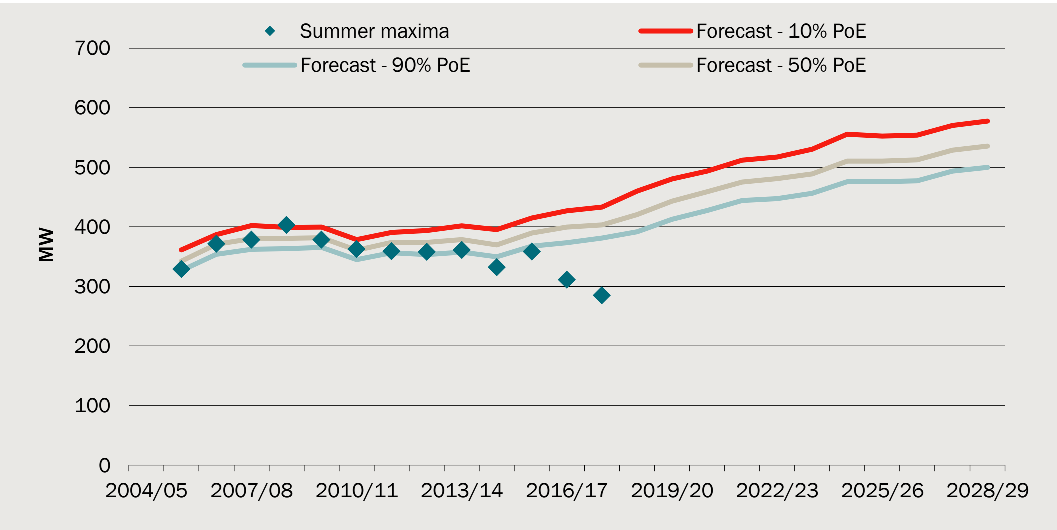
The average demand model for WMTS66 was estimated excluding data for 2014, due to load transfers between terminal stations.

### 4.30 WMTS66 annual maximum demand forecasts



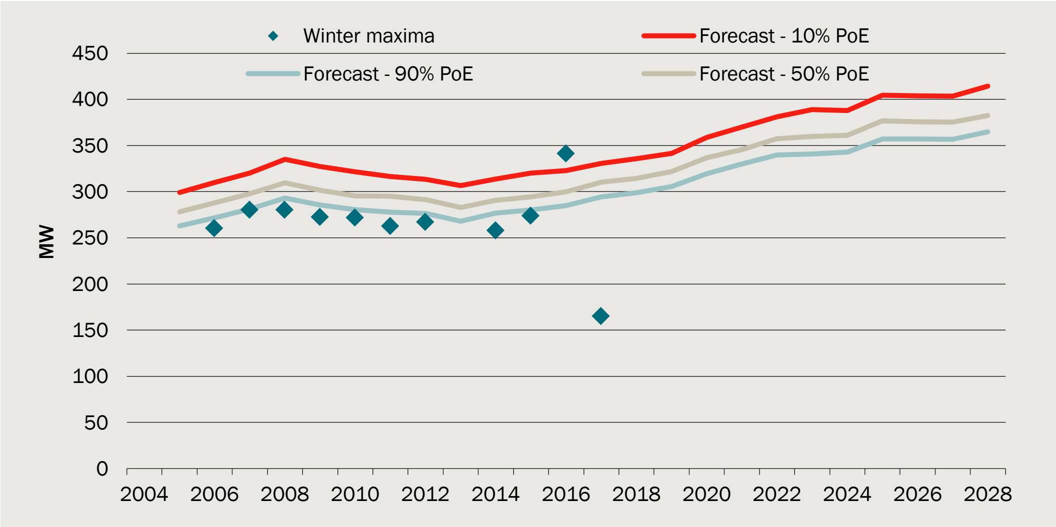

*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

### 4.31 WMTS66 summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

### 4.32 WMTS66 winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 4.33 WMTS66 maximum demand forecasts excluding post modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 391.8 | 412.7 | 427.2 | 444.4 | 447.5 | 456.6 | 475.9 | 475.6 | 477.5 | 493.8 | 500.0 |
| 50% PoE | 420.9 | 443.2 | 458.9 | 475.1 | 481.0 | 489.1 | 510.7 | 510.2 | 512.6 | 528.8 | 535.4 |
| 10% PoE | 460.2 | 480.5 | 493.9 | 512.2 | 517.0 | 530.4 | 555.8 | 552.4 | 553.7 | 570.4 | 577.4 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 298.7 | 305.7 | 319.4 | 329.9 | 339.8 | 340.9 | 342.8 | 357.2 | 357.0 | 356.7 | 365.0 |
| 50% PoE | 314.4 | 321.9 | 336.8 | 345.5 | 357.4 | 359.7 | 361.2 | 376.7 | 375.7 | 375.3 | 382.4 |
| 10% PoE | 335.7 | 341.6 | 358.9 | 370.0 | 381.0 | 389.1 | 387.8 | 404.4 | 404.0 | 403.5 | 414.2 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 391.8 | 412.7 | 427.2 | 444.4 | 447.5 | 456.6 | 475.9 | 475.6 | 477.5 | 493.8 | 500.0 |
| 50% PoE | 420.9 | 443.2 | 458.9 | 475.1 | 481.0 | 489.1 | 510.7 | 510.2 | 512.6 | 528.8 | 535.4 |
| 10% PoE | 460.2 | 480.5 | 493.9 | 512.2 | 517.0 | 530.4 | 555.8 | 552.4 | 553.7 | 570.4 | 577.4 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 4.34 WMTS66 maximum demand forecasts including post modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 420.2 | 429.0 | 472.9 | 489.5 | 491.7 | 519.7 | 537.6 | 533.5 | 532.8 | 546.4 | 549.3 |
| 50% PoE | 448.9 | 459.2 | 504.2 | 519.8 | 524.8 | 551.8 | 572.0 | 567.7 | 567.5 | 581.0 | 584.2 |
| 10% PoE | 487.7 | 496.0 | 538.8 | 556.6 | 560.4 | 592.7 | 616.6 | 609.4 | 608.2 | 622.2 | 625.8 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 311.7 | 316.7 | 331.5 | 365.8 | 374.4 | 373.7 | 393.8 | 403.7 | 400.2 | 396.8 | 400.7 |
| 50% PoE | 327.2 | 332.7 | 348.7 | 381.2 | 391.7 | 392.3 | 412.0 | 423.0 | 418.7 | 415.2 | 418.0 |
| 10% PoE | 348.3 | 352.2 | 370.6 | 405.5 | 415.1 | 421.4 | 438.4 | 450.4 | 446.7 | 443.1 | 449.5 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 420.2 | 429.0 | 472.9 | 489.5 | 491.7 | 519.7 | 537.6 | 533.5 | 532.8 | 546.4 | 549.3 |
| 50% PoE | 448.9 | 459.2 | 504.2 | 519.8 | 524.8 | 551.8 | 572.0 | 567.7 | 567.5 | 581.0 | 584.2 |
| 10% PoE | 487.7 | 496.0 | 538.8 | 556.6 | 560.4 | 592.7 | 616.6 | 609.4 | 608.2 | 622.2 | 625.8 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

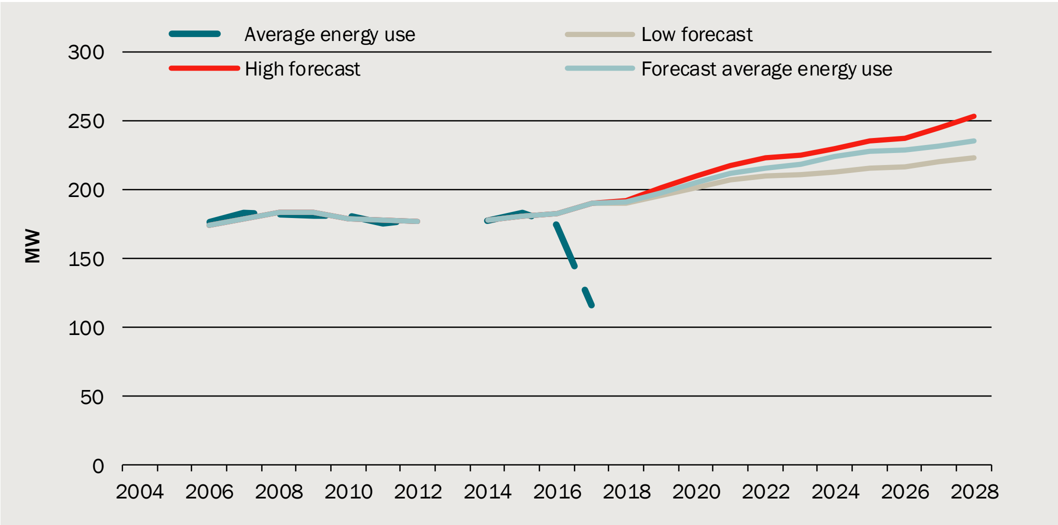
The average demand model was estimated using the long run relationship only, as the coefficient on the error correction term was less than -1.

### 4.35 WMTS66 average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate long run model only | -0.2646 |
| Income | AEMO constrained long run model only | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

### 4.36 WMTS66 average demand forecasts




*Data source:* Powercor terminal station data, The CIE.

### 4.37 WMTS66 predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 403.1 | 378.5 | 362.6 | 358.8 | 358.0 | 360.9 | 332.4 | 358.5 | 310.9 | 284.9 |
| 90% PoE | 363.3 | 365.4 | 344.9 | 356.5 | 353.6 | 357.7 | 349.8 | 367.4 | 373.6 | 381.1 |

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| 50% PoE | 380.6 | 381.6 | 360.8 | 373.6 | 374.1 | 378.7 | 369.9 | 389.4 | 399.4 | 403.1 |
| 10% PoE | 399.1 | 399.4 | 378.8 | 390.8 | 393.9 | 401.8 | 395.3 | 415.0 | 427.0 | 433.0 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 280.5 | 272.6 | 271.8 | 262.9 | 267.2 | | 257.8 | 274.0 | 341.4 | 165.1 |
| 90% PoE | 293.0 | 285.6 | 280.4 | 277.8 | 276.5 | 268.0 | 276.9 | 280.3 | 284.9 | 294.3 |
| 50% PoE | 309.8 | 301.4 | 295.6 | 295.1 | 291.4 | 282.8 | 290.8 | 294.5 | 299.9 | 310.3 |
| 10% PoE | 334.9 | 327.4 | 321.5 | 316.5 | 313.5 | 306.6 | 313.8 | 320.2 | 322.7 | 330.5 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 403.1 | 378.5 | 362.6 | 358.8 | 358.0 | | 332.4 | 358.5 | 341.4 | 284.9 |
| 90% PoE | 363.3 | 365.4 | 344.9 | 356.5 | 353.6 | 357.7 | 349.8 | 367.4 | 373.6 | 381.1 |
| 50% PoE | 380.6 | 381.6 | 360.8 | 373.6 | 374.1 | 378.7 | 369.9 | 389.4 | 399.4 | 403.1 |
| 10% PoE | 399.1 | 399.4 | 378.8 | 390.8 | 393.9 | 401.8 | 395.3 | 415.0 | 427.0 | 433.0 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

## 4.38 WMTS66 average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.892 |
| Winter | 0.892 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

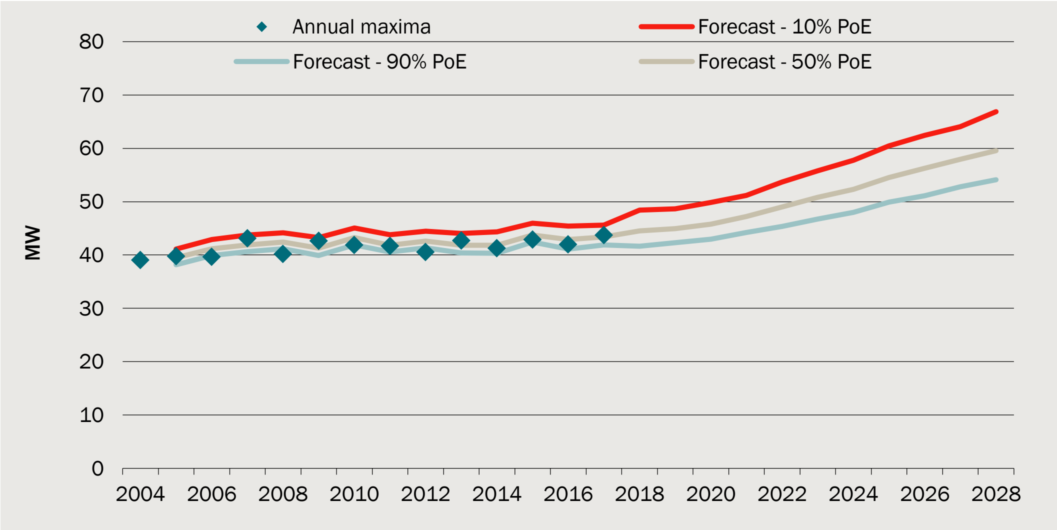
### 4.39 WMTS66 details of actual maxima

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 31-08-06 13:30 | 260.3 | 21.5 | 7.5 | 22.9 | 15.1 |
| 17-07-07 12:00 | 280.2 | 5.8 | 5.0 | 9.6 | 8.4 |
| 21-08-08 13:30 | 280.5 | 8.8 | 7.0 | 12.0 | 10.3 |
| 10-06-09 10:00 | 272.6 | 8.0 | 5.7 | 12.5 | 11.1 |
| 29-06-10 13:00 | 271.8 | 7.9 | 7.6 | 10.7 | 9.8 |
| 07-06-11 12:00 | 262.9 | 9.3 | 5.6 | 14.0 | 11.2 |
| 21-06-12 13:00 | 267.2 | 9.7 | 9.5 | 12.5 | 10.6 |
| 24-06-14 12:30 | 257.8 | 12.2 | 7.2 | 14.3 | 11.9 |
| 04-06-15 14:00 | 274.0 | 9.3 | 4.5 | 10.8 | 11.7 |
| 27-06-16 12:30 | 341.4 | 9.6 | 6.8 | 10.4 | 9.3 |
| 03-08-17 13:00 | 165.1 | 8.5 | 3.1 | 8.9 | 9.7 |
| **Summer** | | | | | |
| 03-03-06 13:00 | 329.0 | 33.9 | 20.9 | 34.6 | 21.8 |
| 23-03-07 12:30 | 371.7 | 34.6 | 21.0 | 37.1 | 21.1 |
| 17-03-08 13:00 | 378.6 | 36.7 | 20.9 | 37.8 | 25.6 |
| 30-01-09 10:30 | 403.1 | 40.3 | 23.9 | 43.9 | 27.9 |
| 17-03-10 12:30 | 378.5 | 31.0 | 21.5 | 32.4 | 23.1 |
| 01-02-11 12:00 | 362.6 | 38.9 | 18.9 | 39.4 | 24.6 |
| 30-01-12 13:00 | 358.8 | 31.4 | 16.5 | 31.8 | 22.0 |
| 18-02-13 13:00 | 358.0 | 33.9 | 21.3 | 36.4 | 25.6 |
| 17-01-14 13:00 | 360.9 | 41.2 | 23.6 | 43.1 | 26.3 |
| 22-01-15 14:00 | 332.4 | 34.4 | 18.8 | 35.0 | 19.5 |
| 23-02-16 14:30 | 358.5 | 39.0 | 18.3 | 39.1 | 21.5 |
| 21-11-16 13:00 | 310.9 | 32.5 | 20.1 | 34.9 | 17.7 |
| 29-01-18 12:00 | 284.9 | 33.2 | 18.9 | 33.2 | 19.5 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.
*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

