2012 Annual Planning Report | Forecasting Data Supplement

Analysis of 2012 Peak Demand

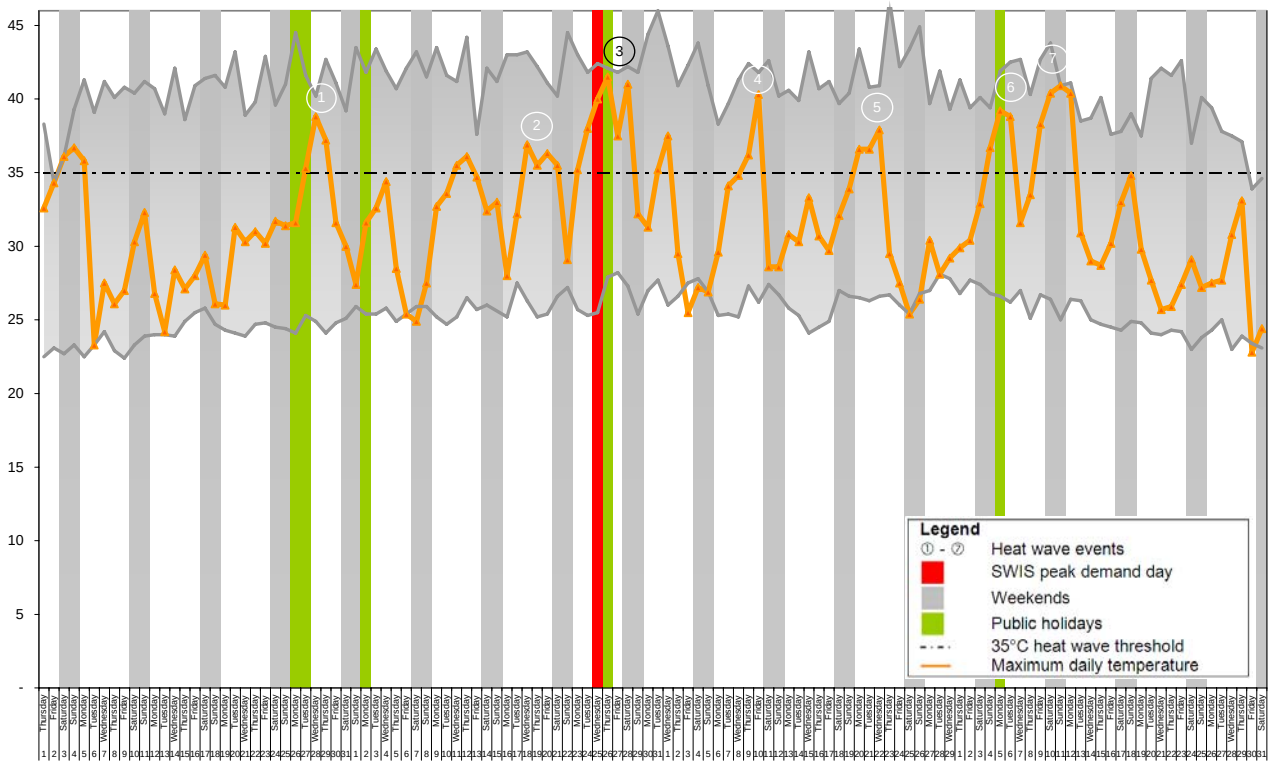

Figure 1: Maximum daily temperature occurrence (2011/12 vs 1971/72 to 2011/12)

Figure 1 presents maximum daily temperatures during summer 2011/12 against the distribution of summer daily maxima for the period 1971/72 to 2011/12.

The peak demand day occurred on the second day of a heat wave[1] and immediately preceded the Australia Day public holiday. Note that the peak day heat wave registered the highest temperature of the summer period. Weekends, public holidays and school holidays typically register lower SWIS demand peaks than ordinary week days.

The top of the grey summer maxima band indicates that more extreme heat waves were experienced in years prior to the 2011/12 summer. A more extreme 2012 summer period could have resulted in a significantly higher peak.

[1] This discussion is based on the Bureau of Meteorology's definition of a heat wave as three or more consecutive days with daily maximum temperatures exceeding 35°C.

To illustrate the scale of this potential variation, the history of SWIS peak demand from 1988 to 2012 was regressed on the State's adult population and average maximum temperature:

$$\frac{D_t^{Peak}}{D_{t-1}^{Peak}} = \left(\frac{Pop_t}{Pop_{t-1}}\right)^{\alpha} \times \left(\frac{Temp_t^{Max}}{Temp_{t-1}^{Max}}\right)^{\beta}$$

where:

D_t^{Peak}, D_{t-1}^{Peak}	SWIS peak demand levels (in MW) for this year and last year respectively.
Pop_t, Pop_{t-1}	WA adult population (over 15 years of age) for this year and last year respectively.
$Temp_t^{Max}$, $Temp_{t-1}^{Max}$	Average maximum temperature for this summer and last summer respectively.
α, β	Estimated elasticities.

This measures the proportional change in peak demand as the proportions of adult population and average summer maximum temperature change. This model shows that the SWIS annual peak is a function of adult population (a proxy for households), with the peak shifting in direct proportion to the adult population. It is, of course, also a function of maximum temperature.