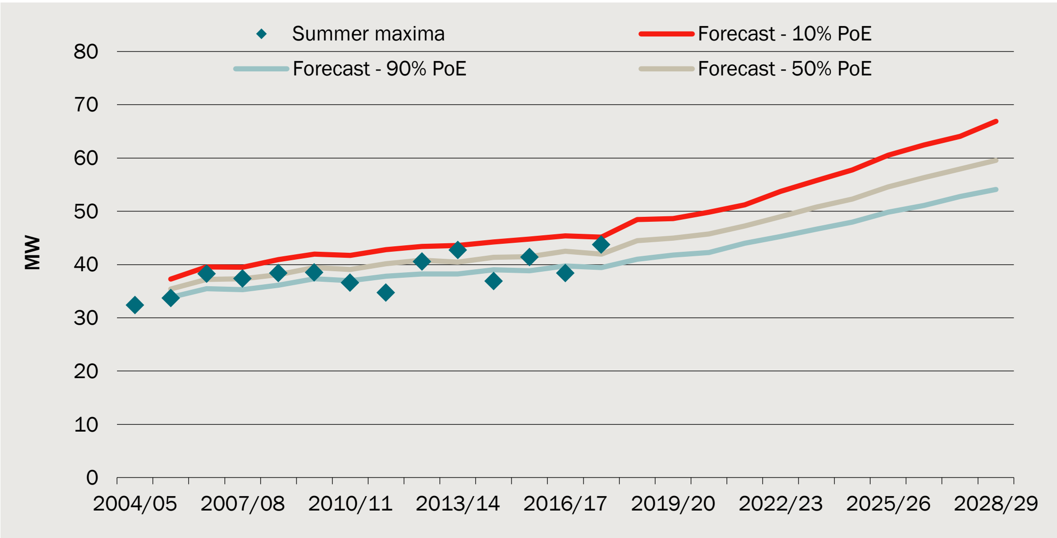
# BTS22

## 4.40 BTS22 annual maximum demand forecasts



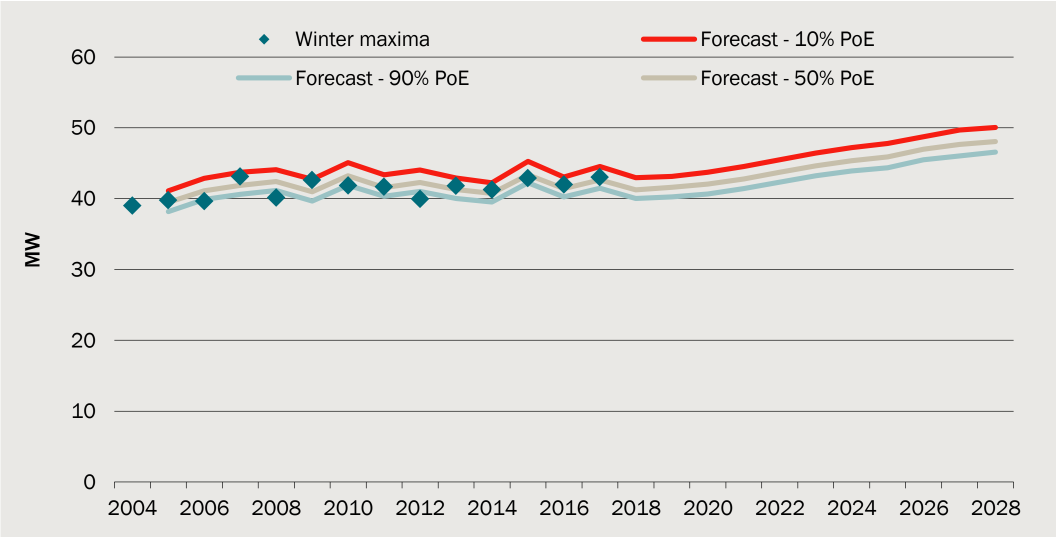

*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

## 4.41 BTS22 summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

### 4.42 BTS22 winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 4.43 BTS22 maximum demand forecasts excluding post modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 41.0 | 41.8 | 42.3 | 44.0 | 45.2 | 46.6 | 48.0 | 49.8 | 51.1 | 52.8 | 54.1 |
| 50% PoE | 44.5 | 44.9 | 45.7 | 47.2 | 49.0 | 50.8 | 52.3 | 54.5 | 56.3 | 57.9 | 59.6 |
| 10% PoE | 48.4 | 48.6 | 49.8 | 51.2 | 53.7 | 55.8 | 57.7 | 60.5 | 62.5 | 64.1 | 66.9 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 40.0 | 40.3 | 40.7 | 41.4 | 42.3 | 43.2 | 43.9 | 44.4 | 45.5 | 46.0 | 46.6 |
| 50% PoE | 41.3 | 41.6 | 42.1 | 42.8 | 43.7 | 44.6 | 45.4 | 45.9 | 47.0 | 47.7 | 48.1 |
| 10% PoE | 43.0 | 43.1 | 43.7 | 44.5 | 45.5 | 46.4 | 47.2 | 47.8 | 48.7 | 49.7 | 50.0 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 41.6 | 42.3 | 42.9 | 44.2 | 45.4 | 46.7 | 48.0 | 49.9 | 51.1 | 52.8 | 54.1 |
| 50% PoE | 44.5 | 45.0 | 45.8 | 47.2 | 49.0 | 50.8 | 52.3 | 54.5 | 56.3 | 57.9 | 59.6 |
| 10% PoE | 48.4 | 48.6 | 49.8 | 51.2 | 53.7 | 55.8 | 57.7 | 60.5 | 62.5 | 64.1 | 66.9 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 4.44 BTS22 maximum demand forecasts including post modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 43.9 | 40.8 | 40.0 | 40.5 | 40.7 | 40.9 | 41.2 | 40.7 | 40.2 | 40.2 | 39.3 |
| 50% PoE | 47.2 | 43.8 | 43.4 | 43.6 | 44.3 | 45.0 | 45.4 | 45.3 | 45.3 | 45.2 | 44.6 |
| 10% PoE | 51.1 | 47.4 | 47.4 | 47.5 | 48.9 | 49.8 | 50.7 | 51.1 | 51.3 | 51.1 | 51.7 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 37.9 | 39.7 | 39.6 | 39.1 | 39.0 | 38.8 | 38.4 | 36.6 | 36.0 | 34.8 | 33.1 |
| 50% PoE | 39.1 | 41.0 | 41.0 | 40.5 | 40.3 | 40.2 | 39.9 | 38.1 | 37.4 | 36.4 | 34.6 |
| 10% PoE | 40.8 | 42.5 | 42.6 | 42.2 | 42.1 | 42.0 | 41.7 | 40.0 | 39.2 | 38.4 | 36.6 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 44.5 | 41.3 | 40.7 | 40.7 | 40.8 | 41.1 | 41.2 | 40.8 | 40.2 | 40.2 | 39.3 |
| 50% PoE | 47.3 | 43.8 | 43.4 | 43.6 | 44.3 | 45.0 | 45.4 | 45.3 | 45.3 | 45.2 | 44.6 |
| 10% PoE | 51.1 | 47.4 | 47.4 | 47.5 | 48.9 | 49.8 | 50.7 | 51.1 | 51.3 | 51.1 | 51.7 |

*Note:* All forecasts are in MW.

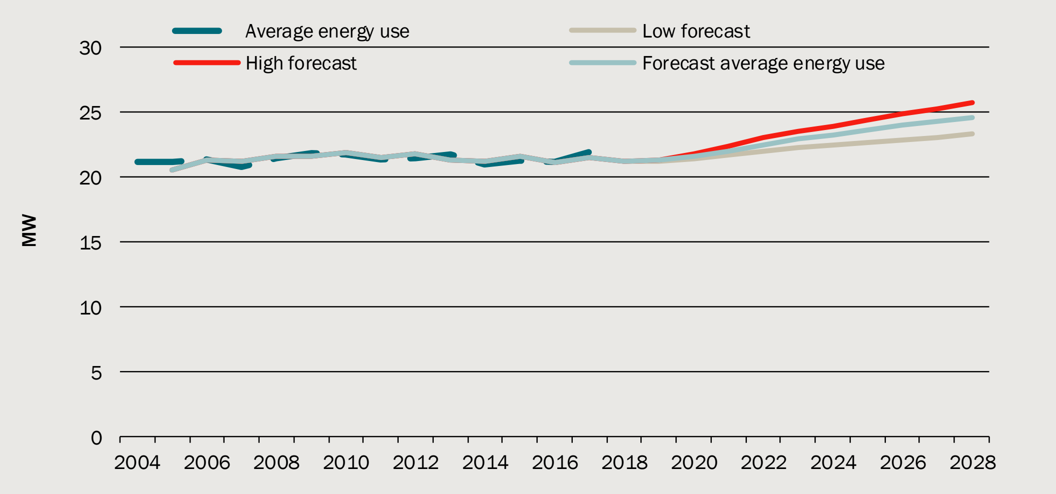
*Source:* Powercor terminal station data, The CIE.

### 4.45 BTS22 average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate ECM | -0.1450 |
| Income | AEMO constrained ECM | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

### 4.46 BTS22 average demand forecasts




*Data source:* Powercor terminal station data, The CIE.

### 4.47 BTS22 predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 38.4 | 38.5 | 36.6 | 34.7 | 40.5 | 42.7 | 36.9 | 41.4 | 38.4 | 43.7 |
| 90% PoE | 36.1 | 37.3 | 37.0 | 37.8 | 38.2 | 38.2 | 39.0 | 38.8 | 39.8 | 39.4 |
| 50% PoE | 38.1 | 39.4 | 39.1 | 40.1 | 40.8 | 40.5 | 41.4 | 41.5 | 42.5 | 42.0 |
| 10% PoE | 40.9 | 41.9 | 41.7 | 42.8 | 43.4 | 43.6 | 44.2 | 44.7 | 45.4 | 45.2 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | |
| Actual | 40.2 | 42.6 | 41.8 | 41.7 | 40.0 | 41.8 | 41.3 | 42.9 | 42.0 | 43.0 |
| 90% PoE | 41.1 | 39.7 | 41.9 | 40.3 | 41.0 | 40.0 | 39.5 | 42.2 | 40.2 | 41.5 |
| 50% PoE | 42.4 | 41.0 | 43.2 | 41.5 | 42.3 | 41.3 | 40.7 | 43.4 | 41.4 | 42.7 |
| 10% PoE | 44.1 | 42.7 | 45.1 | 43.4 | 44.0 | 42.9 | 42.2 | 45.3 | 43.1 | 44.5 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 40.2 | 42.6 | 41.8 | 41.7 | 40.5 | 42.7 | 41.3 | 42.9 | 42.0 | 43.7 |
| 90% PoE | 41.2 | 39.9 | 41.9 | 40.6 | 41.3 | 40.4 | 40.4 | 42.4 | 41.1 | 41.9 |
| 50% PoE | 42.4 | 41.3 | 43.3 | 41.8 | 42.6 | 41.8 | 41.8 | 43.8 | 42.9 | 43.4 |
| 10% PoE | 44.1 | 43.2 | 45.1 | 43.8 | 44.5 | 44.0 | 44.4 | 45.9 | 45.4 | 45.6 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 4.48 BTS22 average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.779 |
| Winter | 0.791 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

### 4.49 BTS22 details of actual maxima

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 30-06-04 8:30 | 39.0 | 11.6 | 7.9 | 14.3 | 11.7 |
| 10-08-05 18:00 | 39.8 | 6.8 | 4.7 | 10.1 | 10.2 |
| 19-07-06 18:00 | 39.6 | 10.4 | 6.0 | 11.0 | 10.4 |
| 17-07-07 18:00 | 43.1 | 5.5 | 5.0 | 9.6 | 8.4 |
| 11-08-08 18:00 | 40.2 | 9.8 | 6.8 | 12.9 | 10.0 |
| 10-06-09 18:00 | 42.6 | 8.9 | 5.7 | 12.5 | 11.1 |
| 29-06-10 18:00 | 41.8 | 10.4 | 7.6 | 10.7 | 9.8 |
| 07-06-11 17:30 | 41.7 | 13.4 | 5.6 | 14.0 | 11.2 |
| 26-06-12 18:00 | 40.0 | 9.4 | 6.8 | 11.8 | 10.9 |
| 24-06-13 18:30 | 41.8 | 11.6 | 2.2 | 12.0 | 9.1 |
| 22-07-14 18:30 | 41.3 | 8.4 | 6.4 | 12.3 | 10.2 |
| 14-07-15 18:30 | 42.9 | 7.4 | 6.7 | 9.7 | 9.4 |
| 26-07-16 18:30 | 42.0 | 9.6 | 6.9 | 10.8 | 10.3 |
| 03-08-17 19:00 | 43.0 | 8.3 | 3.1 | 8.9 | 9.7 |
| **Summer** | | | | | |
| 04-03-04 15:30 | 32.5 | 34.1 | 19.1 | 34.4 | 19.5 |
| 25-01-05 15:30 | 32.4 | 35.3 | 18.2 | 36.1 | 24.0 |

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| 24-02-06 15:30 | 33.7 | 35.6 | 21.2 | 35.6 | 22.1 |
| 16-01-07 16:30 | 38.3 | 39.7 | 17.8 | 40.0 | 24.2 |
| 17-03-08 15:30 | 37.4 | 37.5 | 20.9 | 37.8 | 25.6 |
| 29-01-09 16:00 | 38.4 | 43.7 | 29.1 | 43.7 | 27.9 |
| 10-11-09 15:30 | 38.5 | 34.5 | 20.3 | 36.1 | 23.6 |
| 01-02-11 12:30 | 36.6 | 38.8 | 18.9 | 39.4 | 24.6 |
| 24-02-12 16:30 | 34.7 | 34.3 | 15.1 | 35.9 | 23.3 |
| 12-03-13 16:30 | 40.5 | 35.7 | 24.3 | 36.0 | 20.7 |
| 28-01-14 16:30 | 42.7 | 41.4 | 21.6 | 41.4 | 22.5 |
| 22-01-15 16:00 | 36.9 | 34.6 | 18.8 | 35.0 | 19.5 |
| 13-01-16 16:30 | 41.4 | 41.6 | 17.0 | 41.6 | 22.2 |
| 08-02-17 18:00 | 38.4 | 35.7 | 16.6 | 35.9 | 23.2 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.

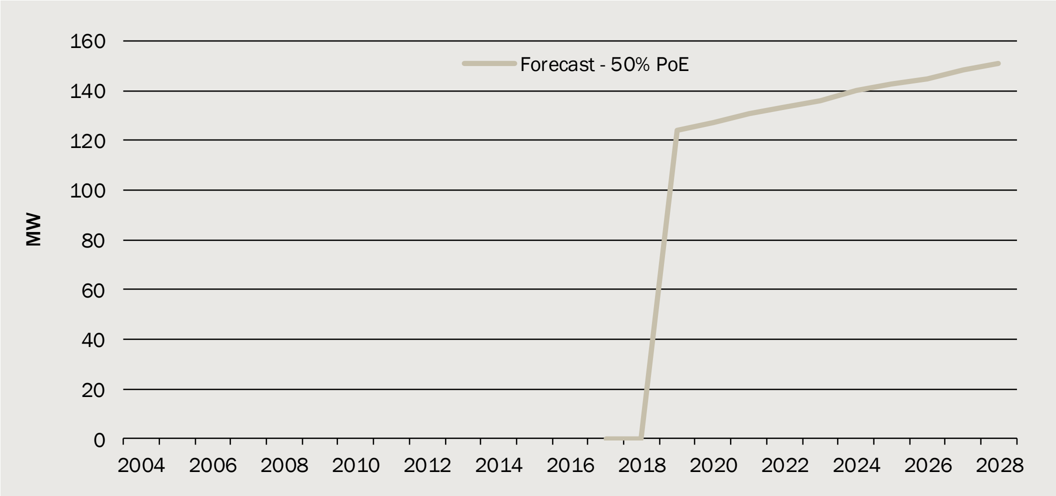
*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

## BTS66

Average demand and maximum demand models were not estimated for BTS66, due to the limited data available for this new terminal station. Several years of demand observations, unaffected by load transfers, are required to estimate the average demand and maximum demand models.

Maximum demand for BTS66 was instead estimated using load transfers from other terminal stations provided by Powercor. Maximum demand forecasts are only prepared for the 50 per cent PoE. The future profile of maximum demand reflects the forecast profiles of the terminal stations from which transfers occur.[45]

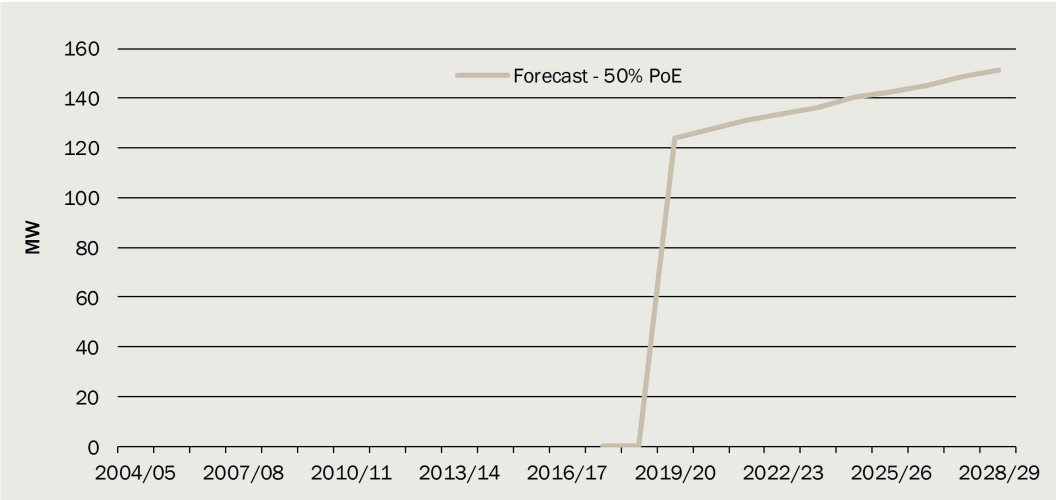
### 4.50 BTS66 annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 4.51 BTS66 summer maximum demand forecasts

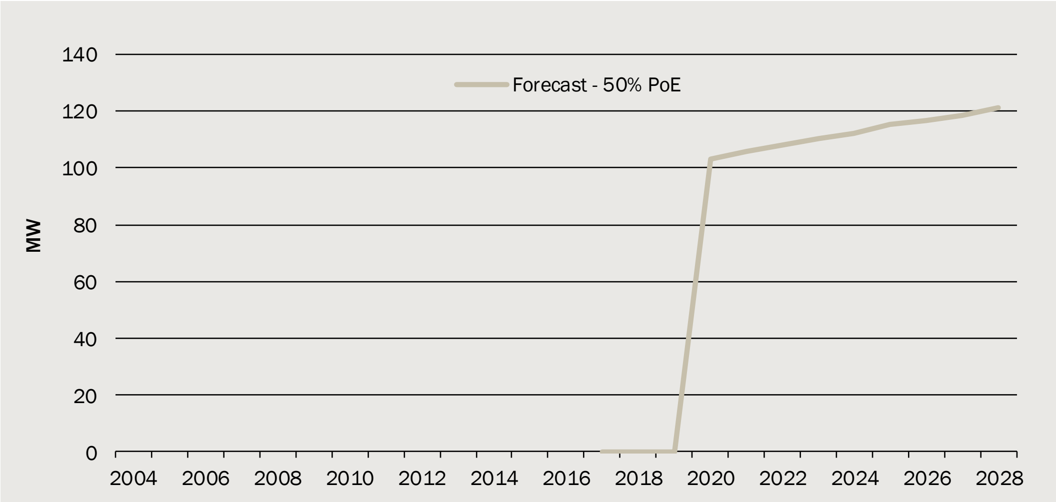



*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

45 For BTS66, loads are transferred from RTS66 Transformers 1 & 2 and WMTS22.

### 4.52 BTS66 winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 4.53 BTS66 maximum demand forecasts including post-modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 50% PoE | 0.0 | 108.3 | 109.1 | 109.9 | 110.2 | 110.4 | 112.0 | 109.1 | 107.2 | 106.6 | 103.3 |
| **Winter Maxima** | | | | | | | | | | | |
| 50% PoE | 0.0 | 0.0 | 84.9 | 84.9 | 85.1 | 84.8 | 84.0 | 82.2 | 79.4 | 76.5 | 73.5 |
| **Annual Maxima** | | | | | | | | | | | |
| 50% PoE | 0.0 | 108.3 | 109.1 | 109.9 | 110.2 | 110.4 | 112.0 | 109.1 | 107.2 | 106.6 | 103.3 |

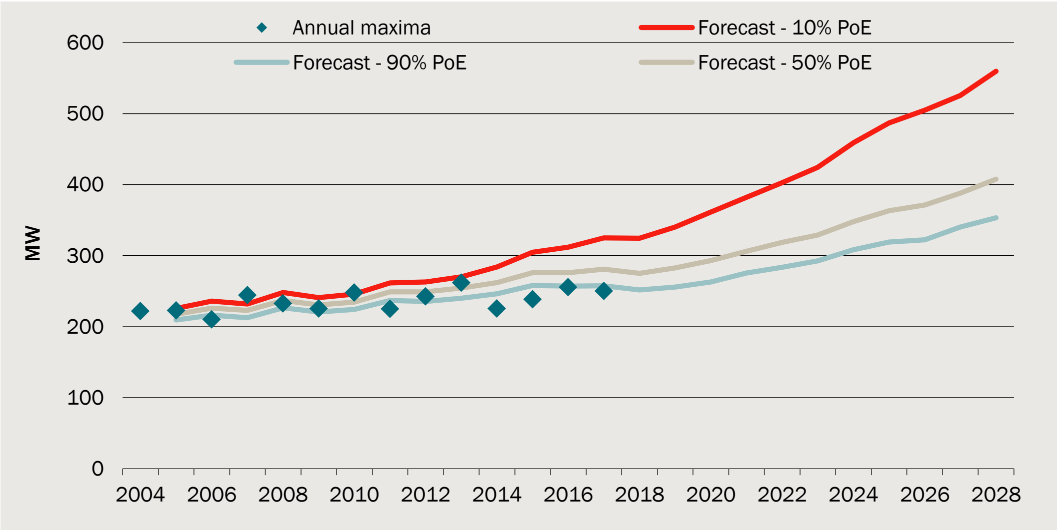
*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

## *FBTS66*

The average demand model for FBTS66 was estimated excluding data for 2014, due to load transfers between terminal stations.