Sample period	1988 - 2012	1993 - 2012	1998 - 2012	2000 - 2012
α	2.1	1.6	1.4	1.5
β	0.6	0.8	0.9	1.3

Table 1: Estimated peak demand elasticities for adult population and average maximum temperature

Table 1 shows the estimated elasticities for adult population and average maximum summer temperature across various sub-samples of the historical SWIS peak demand series. An interesting observation about the elasticity estimates is that they change over time.

To fully understand the implications, note that the elasticity measures the percentage change in the SWIS peak demand with a percentage change in the identified demand driver. For example, for the period 2000-12, a 1% increase in the adult population results in a 1.5% increase in SWIS peak MW. Similarly, a 1% increase in the average summer maximum temperature results in a 1.3% increase in SWIS peak MW.

The 2010/11 average maximum summer temperature was 32.9°C compared to an average of 30.9°C since 1971/72. The 2011/12 summer average maximum of 31.7°C was less extreme than last year but higher than the long-term average. Had last year's average maximum occurred in 2012, this model suggests the SWIS peak would have been 90 MW to 200 MW higher.

It is also noteworthy that the sensitivity of the annual SWIS peak demand to average maximum temperature appears to have increased over time. This is consistent with the SWIS load area's sustained load growth attributable to increased use of air-conditioning.

Regional Peak Demand Forecasts

The following sections summarise and forecast peak demand for each of the 15 transmission load areas within the Western Power Network. The following definitions apply to the charts:

Substation peak history	The sum of the non-coincidental peak loads on each for the Western Power-owned substations in the region.
Substation PoE50 forecast	The sum of the non-coincidental forecast peak loads for each of the Western Power-owned substations in the region. This is the expected peak load under normal conditions.
Substation PoE10 forecast	The sum of the non-coincidental PoE10 forecast loads for each of the Western Power-owned substations in the region. This is the expected peak load under one-in-ten year conditions, i.e. the load Western Power must design the network to support.
Average load	The average load on the region over the year, equivalent to the average energy distributed (sold) over the network. Much of Western Power's revenue is currently collected based on energy volumes. As such, Western Power's network tariff prices are set depending on average load. Neither average load nor energy distributed over the network are forecast at a regional level.
Load factor	Average load / peak load.

Figure 1 shows the transmission load area catchments.