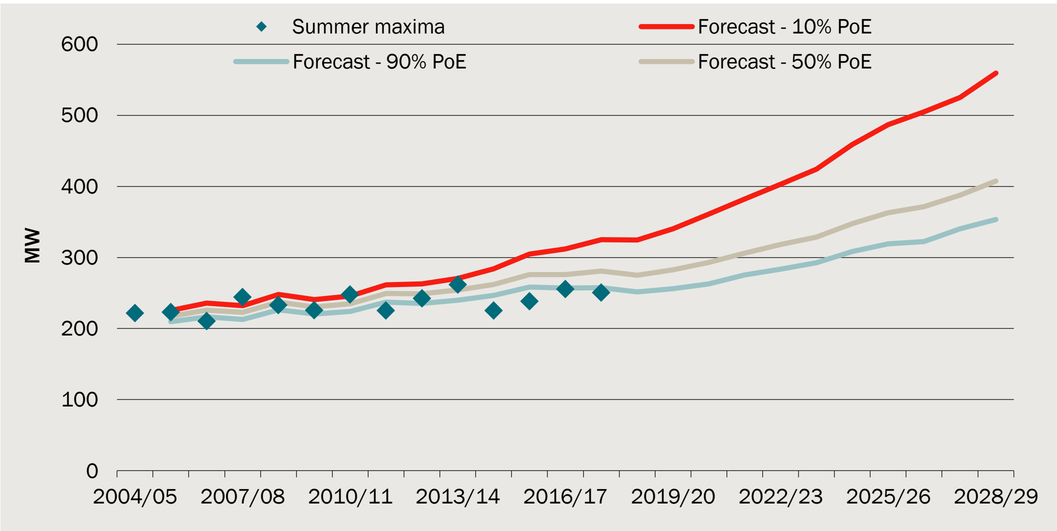
### 4.54 FBTS66 annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

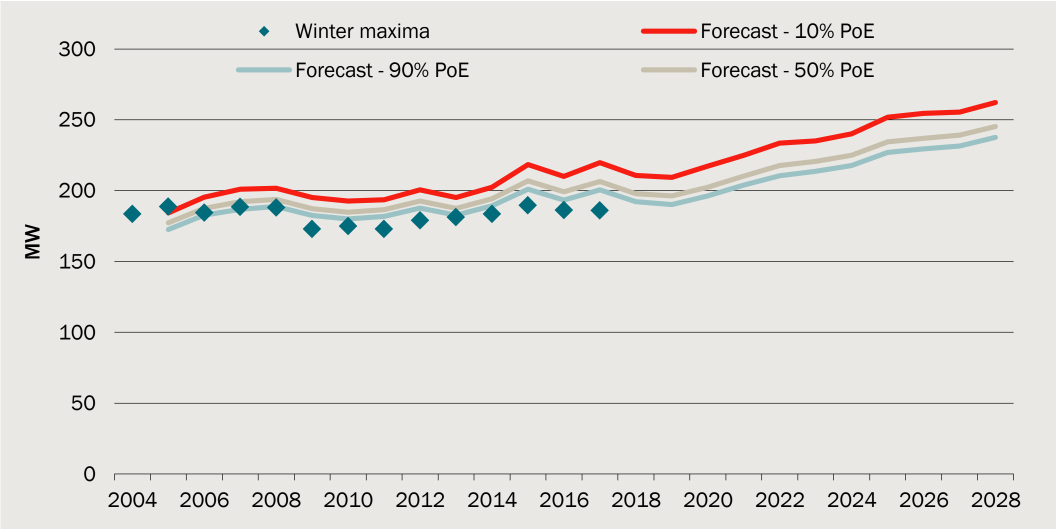
### 4.55 FBTS66 summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

## 4.56 FBTS66 winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

## 4.57 FBTS66 maximum demand forecasts excluding post modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 251.5 | 255.9 | 262.9 | 275.4 | 283.6 | 292.5 | 308.2 | 319.3 | 322.4 | 340.3 | 353.4 |
| 50% PoE | 274.9 | 282.6 | 293.0 | 306.2 | 318.5 | 328.8 | 347.8 | 363.1 | 371.5 | 387.7 | 407.5 |
| 10% PoE | 324.6 | 340.4 | 361.3 | 382.2 | 402.9 | 424.2 | 459.0 | 486.6 | 504.6 | 525.3 | 559.5 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 192.2 | 190.2 | 196.2 | 204.0 | 210.6 | 213.8 | 217.8 | 227.0 | 229.5 | 231.6 | 237.6 |
| 50% PoE | 197.8 | 196.2 | 202.3 | 210.2 | 217.7 | 220.6 | 224.9 | 234.5 | 236.9 | 239.1 | 245.4 |
| 10% PoE | 210.7 | 209.4 | 217.3 | 225.0 | 233.6 | 235.0 | 240.1 | 251.8 | 254.4 | 255.6 | 262.2 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 251.5 | 255.9 | 262.9 | 275.4 | 283.6 | 292.5 | 308.2 | 319.3 | 322.4 | 340.3 | 353.4 |
| 50% PoE | 274.9 | 282.6 | 293.0 | 306.2 | 318.5 | 328.8 | 347.8 | 363.1 | 371.5 | 387.7 | 407.5 |
| 10% PoE | 324.6 | 340.4 | 361.3 | 382.2 | 402.9 | 424.2 | 459.0 | 486.6 | 504.6 | 525.3 | 559.5 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

## 4.58 FBTS66 maximum demand forecasts including post modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 254.5 | 255.1 | 262.7 | 273.4 | 280.5 | 287.1 | 300.0 | 306.8 | 307.2 | 321.5 | 330.6 |
| 50% PoE | 276.5 | 280.2 | 291.0 | 302.4 | 313.4 | 321.3 | 337.2 | 348.0 | 353.4 | 366.2 | 381.6 |
| 10% PoE | 323.3 | 334.6 | 355.3 | 374.0 | 392.9 | 411.1 | 442.0 | 464.3 | 478.7 | 495.7 | 524.7 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 195.8 | 193.7 | 201.2 | 208.1 | 213.9 | 216.3 | 218.5 | 223.7 | 223.6 | 223.3 | 226.0 |
| 50% PoE | 201.1 | 199.3 | 206.9 | 214.1 | 220.6 | 222.8 | 225.2 | 230.7 | 230.5 | 230.4 | 233.3 |
| 10% PoE | 213.3 | 211.8 | 221.1 | 228.0 | 235.6 | 236.4 | 239.6 | 247.1 | 247.1 | 245.9 | 249.2 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 254.5 | 255.1 | 262.7 | 273.4 | 280.5 | 287.1 | 300.0 | 306.8 | 307.2 | 321.5 | 330.6 |
| 50% PoE | 276.5 | 280.2 | 291.0 | 302.4 | 313.4 | 321.3 | 337.2 | 348.0 | 353.4 | 366.2 | 381.6 |
| 10% PoE | 323.3 | 334.6 | 355.3 | 374.0 | 392.9 | 411.1 | 442.0 | 464.3 | 478.7 | 495.7 | 524.7 |

*Note:* All forecasts are in MW.

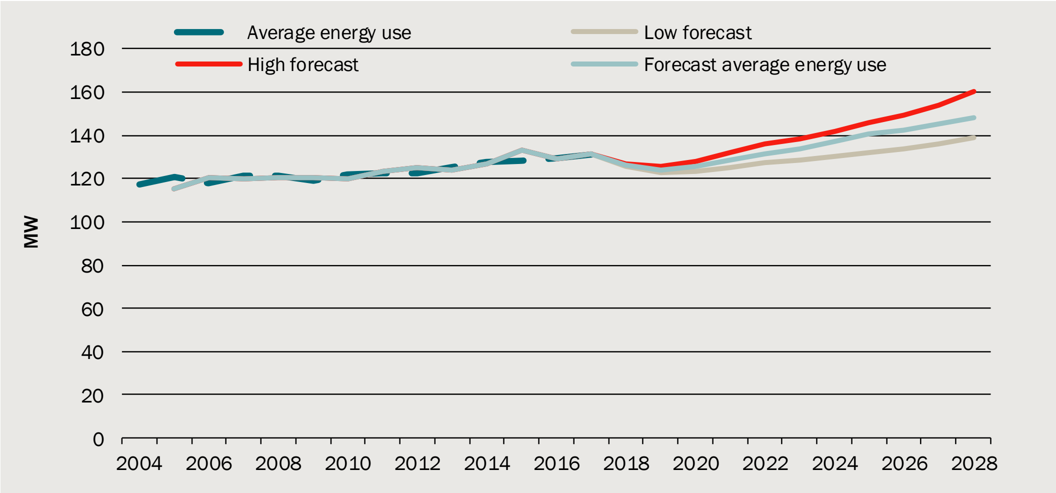
*Source:* Powercor terminal station data, The CIE.

### 4.59 FBTS66 average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate ECM | -0.1019 |
| Income | AEMO constrained ECM | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

### 4.60 FBTS66 average demand forecasts




*Data source:* Powercor terminal station data, The CIE.

### 4.61 FBTS66 predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 232.8 | 225.6 | 247.8 | 225.2 | 242.3 | 261.8 | 225.2 | 238.4 | 255.5 | 250.3 |
| 90% PoE | 226.5 | 220.6 | 224.1 | 237.0 | 235.5 | 239.8 | 246.5 | 258.1 | 256.9 | 257.6 |
| 50% PoE | 237.0 | 230.4 | 234.7 | 249.2 | 248.8 | 254.5 | 262.1 | 275.8 | 276.1 | 281.0 |
| 10% PoE | 247.9 | 240.7 | 245.8 | 261.5 | 262.8 | 270.3 | 284.1 | 304.9 | 312.0 | 325.0 |

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | |
| Actual | 188.1 | 172.8 | 174.8 | 172.8 | 179.1 | 181.2 | 183.4 | 189.7 | 186.2 | 185.9 |
| 90% PoE | 188.8 | 182.5 | 180.1 | 181.9 | 187.7 | 182.6 | 189.3 | 201.1 | 193.4 | 200.6 |
| 50% PoE | 193.9 | 187.3 | 184.8 | 186.7 | 192.7 | 187.4 | 194.1 | 206.8 | 199.3 | 206.5 |
| 10% PoE | 201.8 | 195.0 | 192.6 | 193.7 | 200.6 | 195.1 | 202.5 | 218.5 | 210.0 | 219.8 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 232.8 | 225.6 | 247.8 | 225.2 | 242.3 | 261.8 | 225.2 | 238.4 | 255.5 | 250.3 |
| 90% PoE | 226.5 | 220.6 | 224.1 | 237.0 | 235.5 | 239.8 | 246.5 | 258.1 | 256.9 | 257.6 |
| 50% PoE | 237.0 | 230.4 | 234.7 | 249.2 | 248.8 | 254.5 | 262.1 | 275.8 | 276.1 | 281.0 |
| 10% PoE | 247.9 | 240.7 | 245.8 | 261.5 | 262.8 | 270.3 | 284.1 | 304.9 | 312.0 | 325.0 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

## 4.62 FBTS66 average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.809 |
| Winter | 0.818 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

## 4.63 FBTS66 details of actual maxima

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 18-08-04 9:00 | 183.4 | 8.8 | 6.7 | 14.8 | 10.4 |
| 10-08-05 11:00 | 188.6 | 7.9 | 4.7 | 10.1 | 10.2 |
| 05-06-06 9:30 | 184.5 | 5.4 | 3.8 | 11.0 | 9.0 |
| 17-07-07 13:00 | 188.6 | 6.1 | 5.0 | 9.6 | 8.4 |
| 13-08-08 13:00 | 188.1 | 11.8 | 5.6 | 12.8 | 10.5 |
| 11-06-09 10:00 | 172.8 | 8.8 | 6.2 | 12.2 | 10.1 |
| 10-08-10 12:30 | 174.8 | 8.9 | 6.4 | 11.1 | 10.3 |
| 08-06-11 10:00 | 172.8 | 8.3 | 5.1 | 11.6 | 11.2 |
| 08-08-12 13:00 | 179.1 | 8.8 | 8.6 | 12.1 | 11.2 |
| 24-06-13 10:00 | 181.2 | 5.2 | 2.2 | 12.0 | 9.1 |
| 04-08-14 9:00 | 183.4 | 4.4 | 1.9 | 15.2 | 10.6 |
| 20-07-15 9:30 | 189.7 | 6.0 | 1.9 | 14.4 | 9.2 |
| 27-06-16 10:30 | 186.2 | 8.8 | 6.8 | 10.4 | 9.3 |
| 03-08-17 9:30 | 185.9 | 4.9 | 3.1 | 8.9 | 9.7 |

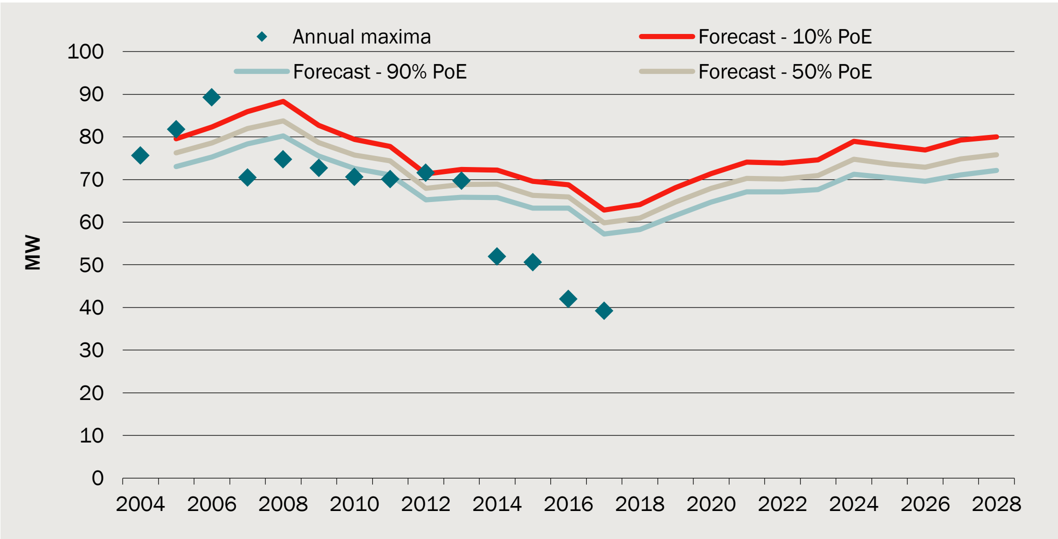
| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Summer** | | | | | |
| 03-03-04 12:30 | 201.1 | 31.6 | 17.2 | 33.0 | 21.0 |
| 28-01-05 11:30 | 221.7 | 33.6 | 20.8 | 35.5 | 24.0 |
| 24-02-06 11:30 | 222.8 | 32.4 | 21.2 | 35.6 | 22.1 |
| 23-03-07 13:00 | 210.3 | 35.6 | 21.0 | 37.1 | 21.1 |
| 14-03-08 12:00 | 244.3 | 36.4 | 20.6 | 38.8 | 25.6 |
| 30-01-09 10:30 | 232.8 | 40.3 | 23.9 | 43.9 | 27.9 |
| 12-01-10 13:00 | 225.6 | 32.3 | 17.6 | 34.8 | 24.7 |
| 01-02-11 13:00 | 247.8 | 39.4 | 18.9 | 39.4 | 24.6 |
| 30-01-12 13:00 | 225.2 | 31.4 | 16.5 | 31.8 | 22.0 |
| 12-03-13 14:00 | 242.3 | 35.0 | 24.3 | 36.0 | 20.7 |
| 16-01-14 13:00 | 261.8 | 41.8 | 27.6 | 43.2 | 26.3 |
| 22-01-15 15:30 | 225.2 | 35.0 | 18.8 | 35.0 | 19.5 |
| 13-01-16 13:30 | 238.4 | 39.5 | 17.0 | 41.6 | 22.2 |
| 09-02-17 12:30 | 255.5 | 34.5 | 20.1 | 34.5 | 23.2 |
| 29-01-18 11:30 | 250.3 | 32.7 | 18.9 | 33.2 | 19.5 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.
*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

## *RTS22*

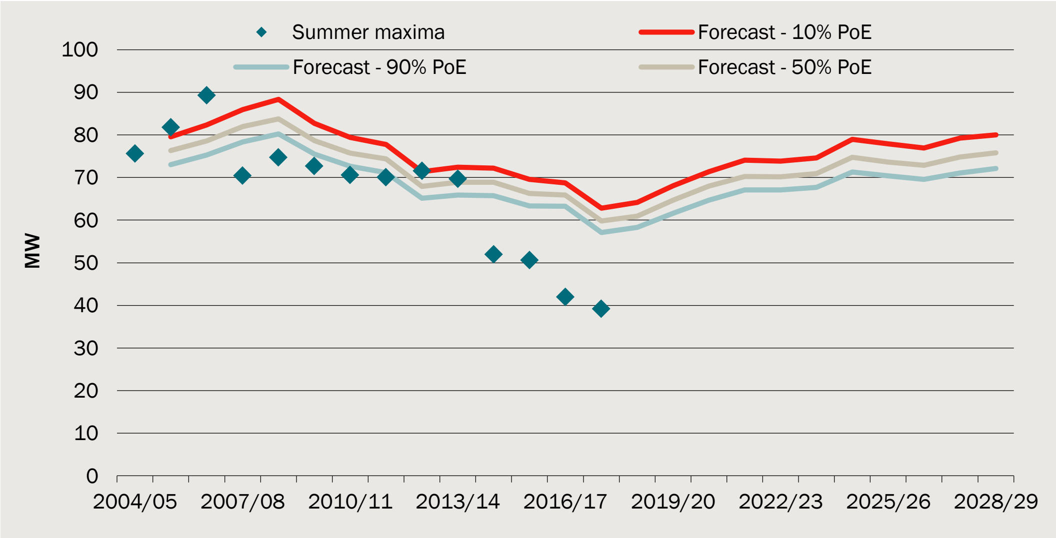
The average demand model for RTS22 was estimated excluding data for 2014, due to load transfers between terminal stations.

### 4.64 RTS22 annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

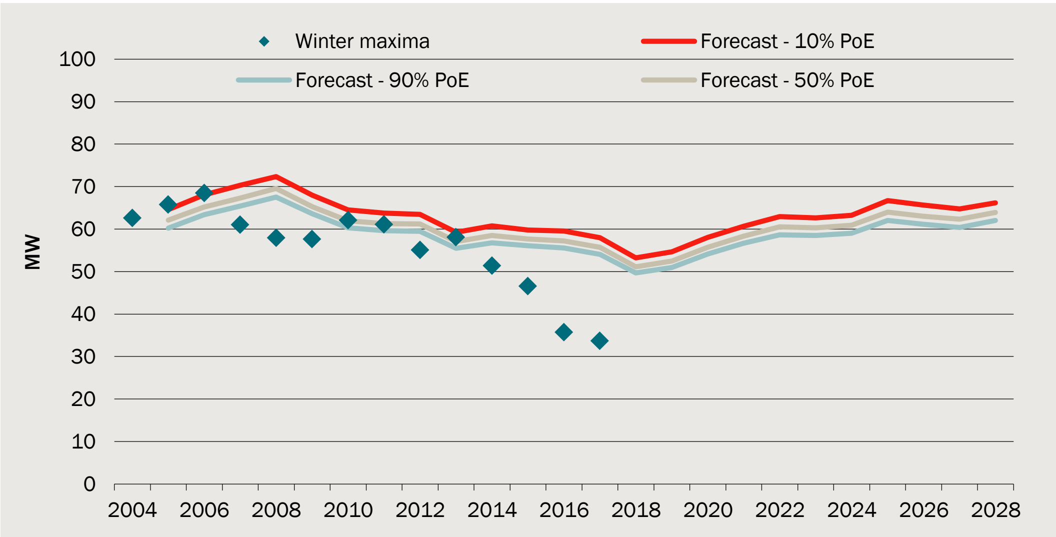
### 4.65 RTS22 summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 4.66 RTS22 winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 4.67 RTS22 maximum demand forecasts excluding post modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 58.3 | 61.6 | 64.7 | 67.1 | 67.1 | 67.7 | 71.3 | 70.4 | 69.6 | 71.1 | 72.1 |
| 50% PoE | 61.0 | 64.7 | 68.0 | 70.2 | 70.1 | 70.9 | 74.7 | 73.6 | 72.9 | 74.8 | 75.8 |
| 10% PoE | 64.1 | 68.1 | 71.4 | 74.1 | 73.9 | 74.6 | 78.9 | 77.9 | 76.9 | 79.2 | 80.0 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 49.7 | 51.0 | 54.1 | 56.7 | 58.6 | 58.5 | 59.0 | 62.1 | 61.2 | 60.4 | 62.0 |
| 50% PoE | 51.1 | 52.5 | 55.7 | 58.3 | 60.5 | 60.3 | 60.9 | 64.0 | 63.0 | 62.3 | 63.9 |
| 10% PoE | 53.2 | 54.6 | 58.1 | 60.7 | 63.0 | 62.7 | 63.2 | 66.7 | 65.7 | 64.7 | 66.2 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 58.3 | 61.6 | 64.7 | 67.1 | 67.1 | 67.7 | 71.3 | 70.4 | 69.6 | 71.1 | 72.1 |
| 50% PoE | 61.0 | 64.7 | 68.0 | 70.2 | 70.1 | 70.9 | 74.7 | 73.6 | 72.9 | 74.8 | 75.8 |
| 10% PoE | 64.1 | 68.1 | 71.4 | 74.1 | 73.9 | 74.6 | 78.9 | 77.9 | 76.9 | 79.2 | 80.0 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 4.68 RTS22 maximum demand forecasts including post modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 45.1 | 47.3 | 48.0 | 48.5 | 47.9 | 27.4 | 28.5 | 26.6 | 25.1 | 24.7 | 23.9 |
| 50% PoE | 47.8 | 50.3 | 51.3 | 51.6 | 50.9 | 30.6 | 31.9 | 29.9 | 28.4 | 28.4 | 27.5 |
| 10% PoE | 51.0 | 53.7 | 54.7 | 55.4 | 54.6 | 34.3 | 36.1 | 34.1 | 32.4 | 32.8 | 31.8 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 26.0 | 44.7 | 39.3 | 39.6 | 39.6 | 38.9 | 18.4 | 18.3 | 16.8 | 15.4 | 14.8 |
| 50% PoE | 27.5 | 46.2 | 40.9 | 41.2 | 41.5 | 40.7 | 20.3 | 20.2 | 18.7 | 17.3 | 16.7 |
| 10% PoE | 29.5 | 48.3 | 43.2 | 43.6 | 44.0 | 43.1 | 22.6 | 22.9 | 21.3 | 19.7 | 19.0 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 45.1 | 47.3 | 48.0 | 48.5 | 47.9 | 27.4 | 28.5 | 26.6 | 25.1 | 24.7 | 23.9 |
| 50% PoE | 47.8 | 50.3 | 51.3 | 51.6 | 50.9 | 30.6 | 31.9 | 29.9 | 28.4 | 28.4 | 27.5 |
| 10% PoE | 51.0 | 53.7 | 54.7 | 55.4 | 54.6 | 34.3 | 36.1 | 34.1 | 32.4 | 32.8 | 31.8 |

*Note:* All forecasts are in MW.

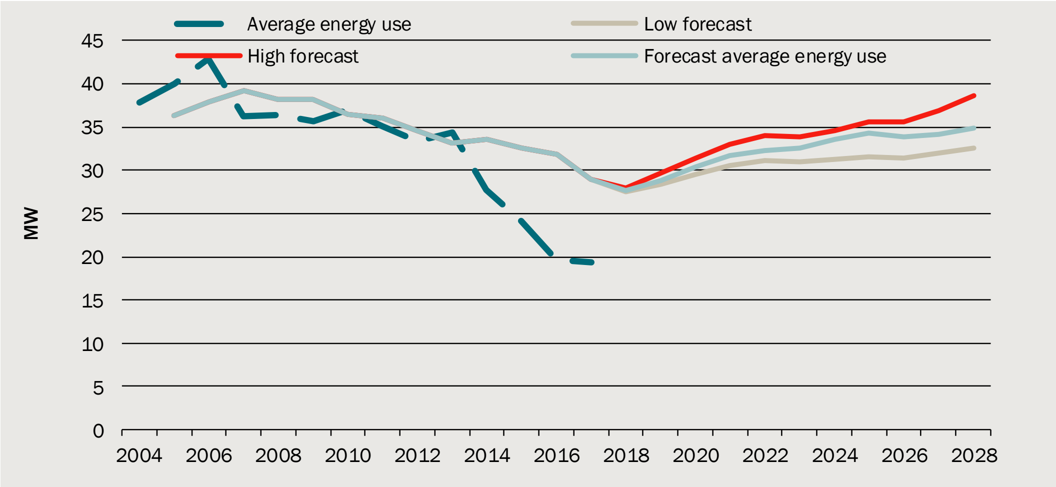
*Source:* Powercor terminal station data, The CIE.

### 4.69 RTS22 average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate long run model only | -0.4175 |
| Income | AEMO constrained long run model only | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

## 4.70 RTS22 average demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

## 4.71 RTS22 predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 74.7 | 72.7 | 70.6 | 70.1 | 71.6 | 69.7 | 52.0 | 50.6 | 41.9 | 39.2 |
| 90% PoE | 80.2 | 75.5 | 72.6 | 71.1 | 65.2 | 65.9 | 65.8 | 63.3 | 63.3 | 57.1 |
| 50% PoE | 83.8 | 78.6 | 75.7 | 74.4 | 67.9 | 68.9 | 68.9 | 66.3 | 65.9 | 59.8 |
| 10% PoE | 88.3 | 82.7 | 79.4 | 77.7 | 71.3 | 72.4 | 72.2 | 69.6 | 68.8 | 62.8 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 57.9 | 57.6 | 62.1 | 61.1 | 55.1 | 58.1 | 51.4 | 46.6 | 35.7 | 33.7 |
| 90% PoE | 67.5 | 63.6 | 60.3 | 59.6 | 59.5 | 55.5 | 56.8 | 56.1 | 55.6 | 54.0 |
| 50% PoE | 69.5 | 65.3 | 62.0 | 61.3 | 61.2 | 57.0 | 58.5 | 57.6 | 57.2 | 55.7 |
| 10% PoE | 72.3 | 68.0 | 64.5 | 63.8 | 63.5 | 59.3 | 60.8 | 59.8 | 59.6 | 58.0 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 74.7 | 72.7 | 70.6 | 70.1 | 71.6 | 69.7 | 52.0 | 50.6 | 41.9 | 39.2 |
| 90% PoE | 80.2 | 75.5 | 72.6 | 71.1 | 65.3 | 65.9 | 65.8 | 63.3 | 63.3 | 57.3 |
| 50% PoE | 83.8 | 78.6 | 75.7 | 74.4 | 67.9 | 68.9 | 68.9 | 66.3 | 65.9 | 59.8 |
| 10% PoE | 88.3 | 82.7 | 79.4 | 77.7 | 71.3 | 72.4 | 72.2 | 69.6 | 68.8 | 62.8 |

*Note: All forecasts are in MW.*

*Source:* Powercor terminal station data, The CIE.

## 4.72 RTS22 average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.806 |
| Winter | 0.838 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

## 4.73 RTS22 details of actual maxima

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 16-06-04 9:00 | 62.6 | 12.7 | 8.3 | 14.5 | 11.6 |
| 10-08-05 17:00 | 65.8 | 7.7 | 4.7 | 10.1 | 10.2 |
| 20-06-06 17:30 | 68.5 | 11.2 | 3.0 | 13.7 | 10.4 |
| 17-07-07 17:00 | 61.0 | 7.2 | 5.0 | 9.6 | 8.4 |
| 21-08-08 17:00 | 57.9 | 8.3 | 7.0 | 12.0 | 10.3 |
| 09-06-09 17:00 | 57.6 | 8.0 | 6.0 | 12.4 | 11.1 |
| 12-08-10 17:00 | 62.1 | 13.0 | 9.0 | 14.1 | 10.3 |
| 07-06-11 17:00 | 61.1 | 13.4 | 5.6 | 14.0 | 11.2 |
| 21-06-12 17:00 | 55.1 | 9.5 | 9.5 | 12.5 | 10.6 |
| 24-06-13 9:00 | 58.1 | 4.1 | 2.2 | 12.0 | 9.1 |
| 04-08-14 9:00 | 51.4 | 4.4 | 1.9 | 15.2 | 10.6 |
| 04-06-15 17:00 | 46.6 | 8.0 | 4.5 | 10.8 | 11.7 |
| 27-06-16 9:00 | 35.7 | 7.8 | 6.8 | 10.4 | 9.3 |
| 12-07-17 8:30 | 33.7 | 4.2 | 3.3 | 15.0 | 10.4 |
| **Summer** | | | | | |
| 04-03-04 15:00 | 72.6 | 33.7 | 19.1 | 34.4 | 19.5 |
| 28-01-05 14:00 | 75.6 | 34.9 | 20.8 | 35.5 | 24.0 |
| 24-02-06 15:00 | 81.8 | 35.3 | 21.2 | 35.6 | 22.1 |
| 19-02-07 16:00 | 89.3 | 26.9 | 21.2 | 27.1 | 23.3 |
| 14-03-08 15:00 | 70.4 | 38.2 | 20.6 | 38.8 | 25.6 |
| 30-01-09 11:30 | 74.7 | 42.1 | 23.9 | 43.9 | 27.9 |
| 16-12-09 15:30 | 72.7 | 38.0 | 18.5 | 39.0 | 19.8 |
| 01-02-11 12:30 | 70.6 | 38.8 | 18.9 | 39.4 | 24.6 |
| 24-01-12 14:30 | 70.1 | 34.1 | 20.6 | 34.4 | 24.0 |
| 12-03-13 15:30 | 71.6 | 36.0 | 24.3 | 36.0 | 20.7 |
| 28-01-14 15:30 | 69.7 | 40.0 | 21.6 | 41.4 | 22.5 |
| 22-01-15 15:30 | 52.0 | 35.0 | 18.8 | 35.0 | 19.5 |
| 08-12-15 15:30 | 50.6 | 34.1 | 18.1 | 35.0 | 21.3 |
| 09-02-17 12:30 | 41.9 | 34.5 | 20.1 | 34.5 | 23.2 |
| 30-11-17 15:00 | 39.2 | 33.6 | 22.7 | 34.4 | 22.0 |

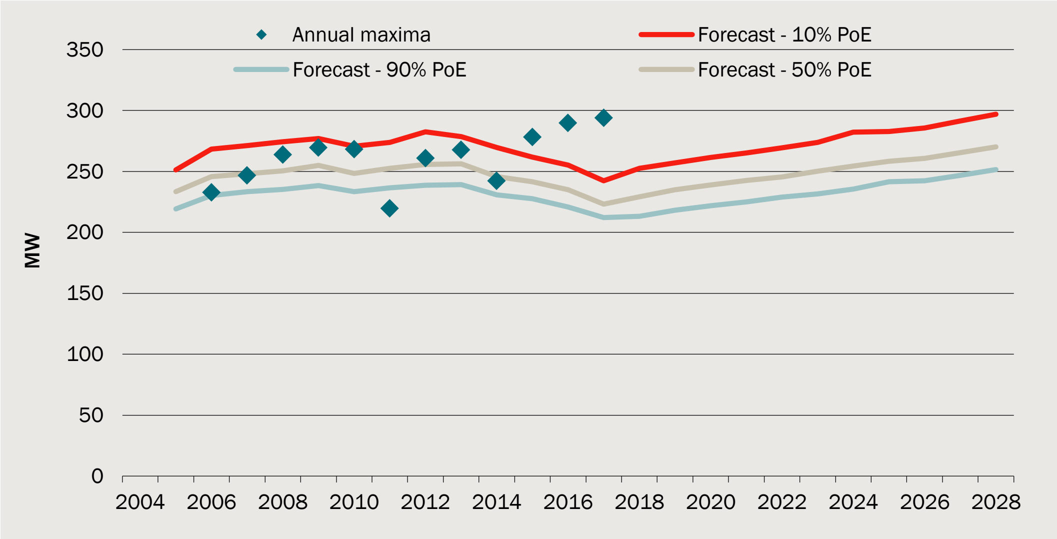
*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.

*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

## *RTS66 Transformers 1 & 2*

The average demand model was estimated excluding data for 2014, due to load transfers between terminal stations.

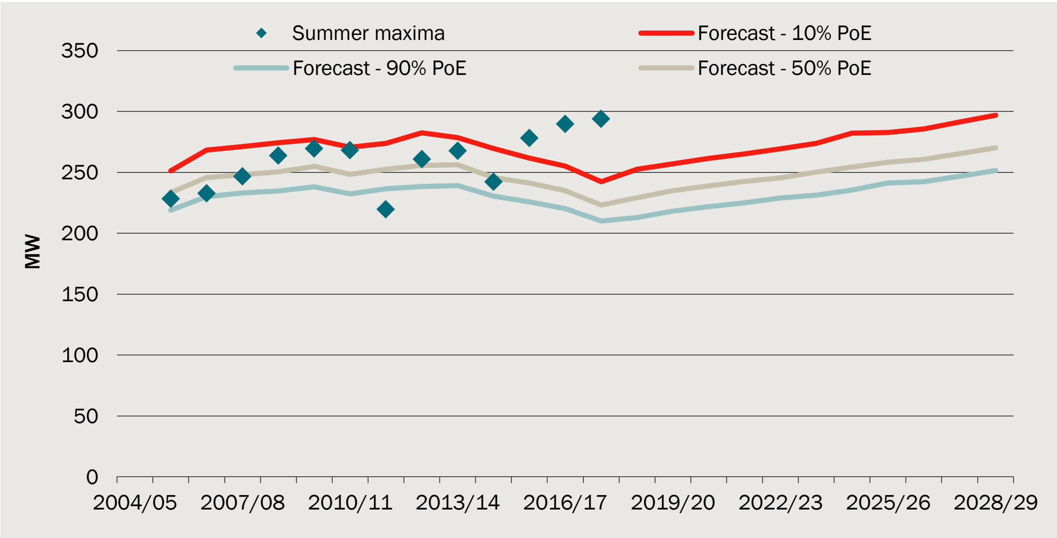
### 4.74 RTS66 Transformers 1 & 2 annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

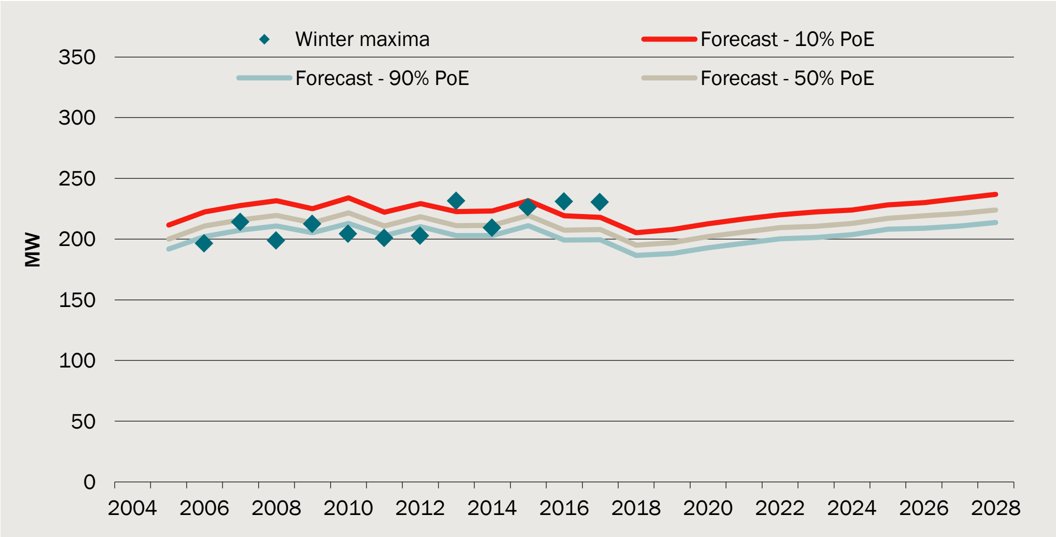
### 4.75 RTS66 Transformers 1 & 2 summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

## 4.76 RTS66 Transformers 1 & 2 winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

## 4.77 RTS66 Transformers 1 & 2 maximum demand forecasts excluding post modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 212.8 | 218.1 | 221.8 | 225.0 | 229.0 | 231.4 | 235.5 | 241.2 | 242.3 | 246.7 | 251.5 |
| 50% PoE | 229.2 | 234.9 | 238.9 | 242.5 | 245.6 | 250.2 | 254.3 | 258.3 | 260.8 | 265.3 | 270.2 |
| 10% PoE | 252.6 | 257.1 | 261.6 | 265.2 | 269.4 | 273.9 | 282.3 | 282.9 | 285.6 | 291.3 | 297.0 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 186.4 | 188.2 | 193.0 | 196.7 | 200.3 | 201.4 | 203.6 | 208.1 | 209.0 | 210.7 | 213.8 |
| 50% PoE | 194.9 | 197.2 | 202.0 | 205.8 | 209.4 | 210.5 | 212.9 | 217.1 | 219.2 | 221.1 | 224.0 |
| 10% PoE | 205.3 | 208.0 | 212.6 | 216.6 | 220.1 | 222.4 | 223.9 | 228.1 | 230.0 | 233.5 | 236.9 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 213.1 | 218.1 | 222.0 | 225.1 | 229.0 | 231.6 | 235.5 | 241.6 | 242.4 | 246.7 | 251.5 |
| 50% PoE | 229.2 | 234.9 | 238.9 | 242.5 | 245.6 | 250.2 | 254.3 | 258.3 | 260.8 | 265.3 | 270.2 |
| 10% PoE | 252.6 | 257.1 | 261.6 | 265.2 | 269.4 | 273.9 | 282.3 | 282.9 | 285.6 | 291.3 | 297.0 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

## 4.78 RTS66 Transformers 1 & 2 maximum demand forecasts including post modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 233.9 | 234.7 | 238.3 | 240.9 | 243.7 | 245.2 | 249.5 | 252.4 | 251.4 | 254.9 | 257.8 |
| 50% PoE | 250.2 | 251.5 | 255.4 | 258.4 | 260.3 | 264.0 | 268.4 | 269.5 | 269.9 | 273.5 | 276.5 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10% PoE | 273.7 | 273.7 | 278.0 | 281.1 | 284.1 | 287.7 | 296.4 | 294.1 | 294.7 | 299.5 | 303.4 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 207.0 | 203.5 | 208.4 | 211.8 | 215.2 | 215.0 | 216.3 | 219.7 | 218.3 | 218.0 | 219.7 |
| 50% PoE | 215.5 | 212.5 | 217.3 | 220.9 | 224.3 | 224.1 | 225.6 | 228.7 | 228.5 | 228.5 | 229.9 |
| 10% PoE | 225.8 | 223.3 | 227.9 | 231.7 | 235.0 | 236.0 | 236.6 | 239.7 | 239.4 | 240.9 | 242.8 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 234.2 | 234.7 | 238.4 | 241.0 | 243.7 | 245.4 | 249.5 | 252.8 | 251.5 | 254.9 | 257.8 |
| 50% PoE | 250.2 | 251.5 | 255.4 | 258.4 | 260.3 | 264.0 | 268.4 | 269.5 | 269.9 | 273.5 | 276.5 |
| 10% PoE | 273.7 | 273.7 | 278.0 | 281.1 | 284.1 | 287.7 | 296.4 | 294.1 | 294.7 | 299.5 | 303.4 |

*Note:* All forecasts are in MW.

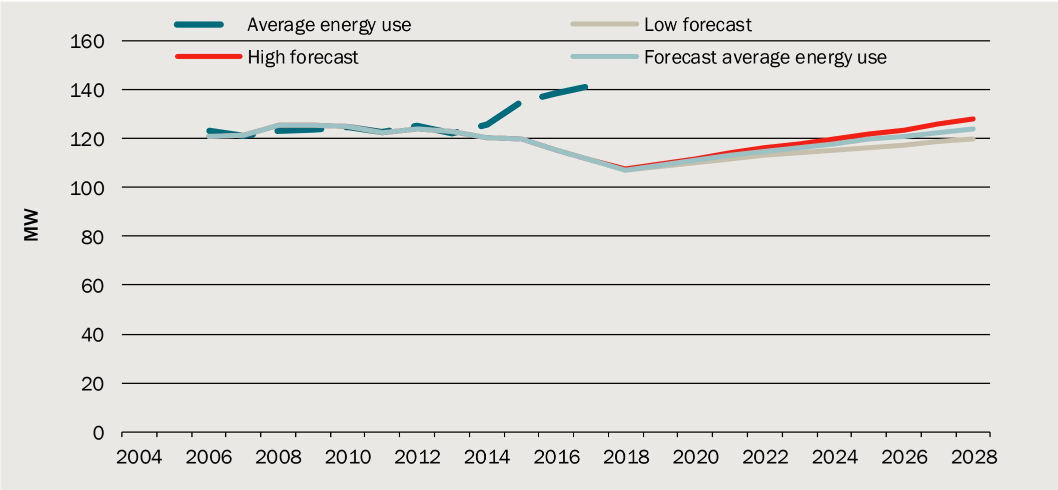
*Source:* Powercor terminal station data, The CIE.