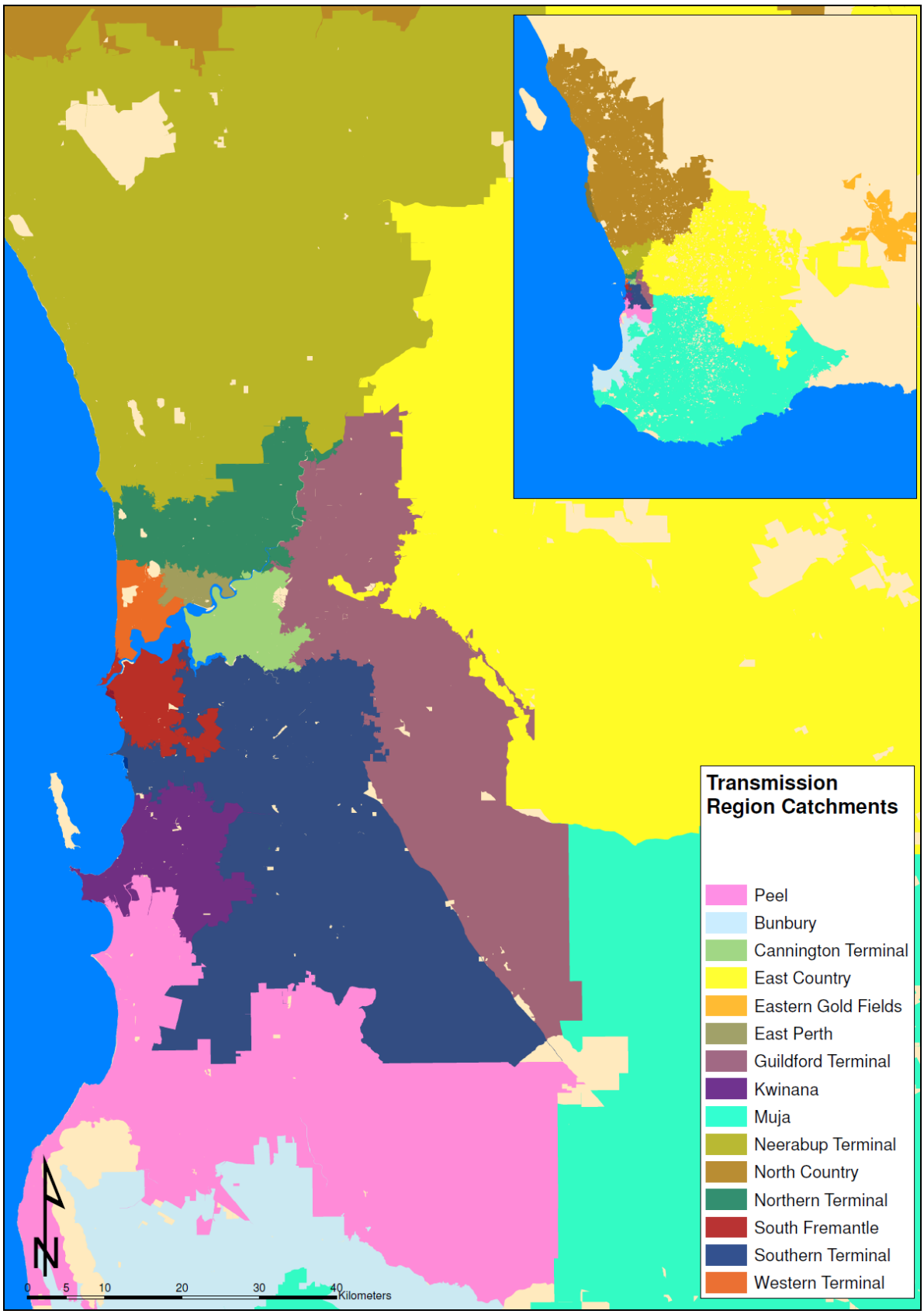

Figure 1: Transmission load area catchments

North Country

The North Country region extends from Pinjar and Muchea at the far north of the Perth Metro region to Kalbarri at the northern extremity of the Western Power Network. It includes Geraldton and many northern wheat belt towns and has residential, commercial, agricultural, industrial and mining loads. In this region, peak demand on Western Power-owned substations has declined slightly in the last few years but is expected to rise with new customer connections and the increasing peak load of existing customers. The completion of the southern section of the Mid West Energy Project in-mid 2014 will support increased peak demand.

Average demand (average energy consumption) has declined at a faster rate than peak demand and is unlikely to grow significantly. The combined result is a declining load factor, as shown in Figure 3. The establishment of new customer-owned substations in this region will drive new loads that are not included in this forecast.

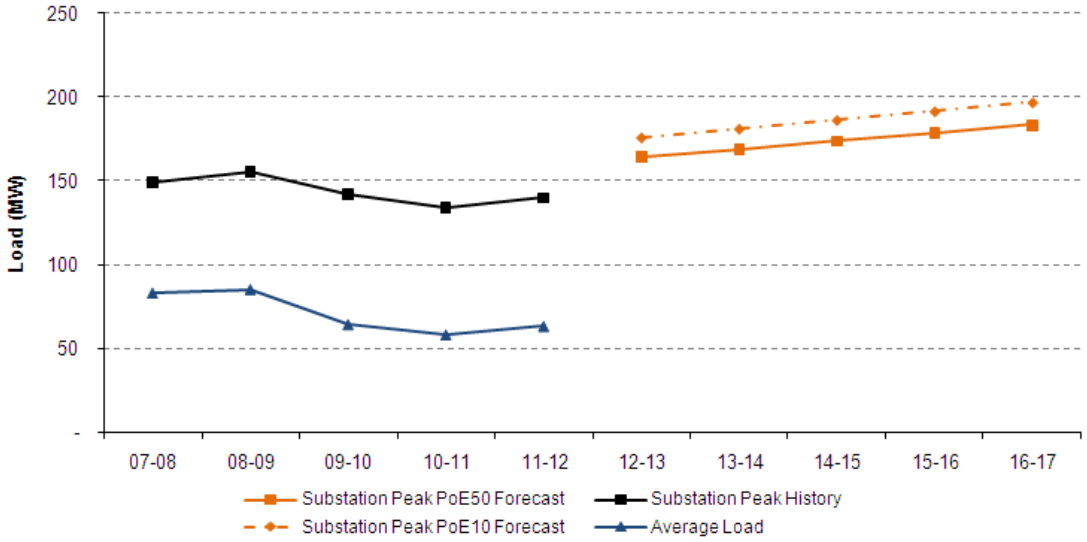

Figure 2: North Country central forecast (2012/13 - 2016/17)

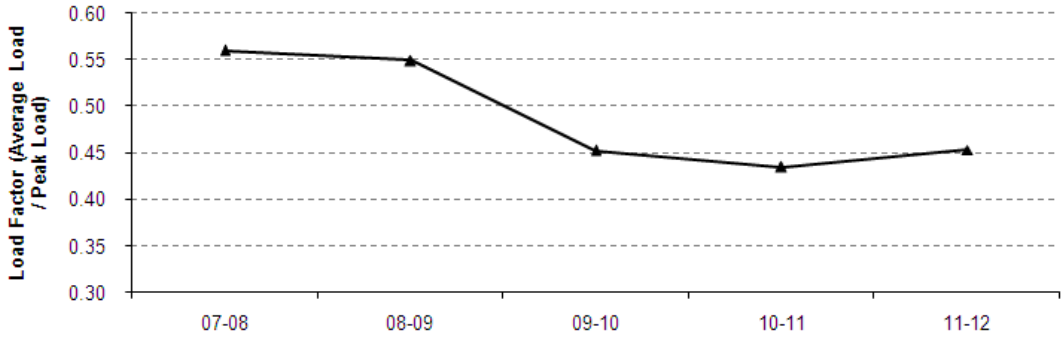

Figure 3: North Country load factor

Eastern Goldfields

The Eastern Goldfields load area comprises mainly mining loads. Although the demand in this load area is driven primarily by mining activity, a residential component is also supplied. It is expected that there will be an increase in load in the next two years that will eventually taper off.