### 4.79 RTS66 Transformers 1 & 2 average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate long run model only | -0.0470 |
| Income | AEMO constrained long run model only | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

### 4.80 RTS66 Transformers 1 & 2 average demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

## 4.81 RTS66 Transformers 1 & 2 predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 263.8 | 269.5 | 268.3 | 219.6 | 260.9 | 267.6 | 242.2 | 278.1 | 289.6 | 293.9 |
| 90% PoE | 234.7 | 238.2 | 232.4 | 236.4 | 238.5 | 239.2 | 230.5 | 225.9 | 220.4 | 210.2 |
| 50% PoE | 250.5 | 254.9 | 248.3 | 252.7 | 255.6 | 256.3 | 245.8 | 241.3 | 235.1 | 223.1 |
| 10% PoE | 274.2 | 277.1 | 270.6 | 274.0 | 282.6 | 278.6 | 269.6 | 261.8 | 255.1 | 242.4 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 198.9 | 212.6 | 204.4 | 201.0 | 202.8 | 231.5 | 209.3 | 226.1 | 231.0 | 230.5 |
| 90% PoE | 210.8 | 205.3 | 212.8 | 202.9 | 210.2 | 202.8 | 202.8 | 211.0 | 199.1 | 199.6 |
| 50% PoE | 219.4 | 213.4 | 221.5 | 210.7 | 218.4 | 210.9 | 211.4 | 219.5 | 207.4 | 208.0 |
| 10% PoE | 231.5 | 224.9 | 233.9 | 222.1 | 229.2 | 222.7 | 223.1 | 231.6 | 219.2 | 218.0 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 263.8 | 269.5 | 268.3 | 219.6 | 260.9 | 267.6 | 242.2 | 278.1 | 289.6 | 293.9 |
| 90% PoE | 235.3 | 238.3 | 233.5 | 236.6 | 238.6 | 239.2 | 230.7 | 227.6 | 220.8 | 212.1 |
| 50% PoE | 250.5 | 254.9 | 248.3 | 252.7 | 255.8 | 256.3 | 245.8 | 241.5 | 235.1 | 223.3 |
| 10% PoE | 274.2 | 277.1 | 270.6 | 274.0 | 282.6 | 278.6 | 269.6 | 261.8 | 255.1 | 242.4 |

*Note: All forecasts are in MW.*
*Source:* Powercor terminal station data, The CIE.

## 4.82 RTS66 Transformers 1 & 2 average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.861 |
| Winter | 0.826 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.
Source: Powercor terminal station data, The CIE.

### 4.83 RTS66 Transformers 1 & 2 details of actual maxima

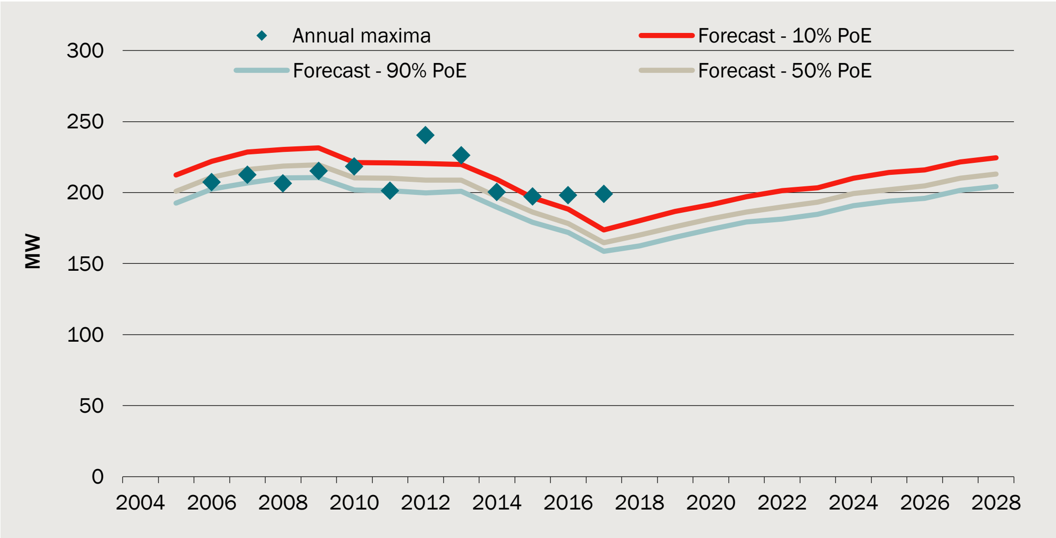
| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 13-06-06 18:30 | 196.4 | 11.0 | 6.3 | 12.1 | 10.7 |
| 17-07-07 18:00 | 214.2 | 5.5 | 5.0 | 9.6 | 8.4 |
| 11-08-08 18:30 | 198.9 | 9.3 | 6.8 | 12.9 | 10.0 |
| 11-06-09 10:00 | 212.6 | 8.8 | 6.2 | 12.2 | 10.1 |
| 29-06-10 13:00 | 204.4 | 7.9 | 7.6 | 10.7 | 9.8 |
| 07-06-11 18:00 | 201.0 | 13.2 | 5.6 | 14.0 | 11.2 |
| 20-06-12 18:00 | 202.8 | 12.9 | 4.9 | 13.4 | 10.6 |
| 24-06-13 18:00 | 231.5 | 12.0 | 2.2 | 12.0 | 9.1 |
| 01-08-14 18:00 | 209.3 | 7.4 | 6.2 | 9.8 | 10.6 |
| 14-07-15 18:00 | 226.1 | 7.3 | 6.7 | 9.7 | 9.4 |
| 26-07-16 18:30 | 231.0 | 9.6 | 6.9 | 10.8 | 10.3 |
| 03-08-17 18:30 | 230.5 | 8.4 | 3.1 | 8.9 | 9.7 |
| **Summer** | | | | | |
| 27-01-06 12:00 | 228.2 | 34.5 | 21.5 | 35.0 | 25.2 |
| 23-03-07 13:30 | 232.9 | 36.5 | 21.0 | 37.1 | 21.1 |
| 17-03-08 15:00 | 246.7 | 37.8 | 20.9 | 37.8 | 25.6 |
| 30-01-09 12:00 | 263.8 | 42.3 | 23.9 | 43.9 | 27.9 |
| 10-02-10 11:00 | 269.5 | 32.3 | 20.1 | 32.3 | 23.9 |
| 01-02-11 13:00 | 268.3 | 39.4 | 18.9 | 39.4 | 24.6 |
| 30-01-12 13:00 | 219.6 | 31.4 | 16.5 | 31.8 | 22.0 |
| 12-03-13 15:30 | 260.9 | 36.0 | 24.3 | 36.0 | 20.7 |
| 17-01-14 13:30 | 267.6 | 42.0 | 23.6 | 43.1 | 26.3 |
| 22-01-15 15:00 | 242.2 | 34.4 | 18.8 | 35.0 | 19.5 |
| 08-03-16 15:30 | 278.1 | 37.9 | 19.9 | 38.6 | 23.2 |
| 09-02-17 12:30 | 289.6 | 34.5 | 20.1 | 34.5 | 23.2 |
| 29-01-18 12:00 | 293.9 | 33.2 | 18.9 | 33.2 | 19.5 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.
*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

## *RTS66 Transformers 3 & 4*

The average demand model for RTS66 Transformers 3 & 4 was estimated excluding data for 2014, due to load transfers between terminal stations.

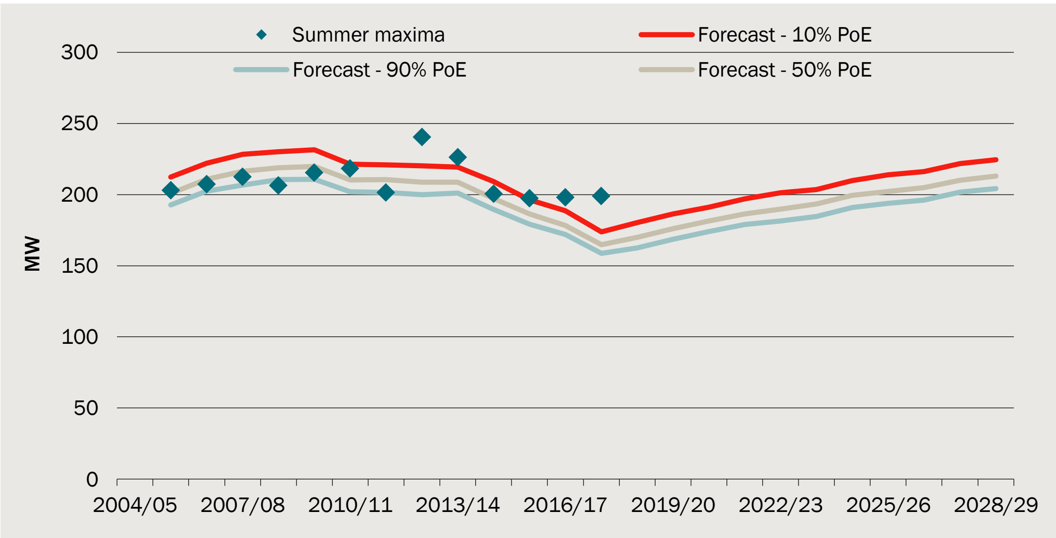
### 4.84 RTS66 Transformers 3 & 4 annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

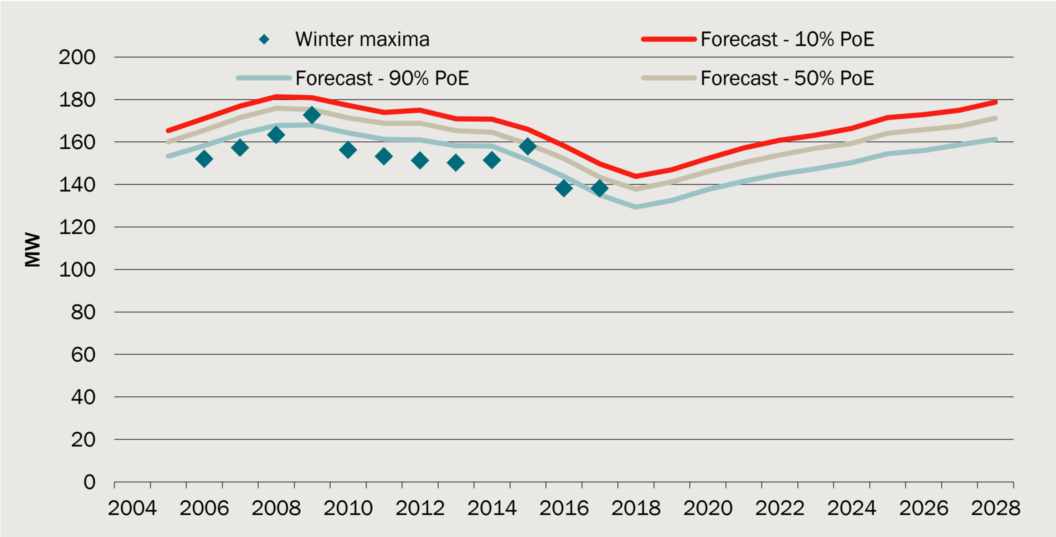
### 4.85 RTS66 Transformers 3 & 4 summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 4.86 RTS66 Transformers 3 & 4 winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 4.87 RTS66 Transformers 3 & 4 maximum demand forecasts excluding post modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 162.6 | 168.6 | 174.1 | 179.0 | 181.5 | 184.7 | 190.8 | 193.7 | 196.0 | 201.7 | 204.3 |
| 50% PoE | 170.0 | 176.0 | 181.4 | 186.4 | 189.8 | 193.3 | 199.5 | 202.1 | 204.9 | 210.0 | 213.0 |
| 10% PoE | 180.3 | 186.5 | 191.2 | 197.0 | 201.3 | 203.5 | 209.8 | 214.0 | 216.1 | 221.7 | 224.6 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 129.3 | 132.4 | 137.7 | 141.5 | 144.9 | 147.5 | 150.2 | 154.5 | 155.9 | 158.6 | 161.2 |
| 50% PoE | 137.8 | 141.2 | 146.0 | 150.3 | 153.9 | 157.0 | 159.3 | 164.1 | 165.7 | 167.4 | 171.2 |
| 10% PoE | 143.8 | 147.0 | 152.3 | 157.2 | 160.9 | 163.2 | 166.5 | 171.5 | 172.9 | 174.9 | 178.7 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 162.5 | 168.6 | 174.2 | 179.2 | 181.4 | 184.7 | 190.8 | 193.9 | 196.0 | 201.6 | 204.3 |
| 50% PoE | 170.0 | 176.0 | 181.5 | 186.4 | 189.8 | 193.3 | 199.4 | 202.1 | 204.8 | 210.0 | 213.0 |
| 10% PoE | 180.3 | 186.8 | 191.4 | 197.1 | 201.4 | 203.5 | 210.0 | 214.2 | 215.9 | 221.6 | 224.5 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 4.88 RTS66 Transformers 3 & 4 maximum demand forecasts including post modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 155.2 | 48.6 | 48.0 | 46.6 | 44.2 | 42.2 | 41.8 | 36.7 | 31.9 | 29.0 | 22.4 |
| 50% PoE | 162.7 | 56.0 | 55.3 | 54.1 | 52.6 | 50.9 | 50.4 | 45.1 | 40.7 | 37.4 | 31.2 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10% PoE | 172.9 | 66.5 | 65.1 | 64.6 | 64.0 | 61.0 | 60.8 | 56.9 | 52.0 | 49.1 | 42.7 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 121.9 | 112.1 | 33.6 | 31.8 | 30.4 | 27.9 | 26.2 | 21.6 | 16.6 | 12.6 | 5.6 |
| 50% PoE | 130.4 | 120.9 | 41.9 | 40.5 | 39.4 | 37.5 | 35.2 | 31.2 | 26.4 | 21.4 | 15.6 |
| 10% PoE | 136.4 | 126.7 | 48.2 | 47.5 | 46.4 | 43.7 | 42.4 | 38.6 | 33.6 | 28.9 | 23.1 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 155.1 | 48.6 | 48.1 | 46.9 | 44.1 | 42.2 | 41.8 | 36.8 | 31.9 | 29.0 | 22.5 |
| 50% PoE | 162.7 | 56.0 | 55.4 | 54.0 | 52.5 | 50.9 | 50.4 | 45.1 | 40.7 | 37.4 | 31.1 |
| 10% PoE | 172.9 | 66.8 | 65.3 | 64.7 | 64.1 | 61.0 | 61.0 | 57.2 | 51.8 | 49.0 | 42.6 |

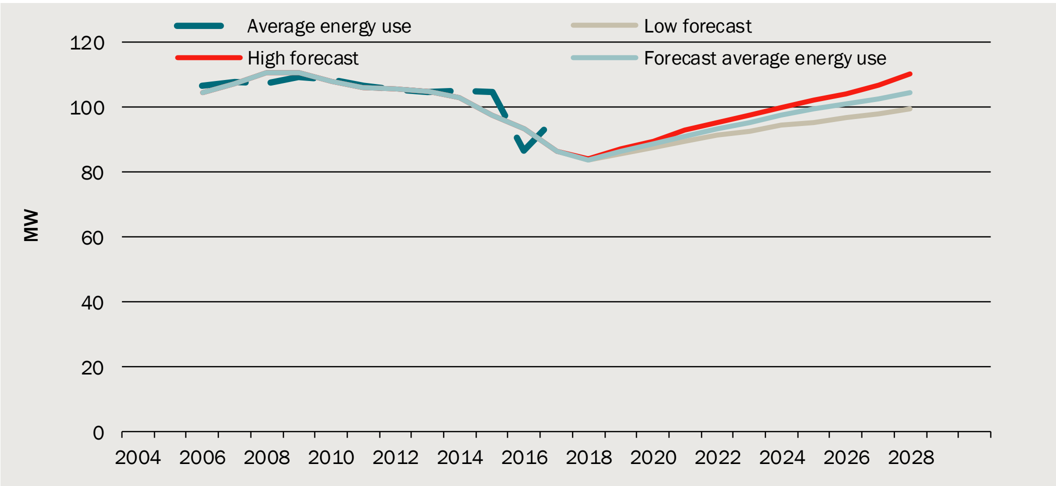
*Note:* All forecasts are in MW.
*Source:* Powercor terminal station data, The CIE.

### 4.89 RTS66 Transformers 3 & 4 average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate long run only | -0.1064 |
| Income | AEMO constrained long run only | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

### 4.90 RTS66 Transformers 3 & 4 average demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

### 4.91 RTS66 Transformers 3 & 4 predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 206.3 | 215.3 | 218.3 | 201.3 | 240.3 | 226.2 | 200.4 | 197.2 | 198.0 | 199.0 |
| 90% PoE | 210.4 | 210.6 | 201.8 | 201.5 | 199.9 | 200.9 | 189.6 | 179.1 | 171.9 | 158.6 |
| 50% PoE | 218.8 | 219.6 | 210.3 | 210.4 | 208.7 | 208.7 | 197.1 | 186.4 | 178.3 | 164.7 |

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| 10% PoE | 230.2 | 231.4 | 221.3 | 220.9 | 220.1 | 219.2 | 209.0 | 196.4 | 188.7 | 173.8 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 163.3 | 172.6 | 156.3 | 153.2 | 151.2 | 150.2 | 151.3 | 157.9 | 138.2 | 138.1 |
| 90% PoE | 167.8 | 168.0 | 164.2 | 161.2 | 161.0 | 158.2 | 158.0 | 151.5 | 143.8 | 135.0 |
| 50% PoE | 175.9 | 175.3 | 171.4 | 168.8 | 168.8 | 165.4 | 164.6 | 159.0 | 152.2 | 143.4 |
| 10% PoE | 181.4 | 180.8 | 177.3 | 174.0 | 175.0 | 170.9 | 170.8 | 165.9 | 158.3 | 149.7 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 206.3 | 215.3 | 218.3 | 201.3 | 240.3 | 226.2 | 200.4 | 197.2 | 198.0 | 199.0 |
| 90% PoE | 210.4 | 210.5 | 201.8 | 201.5 | 199.9 | 200.9 | 189.6 | 179.1 | 171.9 | 158.6 |
| 50% PoE | 218.8 | 219.6 | 210.3 | 210.2 | 208.7 | 208.7 | 197.1 | 186.4 | 178.3 | 164.6 |
| 10% PoE | | 223.7 | 226.1 | 227.4 | 224.4 | 223.9 | 219.7 | 221.2 | 224.2 | 236.2 |

*Note:* All forecasts are in MW.
*Source:* Powercor terminal station data, The CIE.

### 4.92 RTS66 Transformers 3 & 4 average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.877 |
| Winter | 0.816 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.
Source: Powercor terminal station data, The CIE.

Summer peaks occur during the early afternoon, while winter peaks occur around mid-morning.

### 4.93 RTS66 Transformers 3 & 4 details of actual maxima

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 02-08-06 8:30 | 152.1 | 9.2 | 7.4 | 13.8 | 11.1 |
| 17-07-07 12:30 | 157.3 | 6.0 | 5.0 | 9.6 | 8.4 |
| 11-08-08 9:00 | 163.3 | 8.4 | 6.8 | 12.9 | 10.0 |
| 12-06-09 9:00 | 172.6 | 6.9 | 5.4 | 10.5 | 10.1 |
| 29-06-10 12:00 | 156.3 | 7.6 | 7.6 | 10.7 | 9.8 |
| 29-06-11 9:00 | 153.2 | 6.6 | 4.6 | 18.0 | 12.4 |
| 16-08-12 9:30 | 151.2 | 10.1 | 7.0 | 14.6 | 10.9 |
| 24-06-13 9:00 | 150.2 | 4.1 | 2.2 | 12.0 | 9.1 |
| 04-08-14 9:00 | 151.3 | 4.4 | 1.9 | 15.2 | 10.6 |
| 20-07-15 9:00 | 157.9 | 4.3 | 1.9 | 14.4 | 9.2 |
| 26-07-16 15:00 | 138.2 | 10.2 | 6.9 | 10.8 | 10.3 |
| 03-08-17 11:00 | 138.1 | 6.7 | 3.1 | 8.9 | 9.7 |

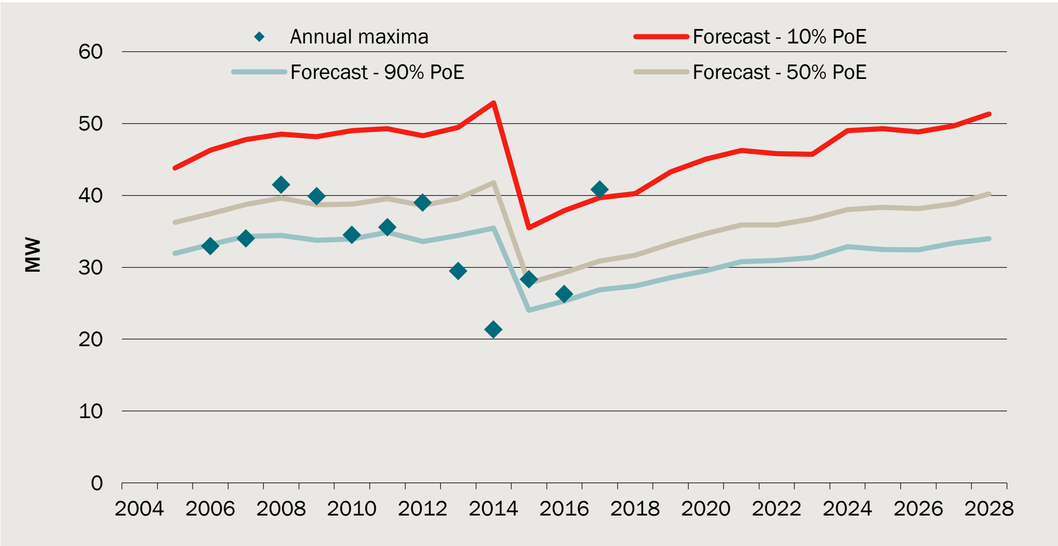
| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Summer** | | | | | |
| 27-01-06 12:00 | 202.9 | 34.5 | 21.5 | 35.0 | 25.2 |
| 23-03-07 15:00 | 207.3 | 36.0 | 21.0 | 37.1 | 21.1 |
| 17-03-08 15:00 | 212.4 | 37.8 | 20.9 | 37.8 | 25.6 |
| 29-01-09 11:30 | 206.3 | 41.1 | 29.1 | 43.7 | 27.9 |
| 12-01-10 13:00 | 215.3 | 32.3 | 17.6 | 34.8 | 24.7 |
| 01-02-11 12:30 | 218.3 | 38.8 | 18.9 | 39.4 | 24.6 |
| 30-01-12 12:30 | 201.3 | 30.1 | 16.5 | 31.8 | 22.0 |
| 12-03-13 13:00 | 240.3 | 34.3 | 24.3 | 36.0 | 20.7 |
| 17-01-14 14:30 | 226.2 | 42.4 | 23.6 | 43.1 | 26.3 |
| 22-01-15 15:00 | 200.4 | 34.4 | 18.8 | 35.0 | 19.5 |
| 13-01-16 14:30 | 197.2 | 40.1 | 17.0 | 41.6 | 22.2 |
| 09-02-17 12:30 | 198.0 | 34.5 | 20.1 | 34.5 | 23.2 |
| 29-01-18 12:00 | 199.0 | 33.2 | 18.9 | 33.2 | 19.5 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.
*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

## *SVTS*

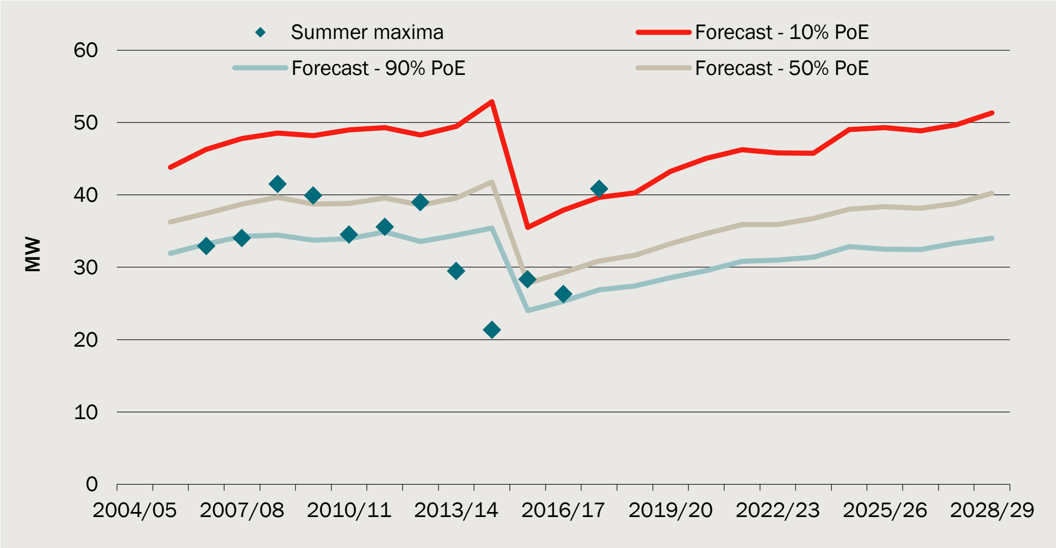
The average demand model was estimated including a structural break at the beginning of 2014 to account United Energy. Electricity from SVTS is transferred to the United Energy network load in the data before 2014, and is included in that data. More recent data has been adjusted to remove United Energy Load, resulting in a downward shift in the data.

### 4.94 SVTS annual maximum demand forecasts



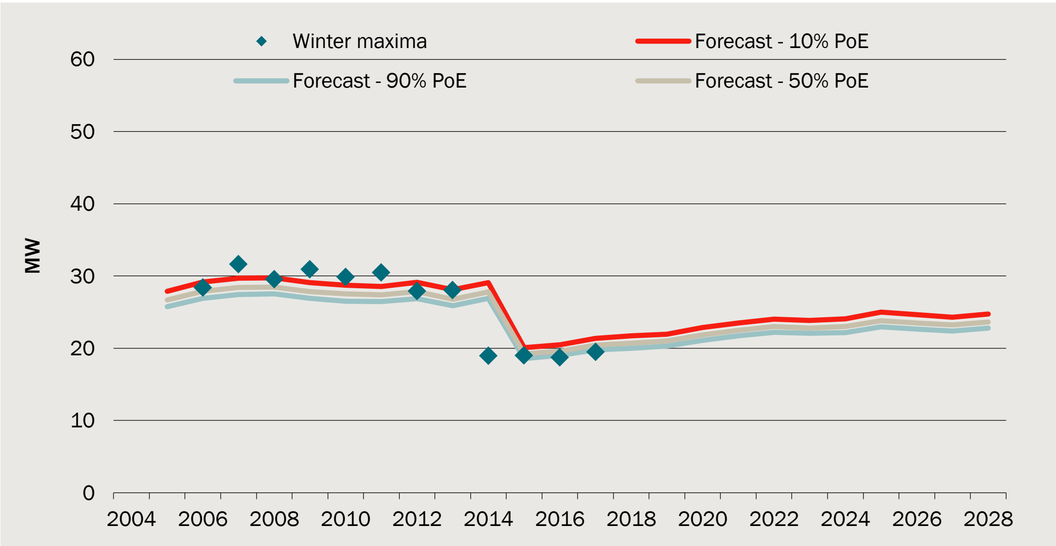
*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

### 4.95 SVTS summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

### 4.96 SVTS winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.
*Data source:* The CIE.

## 4.97 SVTS maximum demand forecasts excluding post modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 27.4 | 28.6 | 29.5 | 30.8 | 31.0 | 31.4 | 32.9 | 32.5 | 32.4 | 33.3 | 34.0 |
| 50% PoE | 31.7 | 33.3 | 34.7 | 35.9 | 35.9 | 36.7 | 38.0 | 38.4 | 38.2 | 38.8 | 40.2 |
| 10% PoE | 40.3 | 43.3 | 45.0 | 46.3 | 45.8 | 45.7 | 49.0 | 49.3 | 48.9 | 49.7 | 51.3 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 20.0 | 20.3 | 21.1 | 21.7 | 22.2 | 22.1 | 22.2 | 23.0 | 22.7 | 22.4 | 22.8 |
| 50% PoE | 20.7 | 21.0 | 21.8 | 22.5 | 23.0 | 22.8 | 23.0 | 23.8 | 23.5 | 23.2 | 23.6 |
| 10% PoE | 21.7 | 21.9 | 22.9 | 23.5 | 24.0 | 23.9 | 24.1 | 25.0 | 24.6 | 24.3 | 24.7 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 27.4 | 28.6 | 29.5 | 30.8 | 31.0 | 31.4 | 32.9 | 32.5 | 32.4 | 33.3 | 34.0 |
| 50% PoE | 31.7 | 33.3 | 34.7 | 35.9 | 35.9 | 36.7 | 38.0 | 38.4 | 38.2 | 38.8 | 40.2 |
| 10% PoE | 40.3 | 43.3 | 45.0 | 46.3 | 45.8 | 45.7 | 49.0 | 49.3 | 48.9 | 49.7 | 51.3 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

## 4.98 SVTS maximum demand forecasts including post modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 26.2 | 25.3 | 25.8 | 26.5 | 26.3 | 26.3 | 27.3 | 26.1 | 25.5 | 25.8 | 25.8 |
| 50% PoE | 30.4 | 30.0 | 31.0 | 31.6 | 31.2 | 31.6 | 32.5 | 32.0 | 31.2 | 31.3 | 32.0 |
| 10% PoE | 39.0 | 40.0 | 41.3 | 42.0 | 41.2 | 40.6 | 43.5 | 42.9 | 41.9 | 42.2 | 43.1 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 18.8 | 17.1 | 17.4 | 17.5 | 17.5 | 17.0 | 16.6 | 16.6 | 15.7 | 14.9 | 14.6 |
| 50% PoE | 19.5 | 17.8 | 18.1 | 18.2 | 18.3 | 17.7 | 17.5 | 17.4 | 16.5 | 15.7 | 15.4 |
| 10% PoE | 20.5 | 18.7 | 19.2 | 19.2 | 19.4 | 18.8 | 18.6 | 18.6 | 17.7 | 16.8 | 16.5 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 26.2 | 25.3 | 25.8 | 26.5 | 26.3 | 26.3 | 27.3 | 26.1 | 25.5 | 25.8 | 25.8 |
| 50% PoE | 30.4 | 30.0 | 31.0 | 31.6 | 31.2 | 31.6 | 32.5 | 32.0 | 31.2 | 31.3 | 32.0 |
| 10% PoE | 39.0 | 40.0 | 41.3 | 42.0 | 41.2 | 40.6 | 43.5 | 42.9 | 41.9 | 42.2 | 43.1 |

*Note:* All forecasts are in MW.

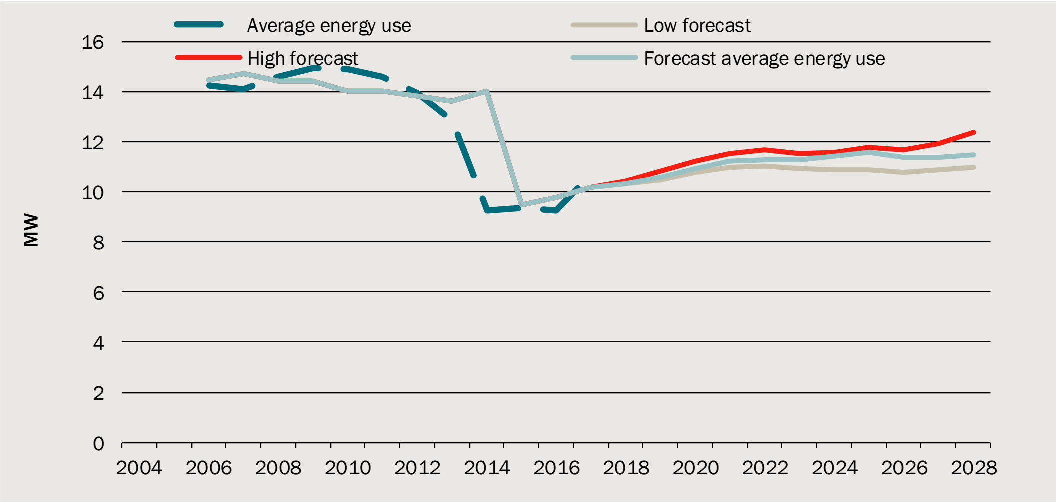
*Source:* Powercor terminal station data, The CIE.

## 4.99 SVTS average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate long run model only | -0.3364 |
| Income | AEMO constrained long run model only | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

### 4.100 SVTS average demand forecasts




*Data source:* Powercor terminal station data, The CIE.

### 4.101 SVTS predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 41.5 | 39.9 | 34.5 | 35.6 | 39.0 | 29.5 | 21.3 | 28.3 | 26.3 | 40.8 |
| 90% PoE | 34.4 | 33.7 | 33.9 | 34.9 | 33.6 | 34.4 | 35.4 | 24.0 | 25.3 | 26.9 |
| 50% PoE | 39.7 | 38.7 | 38.8 | 39.6 | 38.6 | 39.6 | 41.8 | 27.8 | 29.3 | 30.9 |
| 10% PoE | 48.6 | 48.2 | 49.0 | 49.3 | 48.3 | 49.5 | 52.9 | 35.5 | 37.9 | 39.7 |
| **Winter Maxima** | | | | | | | | | | |
| Actual | 29.6 | 30.9 | 29.8 | 30.5 | 27.9 | 28.0 | 19.0 | 19.0 | 18.7 | 19.5 |
| 90% PoE | 27.5 | 26.9 | 26.5 | 26.5 | 26.9 | 25.9 | 26.9 | 18.6 | 19.0 | 19.8 |
| 50% PoE | 28.5 | 27.8 | 27.5 | 27.4 | 27.8 | 26.8 | 27.8 | 19.2 | 19.6 | 20.5 |
| 10% PoE | 29.7 | 29.1 | 28.7 | 28.6 | 29.1 | 28.1 | 29.1 | 20.1 | 20.5 | 21.4 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 41.5 | 39.9 | 34.5 | 35.6 | 39.0 | 29.5 | 21.3 | 28.3 | 26.3 | 40.8 |
| 90% PoE | 34.4 | 33.7 | 33.9 | 34.9 | 33.6 | 34.4 | 35.4 | 24.0 | 25.3 | 26.9 |
| 50% PoE | 39.7 | 38.7 | 38.8 | 39.6 | 38.6 | 39.6 | 41.8 | 27.8 | 29.3 | 30.9 |
| 10% PoE | 48.6 | 48.2 | 49.0 | 49.3 | 48.3 | 49.5 | 52.9 | 35.5 | 37.9 | 39.7 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 4.102 SVTS average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.731 |
| Winter | 0.722 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

### 4.103 SVTS details of actual maxima

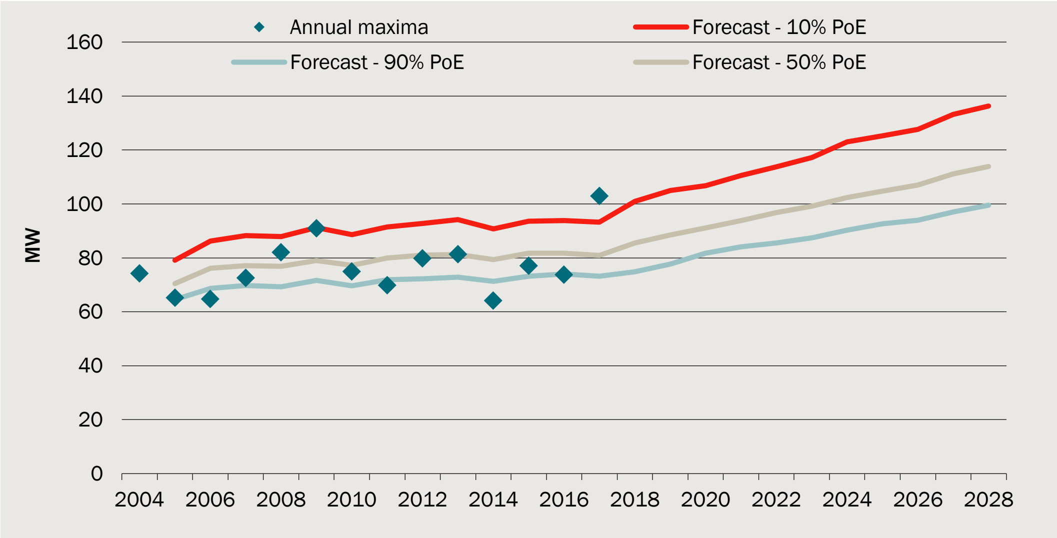
| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 05-06-06 18:00 | 28.4 | 11.0 | 3.8 | 11.0 | 9.0 |
| 17-07-07 18:00 | 31.6 | 5.5 | 5.0 | 9.6 | 8.4 |
| 11-08-08 18:00 | 29.6 | 9.8 | 6.8 | 12.9 | 10.0 |
| 09-06-09 18:00 | 30.9 | 7.8 | 6.0 | 12.4 | 11.1 |
| 28-06-10 18:00 | 29.8 | 9.4 | 4.0 | 11.1 | 9.8 |
| 08-06-11 18:00 | 30.5 | 10.6 | 5.1 | 11.6 | 11.2 |
| 09-08-12 18:00 | 27.9 | 10.4 | 8.2 | 11.2 | 11.2 |
| 24-06-13 18:00 | 28.0 | 12.0 | 2.2 | 12.0 | 9.1 |
| 11-08-14 18:30 | 19.0 | 10.0 | 6.0 | 12.7 | 11.3 |
| 14-07-15 18:00 | 19.0 | 7.3 | 6.7 | 9.7 | 9.4 |
| 26-07-16 18:30 | 18.7 | 9.6 | 6.9 | 10.8 | 10.3 |
| 03-08-17 18:30 | 19.5 | 8.4 | 3.1 | 8.9 | 9.7 |
| **Summer** | | | | | |
| 18-02-07 17:00 | 32.9 | 36.6 | 21.4 | 37.9 | 27.1 |
| 17-03-08 16:30 | 34.0 | 37.6 | 20.9 | 37.8 | 25.6 |
| 29-01-09 17:30 | 41.5 | 43.1 | 29.1 | 43.7 | 27.9 |
| 11-01-10 17:30 | 39.9 | 41.7 | 19.1 | 43.1 | 24.7 |
| 01-02-11 13:00 | 34.5 | 39.4 | 18.9 | 39.4 | 24.6 |
| 26-02-12 16:30 | 35.6 | 32.8 | 23.9 | 32.8 | 20.5 |
| 12-03-13 16:30 | 39.0 | 35.7 | 24.3 | 36.0 | 20.7 |
| 28-01-14 17:30 | 29.5 | 40.7 | 21.6 | 41.4 | 22.5 |
| 22-01-15 16:30 | 21.3 | 34.9 | 18.8 | 35.0 | 19.5 |
| 08-03-16 17:00 | 28.3 | 37.8 | 19.9 | 38.6 | 23.2 |
| 08-02-17 17:30 | 26.3 | 35.8 | 16.6 | 35.9 | 23.2 |
| 28-01-18 17:30 | 40.8 | 37.7 | 22.8 | 37.7 | 23.4 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.