Due to the nature of the resource industry, this forecast may be subject to variation. While average demand has corresponded with historical growth, the combination results in a slowly declining load factor, as shown in Figure 5.

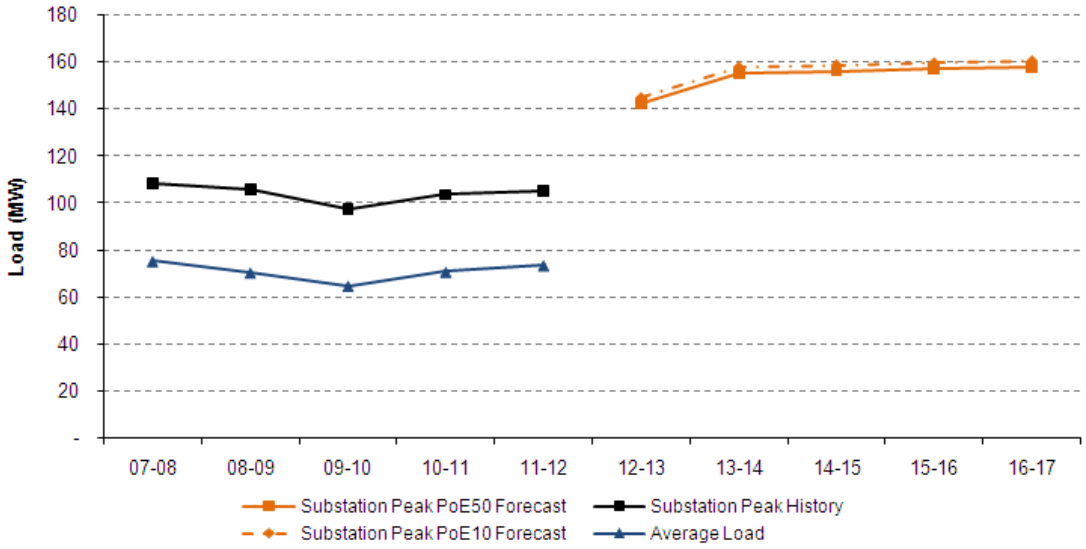

Figure 4: Eastern Goldfields central forecast (2012/13 - 2016/17)

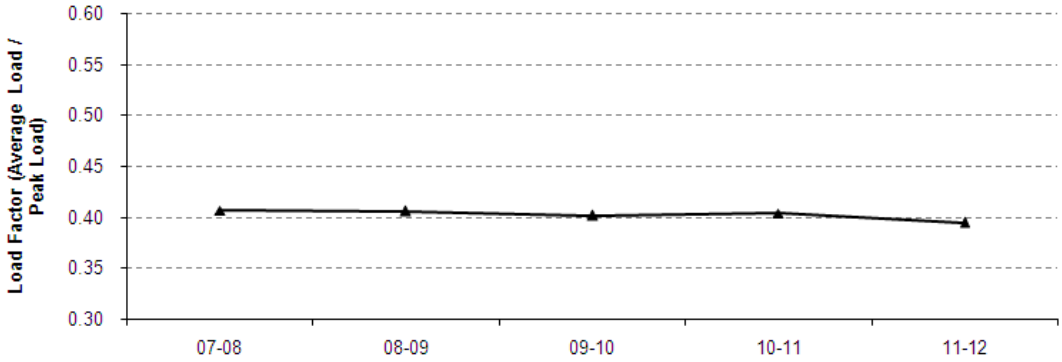

Figure 5: Eastern Goldfields load factor

East Country

The East Country load area covers the Wheatbelt region and supports local load, as well as providing a link to the Eastern Goldfield load area. This load area has been growing and this is expected to continue over the next five years. While average load has increased over the last two years, the load factor has been decreasing very slowly, as shown in Figure 7.

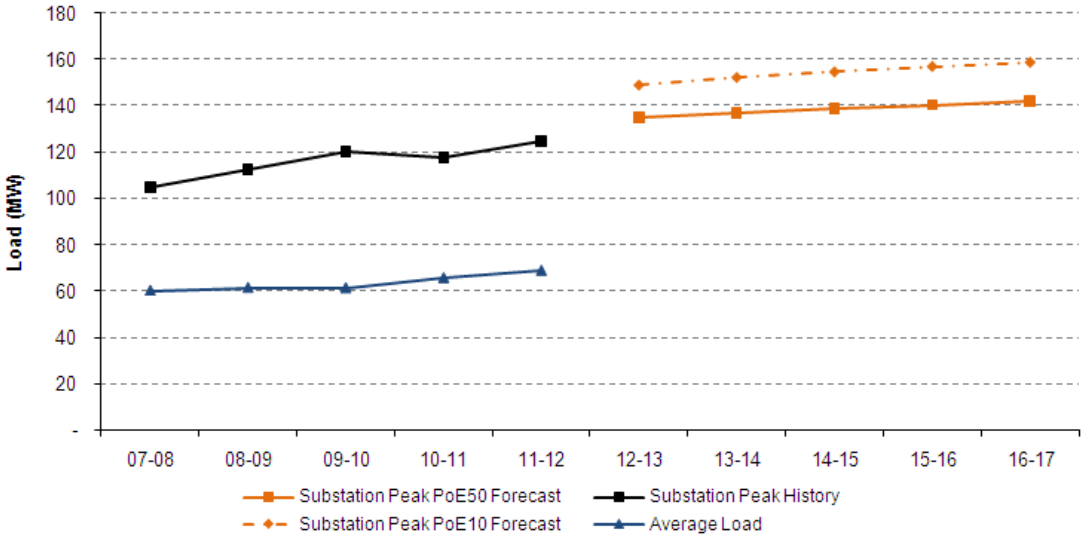

Figure 6: East Country central forecast (2012/13 - 2016/17)

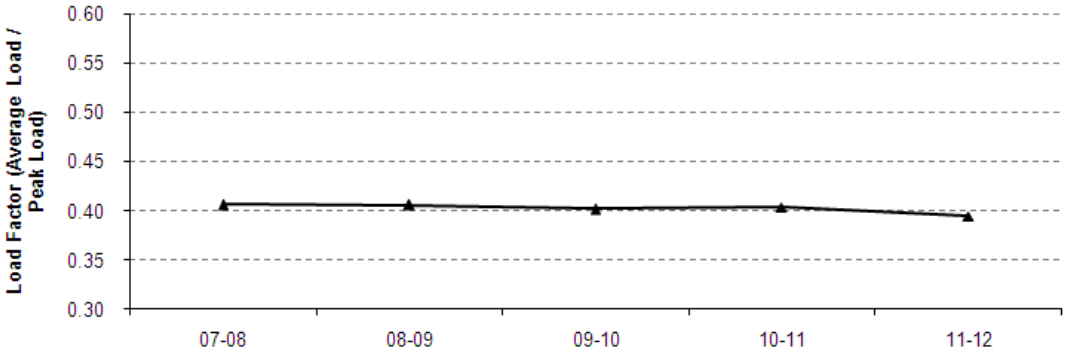

Figure 7: East Country load factor

Muja

This load area includes the agricultural areas of Wagin, Katanning, Kojonup, Mount Barker, Denmark and Albany. Substations supplying mostly residential loads have a winter peak pattern, while those supplying mainly agricultural loads have a summer peak pattern. There has been an increase of mining activity in the area, in conjunction with port developments at Albany.

The peak demand increase in 2012 is expected to continue, with average demand (average energy consumption) declining slightly over the last five years. The combined result is a declining load factor, as shown in Figure 9.

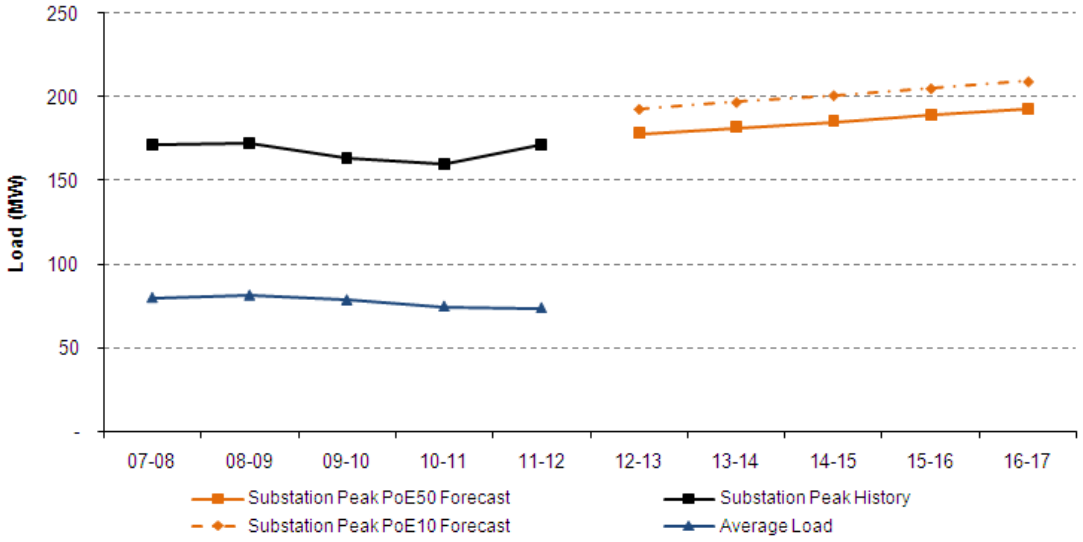

Figure 8: Muja central forecast (2012/13 - 2016/17)