*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

# TSTS

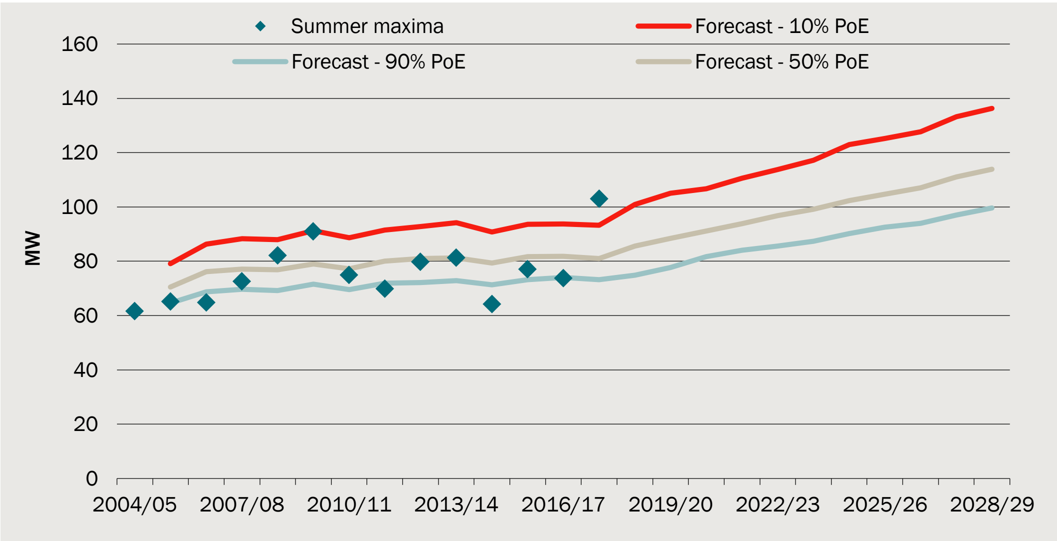
### 4.104 TSTS annual maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

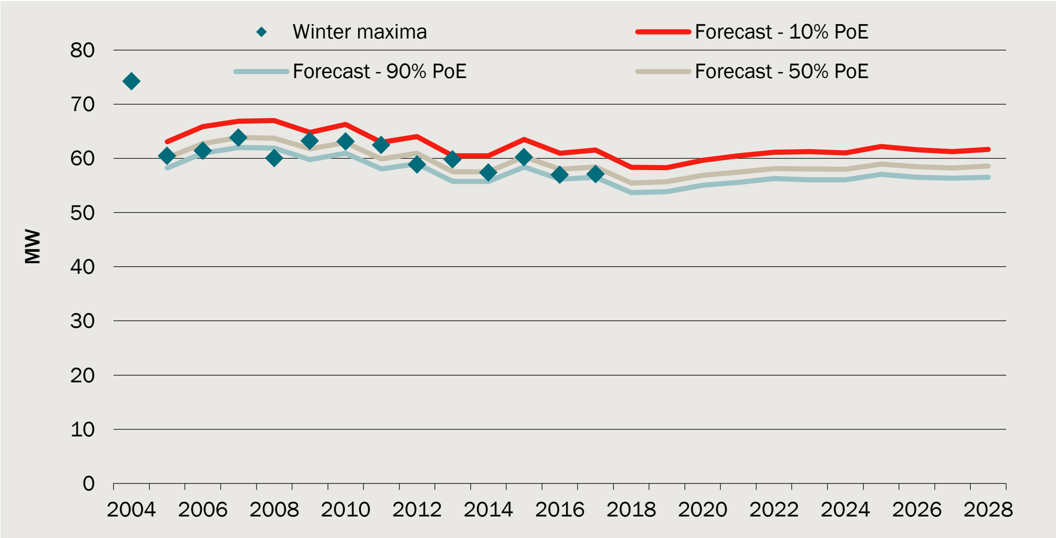
### 4.105 TSTS summer maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 4.106 TSTS winter maximum demand forecasts




*Note:* No block load adjustments have been made to the forecasts presented in this chart.

*Data source:* The CIE.

### 4.107 TSTS maximum demand forecasts excluding post modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 74.9 | 77.6 | 81.7 | 84.1 | 85.6 | 87.4 | 90.2 | 92.6 | 93.9 | 97.0 | 99.6 |
| 50% PoE | 85.5 | 88.5 | 91.1 | 93.9 | 96.8 | 99.2 | 102.4 | 104.7 | 107.0 | 111.1 | 113.9 |
| 10% PoE | 100.9 | 105.0 | 106.8 | 110.6 | 113.8 | 117.2 | 123.0 | 125.3 | 127.7 | 133.2 | 136.3 |
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 53.7 | 53.8 | 55.0 | 55.5 | 56.3 | 56.0 | 56.0 | 57.0 | 56.5 | 56.3 | 56.5 |
| 50% PoE | 55.4 | 55.7 | 56.9 | 57.5 | 58.1 | 58.0 | 58.0 | 58.9 | 58.5 | 58.2 | 58.6 |
| 10% PoE | 58.3 | 58.3 | 59.6 | 60.4 | 61.1 | 61.2 | 61.0 | 62.2 | 61.6 | 61.2 | 61.6 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 74.9 | 77.6 | 81.7 | 84.1 | 85.6 | 87.4 | 90.2 | 92.6 | 93.9 | 97.0 | 99.6 |
| 50% PoE | 85.5 | 88.5 | 91.1 | 93.9 | 96.8 | 99.2 | 102.4 | 104.7 | 107.0 | 111.1 | 113.9 |
| 10% PoE | 100.9 | 105.0 | 106.8 | 110.6 | 113.8 | 117.2 | 123.0 | 125.3 | 127.7 | 133.2 | 136.3 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 4.108 TSTS maximum demand forecasts excluding post modelling adjustments

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | | |
| 90% PoE | 72.4 | 71.2 | 74.3 | 75.6 | 76.2 | 77.2 | 79.2 | 79.9 | 80.0 | 81.9 | 83.1 |
| 50% PoE | 83.0 | 82.0 | 83.7 | 85.3 | 87.4 | 89.0 | 91.4 | 92.0 | 93.1 | 96.1 | 97.4 |
| 10% PoE | 98.4 | 98.6 | 99.3 | 102.1 | 104.5 | 107.0 | 111.9 | 112.5 | 113.7 | 118.1 | 119.8 |

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | | |
| 90% PoE | 51.1 | 47.4 | 47.6 | 47.0 | 46.9 | 45.8 | 45.0 | 44.3 | 42.6 | 41.2 | 40.0 |
| 50% PoE | 52.9 | 49.2 | 49.4 | 49.0 | 48.8 | 47.8 | 47.0 | 46.2 | 44.5 | 43.2 | 42.1 |
| 10% PoE | 55.8 | 51.9 | 52.2 | 51.9 | 51.8 | 51.0 | 50.0 | 49.5 | 47.6 | 46.2 | 45.2 |
| **Annual Maxima** | | | | | | | | | | | |
| 90% PoE | 72.4 | 71.2 | 74.3 | 75.6 | 76.2 | 77.2 | 79.2 | 79.9 | 80.0 | 81.9 | 83.1 |
| 50% PoE | 83.0 | 82.0 | 83.7 | 85.3 | 87.4 | 89.0 | 91.4 | 92.0 | 93.1 | 96.1 | 97.4 |
| 10% PoE | 98.4 | 98.6 | 99.3 | 102.1 | 104.5 | 107.0 | 111.9 | 112.5 | 113.7 | 118.1 | 119.8 |

*Note:* All forecasts are in MW.

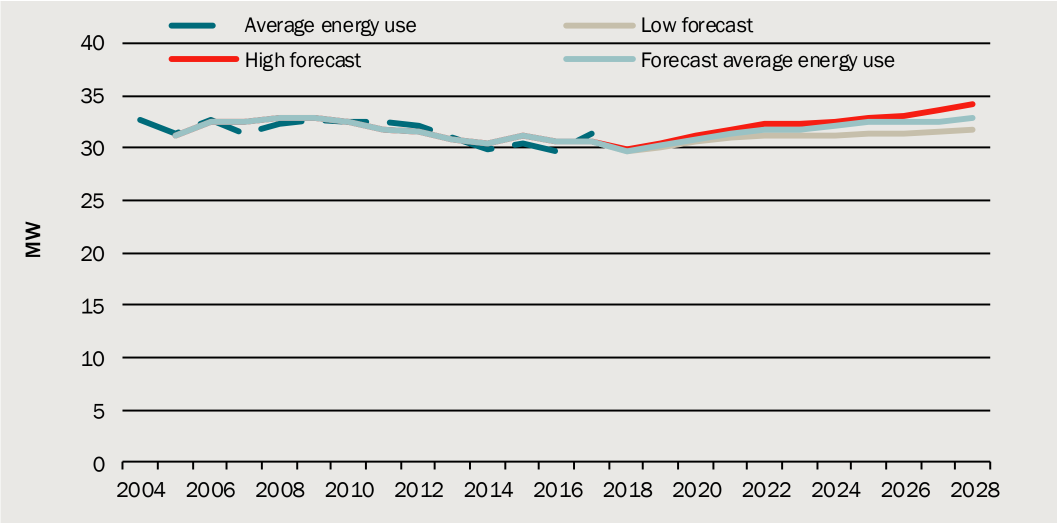
*Source:* Powercor terminal station data, The CIE.

## 4.109 TSTS average demand model coefficients

| Variable | Estimation | Coefficient |
|---|---|---|
| Price | The CIE estimate long run model only | -0.1464 |
| Income | AEMO constrained long run model only | 0.1736 |

*Source:* Powercor terminal station data, The CIE.

## 4.110 TSTS average demand forecasts




*Data source:* Powercor terminal station data, The CIE.

## 4.111 TSTS predicted and actual maximum demand

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Summer Maxima** | | | | | | | | | | |
| Actual | 82.1 | 90.9 | 74.9 | 69.8 | 79.8 | 81.3 | 64.2 | 77.0 | 73.7 | 103.0 |
| 90% PoE | 69.3 | 71.6 | 69.6 | 71.9 | 72.2 | 72.8 | 71.3 | 73.2 | 74.1 | 73.2 |
| 50% PoE | 76.8 | 79.0 | 77.2 | 80.0 | 81.0 | 81.3 | 79.3 | 81.8 | 81.8 | 80.9 |
| 10% PoE | 88.0 | 91.2 | 88.6 | 91.5 | 92.8 | 94.2 | 90.8 | 93.6 | 93.8 | 93.2 |

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Winter Maxima** | | | | | | | | | | |
| Actual | 60.0 | 63.2 | 63.1 | 62.4 | 58.9 | 59.8 | 57.4 | 60.2 | 56.9 | 57.1 |
| 90% PoE | 61.9 | 59.8 | 60.9 | 58.0 | 59.0 | 55.7 | 55.7 | 58.4 | 56.1 | 56.5 |
| 50% PoE | 63.7 | 61.8 | 62.9 | 59.9 | 60.9 | 57.5 | 57.5 | 60.3 | 58.0 | 58.4 |
| 10% PoE | 67.0 | 64.8 | 66.2 | 63.0 | 64.0 | 60.5 | 60.5 | 63.5 | 60.9 | 61.6 |
| **Annual Maxima** | | | | | | | | | | |
| Actual | 82.1 | 90.9 | 74.9 | 69.8 | 79.8 | 81.3 | 64.2 | 77.0 | 73.7 | 103.0 |
| 90% PoE | 69.3 | 71.6 | 69.6 | 71.9 | 72.2 | 72.8 | 71.3 | 73.2 | 74.1 | 73.2 |
| 50% PoE | 76.8 | 79.0 | 77.2 | 80.0 | 81.0 | 81.3 | 79.3 | 81.8 | 81.8 | 80.9 |
| 10% PoE | 88.0 | 91.2 | 88.6 | 91.5 | 92.8 | 94.2 | 90.8 | 93.6 | 93.8 | 93.2 |

*Note:* All forecasts are in MW.

*Source:* Powercor terminal station data, The CIE.

### 4.112 TSTS average adjusted $R^2$ of half-hourly demand models

| Season | Adjusted $R^2$ |
|---|---|
| Summer | 0.818 |
| Winter | 0.779 |

*Note:* The adjusted $R^2$ measure accounts for the number of variables used. $R^2$ never exceeds 1.

Source: Powercor terminal station data, The CIE.

### 4.113 TSTS details of actual maxima

| Time | Max Demand | Temperature | Minimum | Maximum | Weekly average |
|---|---|---|---|---|---|
| | mWh | °C | °C | °C | °C |
| **Winter** | | | | | |
| 15-06-04 18:00 | 74.2 | 11.7 | 9.0 | 14.9 | 11.6 |
| 10-08-05 18:00 | 60.4 | 6.8 | 4.7 | 10.1 | 10.2 |
| 05-06-06 18:00 | 61.4 | 11.0 | 3.8 | 11.0 | 9.0 |
| 17-07-07 18:00 | 63.8 | 5.5 | 5.0 | 9.6 | 8.4 |
| 11-08-08 18:30 | 60.0 | 9.3 | 6.8 | 12.9 | 10.0 |
| 09-06-09 18:00 | 63.2 | 7.8 | 6.0 | 12.4 | 11.1 |
| 17-06-10 10:30 | 63.1 | 11.0 | 8.1 | 15.0 | 10.9 |
| 07-06-11 18:00 | 62.4 | 13.2 | 5.6 | 14.0 | 11.2 |
| 09-08-12 18:30 | 58.9 | 10.8 | 8.2 | 11.2 | 11.2 |
| 24-06-13 18:00 | 59.8 | 12.0 | 2.2 | 12.0 | 9.1 |
| 22-07-14 18:30 | 57.4 | 8.4 | 6.4 | 12.3 | 10.2 |
| 14-07-15 18:30 | 60.2 | 7.4 | 6.7 | 9.7 | 9.4 |
| 26-07-16 18:30 | 56.9 | 9.6 | 6.9 | 10.8 | 10.3 |
| 03-08-17 18:30 | 57.1 | 8.4 | 3.1 | 8.9 | 9.7 |
| **Summer** | | | | | |
| 04-03-04 15:30 | 57.6 | 34.1 | 19.1 | 34.4 | 19.5 |
| 28-01-05 14:00 | 61.7 | 34.9 | 20.8 | 35.5 | 24.0 |
| 27-01-06 13:30 | 65.1 | 32.7 | 21.5 | 35.0 | 25.2 |
| 23-03-07 15:30 | 64.8 | 37.1 | 21.0 | 37.1 | 21.1 |
| 17-03-08 16:30 | 72.5 | 37.6 | 20.9 | 37.8 | 25.6 |
| 29-01-09 16:00 | 82.1 | 43.7 | 29.1 | 43.7 | 27.9 |
| 09-02-10 12:30 | 90.9 | 27.3 | 19.4 | 31.7 | 23.9 |
| 01-02-11 13:00 | 74.9 | 39.4 | 18.9 | 39.4 | 24.6 |
| 15-02-12 15:30 | 69.8 | 33.1 | 17.5 | 33.5 | 21.8 |
| 12-03-13 15:30 | 79.8 | 36.0 | 24.3 | 36.0 | 20.7 |
| 16-01-14 15:30 | 81.3 | 38.6 | 27.6 | 43.2 | 26.3 |
| 22-01-15 16:00 | 64.2 | 34.6 | 18.8 | 35.0 | 19.5 |
| 08-03-16 16:30 | 77.0 | 38.3 | 19.9 | 38.6 | 23.2 |
| 09-02-17 13:00 | 73.7 | 29.4 | 20.1 | 34.5 | 23.2 |
| 28-01-18 17:30 | 77.2 | 37.7 | 22.8 | 37.7 | 23.4 |

*Note:* Minimum and maximum refer to the minimum and maximum daily temperatures, per the Bureau of Meteorology terminology.

*Source:* Powercor terminal station data, Bureau of Meteorology, The CIE.

# A AEMO's methodology to estimate maximum demand

AEMO undertakes two sets of forecasts which are relevant to estimating terminal station maximum demand:

1 Connection point maximum demand forecasts (for each terminal station)

2 State level maximum demand forecasts (used to reconcile connection point forecasts)

In the following sections, we briefly describe the methodology used by AEMO in their 2018 connection point forecasts and 2018 Electricity Forecasting Insights.

## Connection point maximum demand forecast methodology

This section of the report draws on *AEMO Connection Point Forecasting Methodology*.[46] AEMO's connection point forecasting is based on the trend in historical maximum demand, controlling for the effects of weather and structural changes. This trend is projected into the future and is adjusted using post modelling adjustments. The forecasts are finally reconciled to system-level forecasts to account for effects of drivers which are not explicitly accounted for (e.g. electricity prices and population growth).

The forecasting methodology is conducted in the following steps:

- **Data collection:** AEMO collects the required data which includes measured data (i.e. electricity demand from Distribution Network Service Providers (DNSP), industrial load, solar PV capacity etc.), modelled data (solar PV traces, forecast solar PV capacity, etc.) and descriptive data (embedded generation, block load transfers, development plans etc.).[47]
- **Data preparation:** In this step embedded generators and industrial load are removed from half hourly connection point data, while rooftop solar PV generation is added. Solar PV generation is calculated based on monthly solar PV capacity and a solar PV trace. This gives "underlying demand", which is visually inspected and adjusted for block loads and load transfers. From this data, daily maximum demand values are calculated for each connection point.
- **Normalising historical trend:** Connection points are matched to weather stations, from which daily maximums and minimums are extracted. Data points are excluded where the relationship between temperature and demand deviates from the broader

46 AEMO 2016, *AEMO Connection Point Forecasting Methodology*, available at https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/TCPF/2016/AEMO-Transmission-Connection-Point-Forecasting-Methodology.pdf

47 For a full list of data used, see AEMO 2016, *AEMO Connection Point Forecasting Methodology*, p. 8

trend. Maximum demand is then regressed on maximum/minimum daily temperature and a year dummy:

$$Maximum\ demand_t = \beta_1 + Max\ temp_t\beta_2 + Min\ temp_t\beta_3 + \varepsilon \qquad (1)$$

Note this only includes one observation per day, and only includes maximum temperature. Connection points are then weather normalised:

– Where the regression has an R-squared to less than 0.3, the connection point is treated as not being weather sensitive and maximum demand is modelled as a constant (i.e. $Maximum\ demand_t = \beta_1 + \varepsilon$).
– Where connection points have an R-squared greater than 0.3, the connection point is treated as weather sensitive, and equation 1 is used to generate weather normalised demand.

Given these assumptions around temperature sensitivity, a distribution of daily maximum demand is simulated using historical weather demand and a random error term ($\varepsilon$) which is drawn from a normal distribution. Demand is simulated 500 times for each year of weather data (30 years of data would result in 15 000 simulations). From this distribution, maximum demand probability of exceedance (PoE) intervals are estimated.