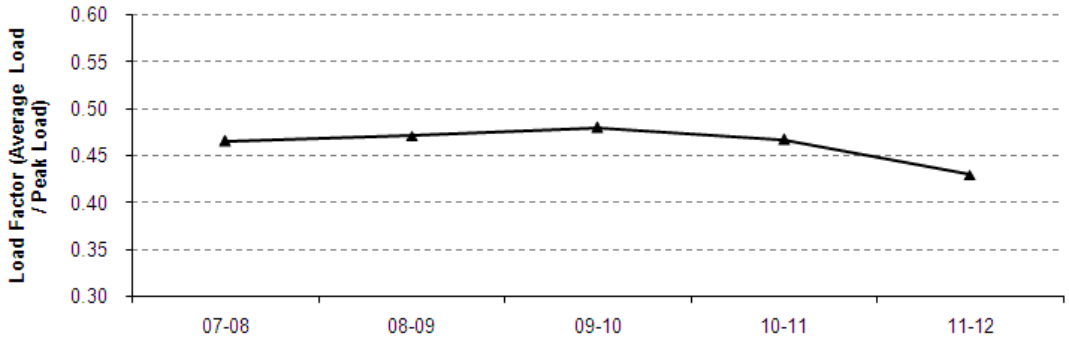

Figure 9: Muja load factor

Bunbury

The Bunbury region includes the Bunbury, Busselton and Margaret River regions with many types of loads. Greater Bunbury is growing the fastest, with new housing and related development from Dalyellup in the south through to Australind in the north. The region also contains several mineral sands mines and a silicon smelter, however these loads are supplied by non Western Power-owned substations and therefore excluded from Figure 10. For the remaining customers in the Bunbury region, peak demand is expected to rise with the addition of new connections and the increasing peak load of existing customers. While peak demand is rising rapidly, average demand (average energy consumption) has not grown at the same rate, even showing signs of decline. The combined result is a declining load factor, as shown in Figure 11.

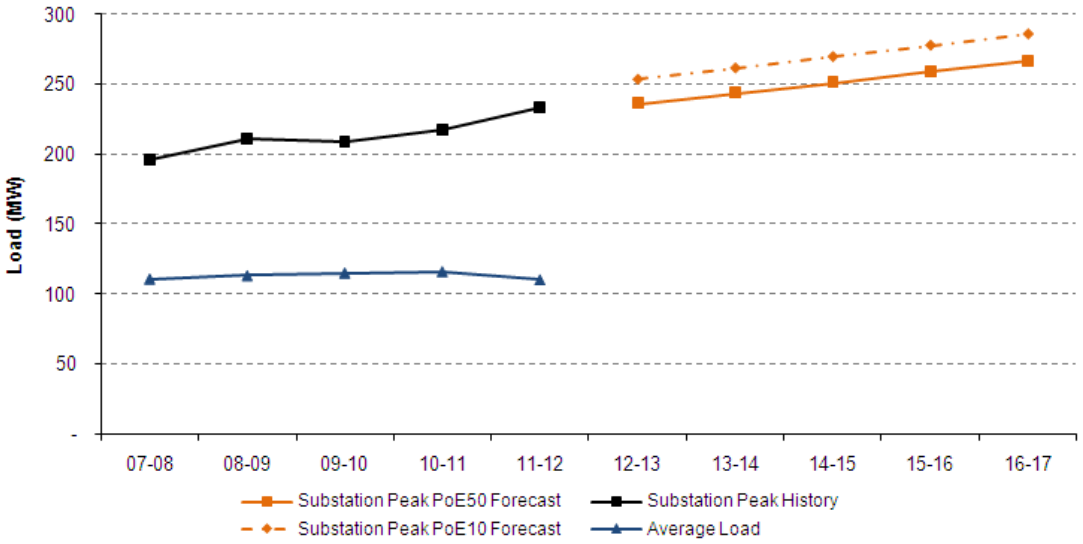

Figure 10: Bunbury central forecast (2012/13 - 2016/17)

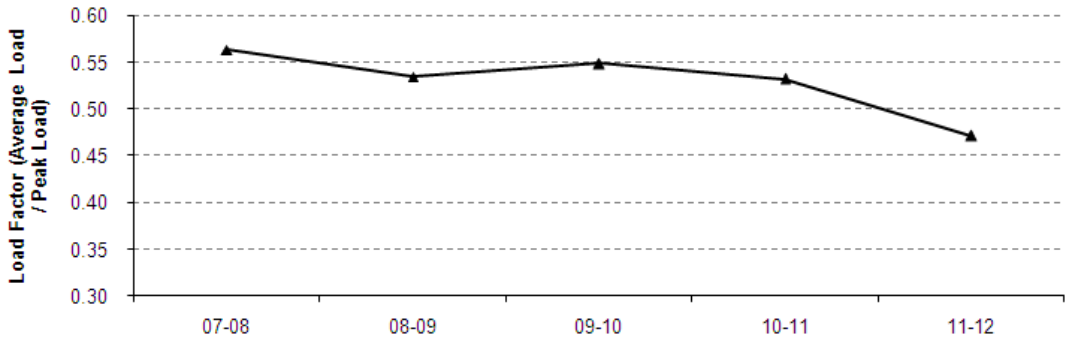

Figure 11: Bunbury load factor

Mandurah

This load area is characterised by rapid expansion of housing developments as well as the expansion of the Mandurah commercial district. In this region, peak demand is expected to grow with new customer connections and the increasing peak load of existing customers. While peak demand is rising, average demand (average energy consumption) has not grown at the same rate and has even shown signs of decline. The combined result is a declining load factor, as shown in Figure 13.

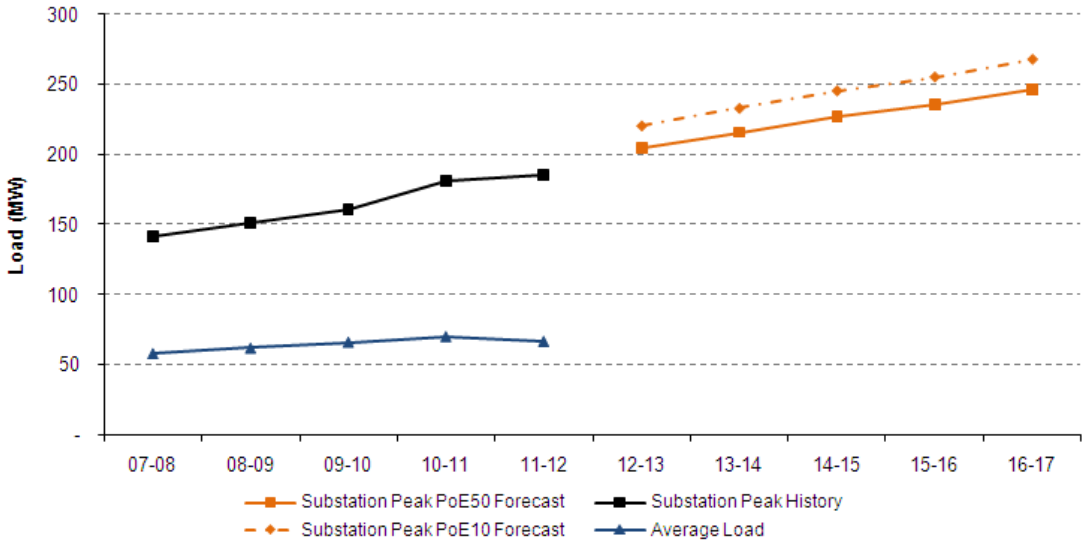

Figure 12: Mandurah central forecast (2012/13 - 2016/17)

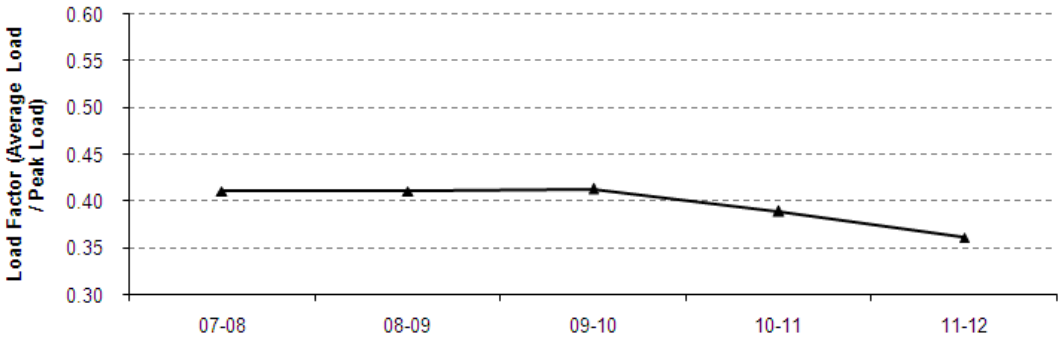

Figure 13: Mandurah load factor

Kwinana

The Kwinana load area services industrial customers, most of which are supplied from substations not owned by Western Power. The remainder of the load area comprises residential customers and a strong commercial base supplied from the Rockingham substation, which supports one of the fastest-growing supply areas in metropolitan Perth. While peak load has been increasing, the average load has declined. The combined result is a rapidly declining load factor, as shown in Figure 15.

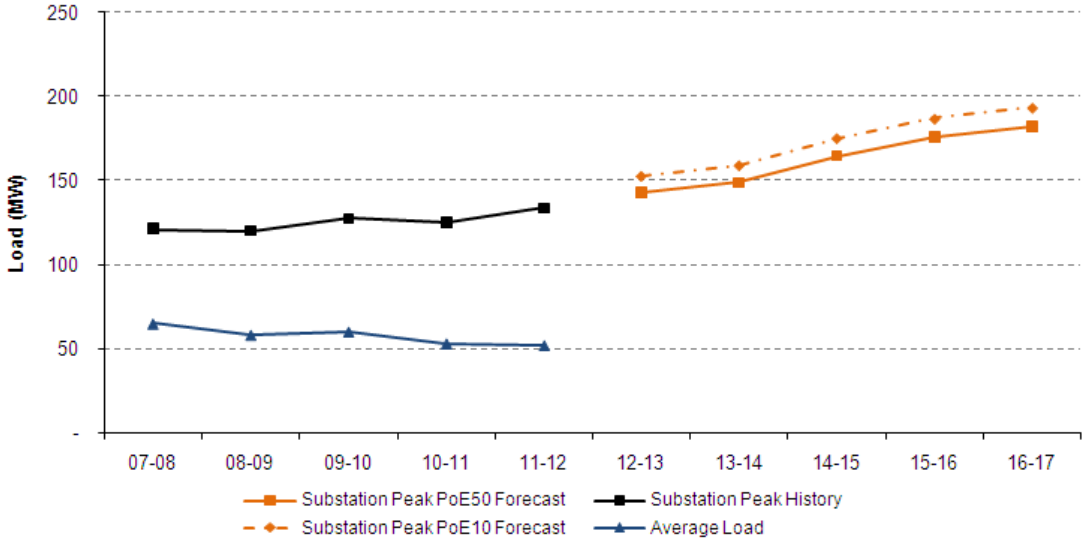

Figure 14: Kwinana central forecast (2012/13 - 2016/17)