- **Determine historical trend:** Maximum demand is projected into the future using historical trend in weather normalised demand. Linear and cubic trends are tested, with preferred trend selected based on an outlier test[48] or a Davidson-Mackinnon J-test. Trends are fitted to the 10% and 50% PoEs.
- **Base line forecast:** The baseline forecast is prepared by extrapolating PoE estimated by the preferred historical trend. These forecasts are reviewed for factors which may have affected the historical trend including:
  – Agricultural loads, variability in cropping practices, harvest timing and volumes which may affect the trend
  – Pumping loads, which are often driven by water availability and demand.
  – Structural breaks in trend relationships
  – Crossing 10% and 50% PoE lines
  – Limited historical data of new connection points may mean there is not enough information to estimate a trend.

  Where one or more of these issues are identified, AEMO select an alternative, either the alternative historical trend (i.e. cubic if linear originally used and vice versa), a zero per cent growth rate for industrial-dominated connection points or growth in line with population growth for residential/commercial connection points.
- **Post modelling adjustment:** Post modelling adjustments are made to capture future changes in demand which are not accounted for in the baseline forecasts. Post modelling adjustments are made for rooftop solar PV, energy efficiency and block loads and transfers. Solar PV adjustments are forecast for each terminal station based

48 This test checks whether the last historical data point has a statistically significant impact on the estimated trend, by including this term as a dummy variable. A stable trend should not be impacted by the inclusion/exclusion of a single data point. It is not clear whether this is a robust test of given trend.

on solar PV capacity by connection point, while energy efficiency adjustments are based on energy efficient forecasts for the NEM, which is then allocated to connection points based on commercial, residential and industrial customers served at that connection point. Information on block loads and transfers is provided by DNSPs. No post modelling adjustment is made for embedded generators.

- **Reconciliation to system forecast:** Non-coincident connection point forecasts are reconciled with the state level forecasts (explained in the following section). AEMO use an indexing approach, calculating growth indices for regional forecasts and aggregating connection point forecasts and then finding an index ratio which corrects connection point forecasts to the state forecast. A blending factor is applied to short term forecasts to be more heavily weighted towards trend-based connection point forecasts and regional trends to drive growth in the long-run.

## *Regional maximum demand forecast methodology*

Regional maximum demand, for each state, are prepared by AEMO, which is described in detail in *Demand Forecasting Methodology Information Paper*.[49] Forecasts are based on historical temperature responsiveness of demand and a forecast growth rate of PoE overtime due to economic conditions, demographics and technological conditions. The aim of the model is to generate forecasts of underlying demand less large industrial loads. This is slightly different to the CIE's forecasts which also adjusts for embedded generators, measuring only demand which requires the transmission network.

AEMO's forecasting methodology is summarised in the following steps:

- **Data preparation:** A half hourly model is used to forecast maximum demand. Data is collected for a range of variables, including electricity underlying demand, solar PV forecast and historical capacity and generation, information on embedded generators, forecast electric vehicle numbers and charge profile, industrial loads and projected climate change adjusted dry temperature. A linear model is fitted to demand data and observations lying more than three standard deviations from the mean are dropped.
- **Model development and selection:** An exploratory data analysis is used to identify short term drivers of electricity demand, evaluating weather variables, different cut offs for weather variables (such as CDD and HDD thresholds) and calendar variables. Models for each region are specified using the variables which are statistically significant in the exploratory data analysis. A range of linear models are then tested, including different combinations of variables and variables to higher order powers. Model selection is based on an algorithm which discards models with illogical results or insignificant coefficients and ranks and selects the preferred model based on goodness of fit, out of sample goodness of fit and tests to ensure there is not persistence in the residuals.[50]

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[49] AEMO 2018, *Demand Forecasting Methodology Information Paper, for the 2018 Electricity Statement of Opportunities for the National Electricity Market*.

[50] For a full list of included variables see: AEMO 2018, *Demand Forecasting Methodology Information Paper, for the 2018 Electricity Statement of Opportunities for the National Electricity Market*, p. 34.

- **Simulate base year:** Maximum demand is simulated using the linear model identified in the previous step, summarised in the following function:

$$Underlying\ Max\ Demand = f(x) + \varepsilon$$

  where $x$ are the weather and calendar variables included in the model and $\varepsilon$ is the unexplained residual, assumed to be normally distributed. The model is simulated over underlying demand which includes rooftop solar PV and PV non-scheduled generation. Weather is simulated by block resampling historical weather (in fortnightly blocks), over 20 years of climate adjusted temperature data. Weather is simulated 1 000 times, giving 1 000 synthetic weather years. The synthetic weather years are imputed into the $f(x)$ function to generate a distribution of demand, while the residual is simulated by sampling a normal distribution. This results in a distribution of demand outcomes given historical weather and a sampled residual, from which PoE levels are inferred. Note there does not appear to be a separate model for summer and winter and the same temperature relation appears to be used across the day.
- **Forecast PoE:** The base year PoE are grown into the future based on economic conditions, including price and GSP, demographic conditions, and technological conditions. It is not clear what functional form, or parameters used relate future demand drivers to future demand. For each year, solar PV generation and PV non-scheduled generation are subtracted from PoE estimates.

## *Key differences with the CIE's methodology*

While sharing some similarities with the CIE's methodology, there are a number of differences. Some of these are noted below:

- Forecasts at the connection point level are based on trends, not actual drivers. This assumes that historical trends will be repeated into the future (i.e. that historical price increases will continue into the future). This contrasts with both the CIE and AEMO's regional methodology which are related to specific demand drivers, although the AEMO methodology does not document these relationships in detail.
- AEMO's methodologies do not allow for changing temperature sensitivity.
- AEMO does not appear to estimate separate models for summer and winter, rather assuming the same temperature relationship across the year.
- The connection point methodology only estimates a single maximum on a given day, whereas the CIE's model estimates a separate temperature relationship for every half hour.
- Residuals are drawn from a normal distribution by AEMO, while the CIE samples actual residuals from historical forecasts.
- AEMO does not appear to estimate PoE for historical periods, where as the CIE's methodology estimates this over the entire history. By only estimating the PoEs for the base year, it is difficult to assess whether the model generates realistic results.
- Both AEMOs regional and connection point forecasts remove solar PV, by estimating half hourly generation, as opposed to the post modelling adjustments used in the CIE

methodology. This approach depends highly on the quality of the solar PV generation estimates.

- AEMO connection point forecasts are reconciled to regional forecasts. The CIE's forecasts are compared to total network forecasts but are not reconciled.

# B Total Powercor and CitiPower 2015 forecast performance

In the following section, we assess the 2015 forecast performance by evaluating the model's out of sample forecast for winter 2017 and summer 2017/18, which involves estimating the average and maximum demand models using actual temperature and demand driver data. The forecasts include post model adjustments for embedded generators, but do not include any post modelling adjustments.

Note that we have only been able to make these adjustments for average demand models. For the half hourly models/comparison to actuals, for these terminal stations no adjustment has been made for these transfers. Half hourly models are presented relative to actual average demand, such that differences between the predicted and actuals are only due to the half hourly models.

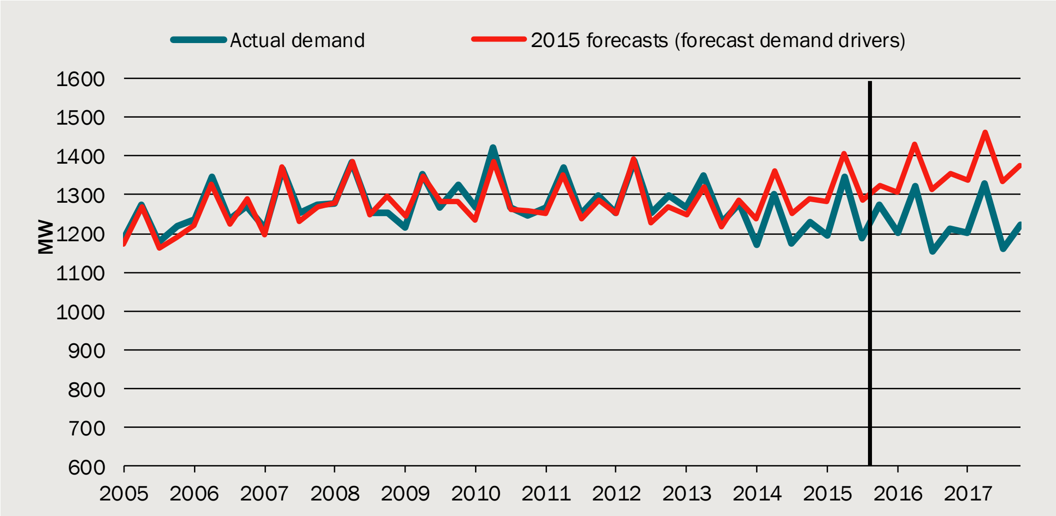
The charts shown are:

- Fitted values and out-of-sample performance of the average demand model, this uses actual explanatory variables including cooling degree days and heating degree days which are based on actual weather
- Out-of-sample performance of the half hourly model for 3pm summer, which uses actual weather outcomes and actual average demand. The difference between the predicted and actuals only reflect differences in half hourly weather model.
- Out-of-sample performance of the half hourly model for 5pm winter, which uses actual weather outcomes and actual average demand. The difference between the predicted and actuals only reflect differences in the half hourly weather model.

We can assess how effective a model is at forecasting demand by comparing the predicted demand with actual demand – where predicted demand closely tracks actual demand the model will have performed well.

Using actual temperature data, the average demand model has performed poorly. Over the out of sample period, the model has significantly over predicted average demand for both Powercor and CitiPower areas. This forecast error has been resolved in the updated forecasts from the inclusion of solar PV per capita in the average demand specification (see chapter 2 for further detail on this new variable). In contrast the half hourly maximum demand models have generally performed well. We can infer that the model accurately reflects the relationship between temperature and electricity demand, and that much of the forecast error in recent years can be attributed to the average demand model

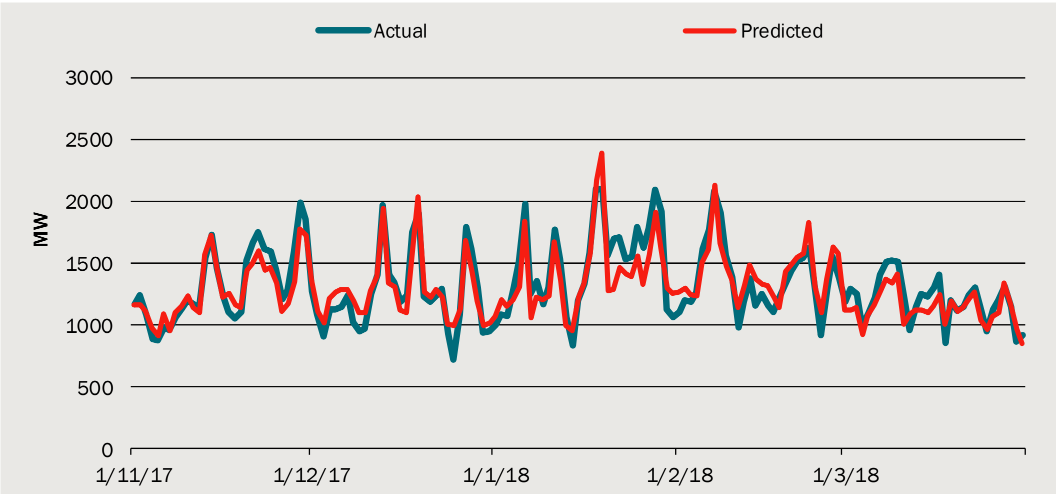
## B.1 Total Powercor average quarterly demand, actuals compared to fitted values 6pm-10pm




*Note:* The model was estimated using data up to December quarter 2015. No post modelling adjustments have been made to the forecasts presented.

*Data source:* Powercor, The CIE.

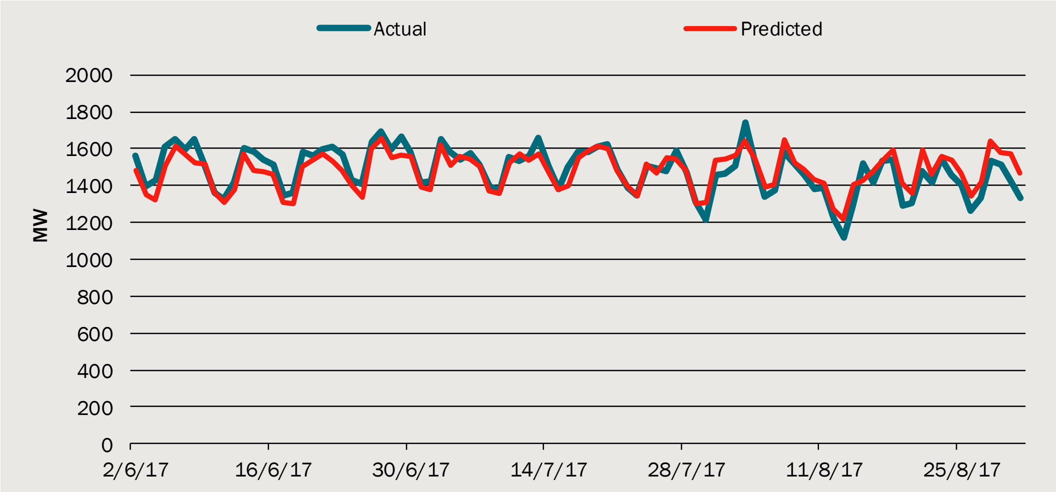
## B.2 Total Powercor summer maximum demand, actuals compared to fitted values 3pm




*Note:* The predicted values use actual average demand estimates – the difference between the predicted and actuals only reflect differences in half hourly weather model. The model was estimated using data up to December quarter 2015. No post modelling adjustments have been made to the forecasts presented.

*Data source:* Powercor, The CIE.

### B.3 Total Powercor winter maximum demand, actuals compared to fitted values 5pm

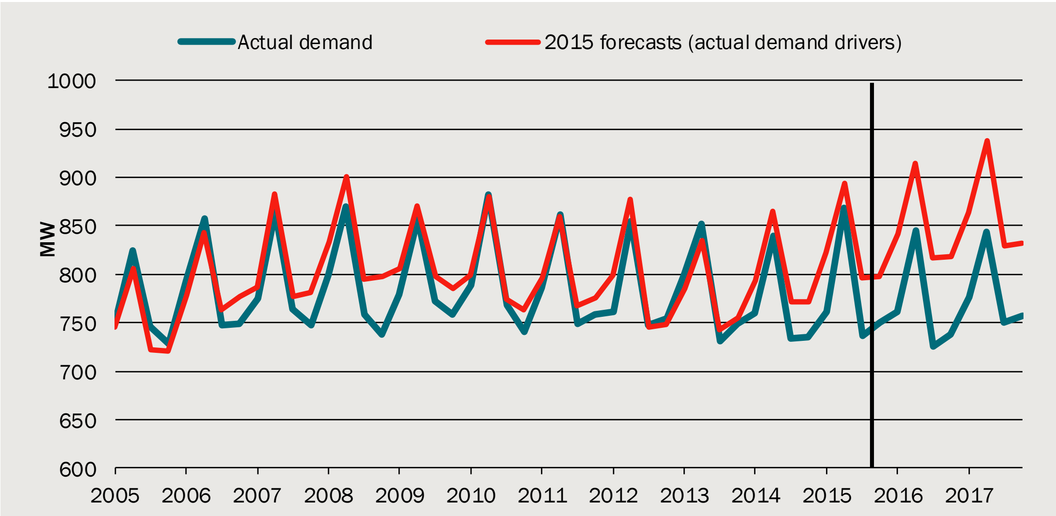



*Note:* The model was estimated using data up to December quarter 2015. No post modelling adjustments have been made to the forecasts presented.

*Data source:* Powercor, The CIE.

A similar pattern is evident for total CitiPower, forecast average and maximum demand closely tracks actuals over the past year. CitiPower average demand was slightly stronger than actual average demand.

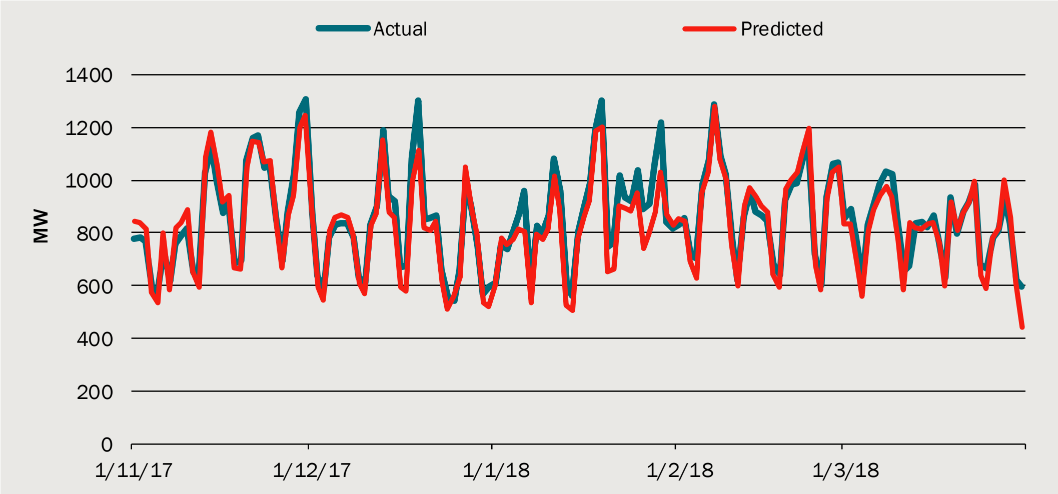
### B.4 Total CitiPower average quarterly demand, actuals compared to fitted values 6pm-10pm




*Note:* The model was estimated using data up to December quarter 2015. No post modelling adjustments have been made to the forecasts presented.

*Data source:* Powercor, The CIE.

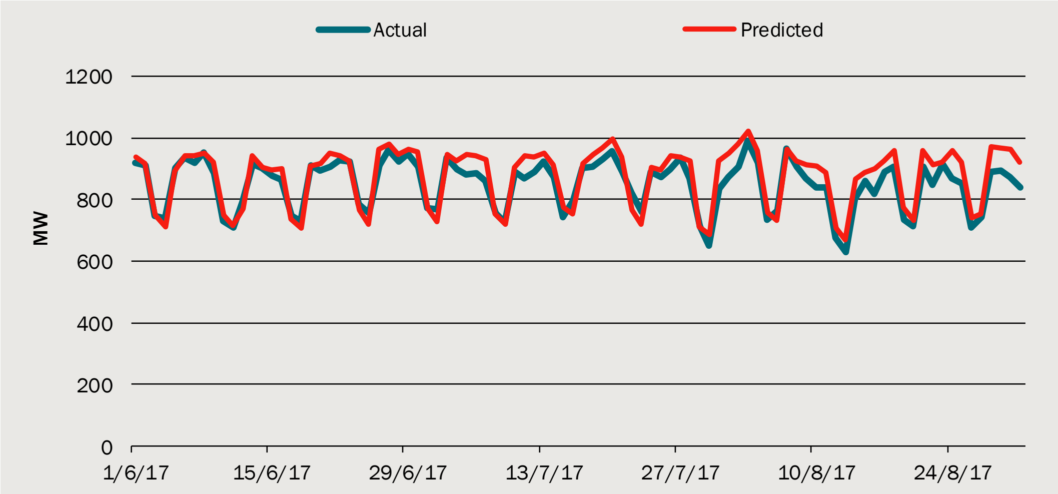
**B.5 Total CitiPower summer maximum demand, actuals compared to fitted values 3pm**




*Note:* The predicted values use actual average demand estimates – the difference between the predicted and actuals only reflect differences in half hourly weather model. The model was estimated using data up to December quarter 2015. No block post modelling adjustments have been made to the forecasts presented.

*Data source:* Powercor, The CIE.

**B.6 Total CitiPower winter maximum demand, actuals compared to fitted values 5pm**




*Note:* The model was estimated using data up to December quarter 2015. No post modelling adjustments have been made to the forecasts presented.

*Data source:* Powercor, The CIE.

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