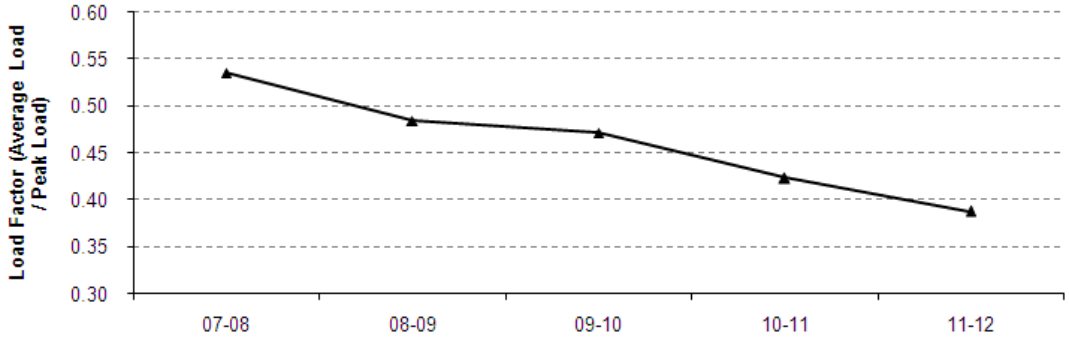

Figure 15: Kwinana load factor

Southern Terminal

The Southern Terminal load area supplies a mix of residential, commercial, industrial and semi-rural load with domestic activity representing the bulk of demand. There are still significant numbers of undeveloped land holdings that will eventually contribute to the increasing peak load. The average demand (average energy consumption) has remained fairly constant, with a slowly declining load factor, as shown in Figure 17.

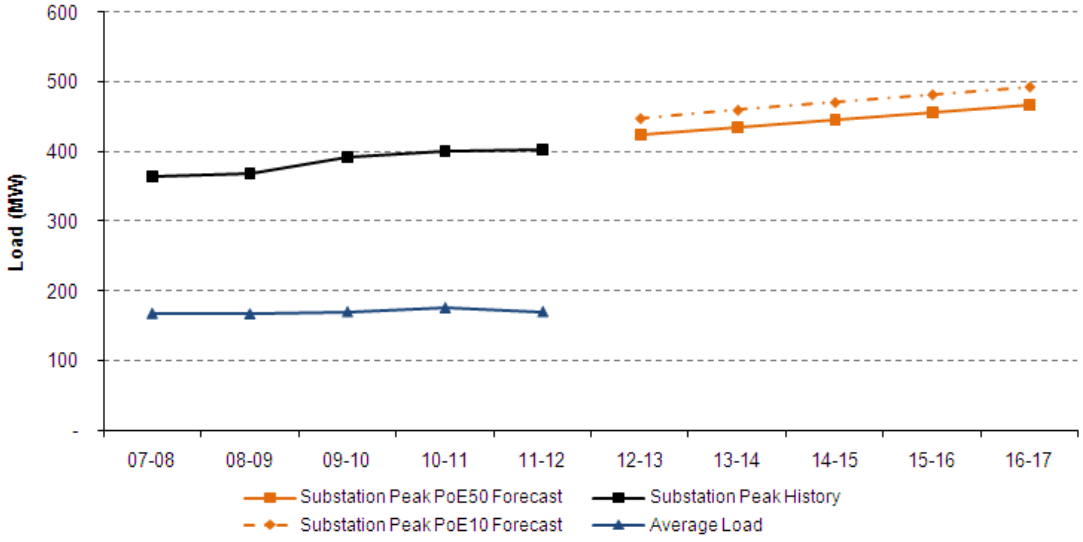

Figure 16: Southern Terminal central forecast (2012/13 - 2016/17)

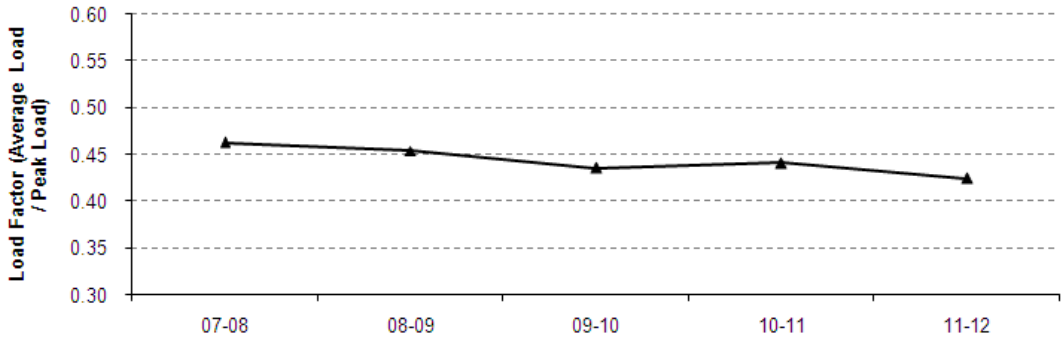

Figure 17: Southern Terminal load factor

South Fremantle

The South Fremantle load area extends from Beeliar Drive in the south, to the Swan River in the north and east from the coast to the Canning River. It includes the City of Fremantle and the Fremantle Port with a mixture of residential, commercial and light and heavy industrial loads. While the increase in peak demand is expected to continue, average demand (average energy consumption) has been declining over the last two years. The combined result is a declining load factor, as shown in Figure 19.

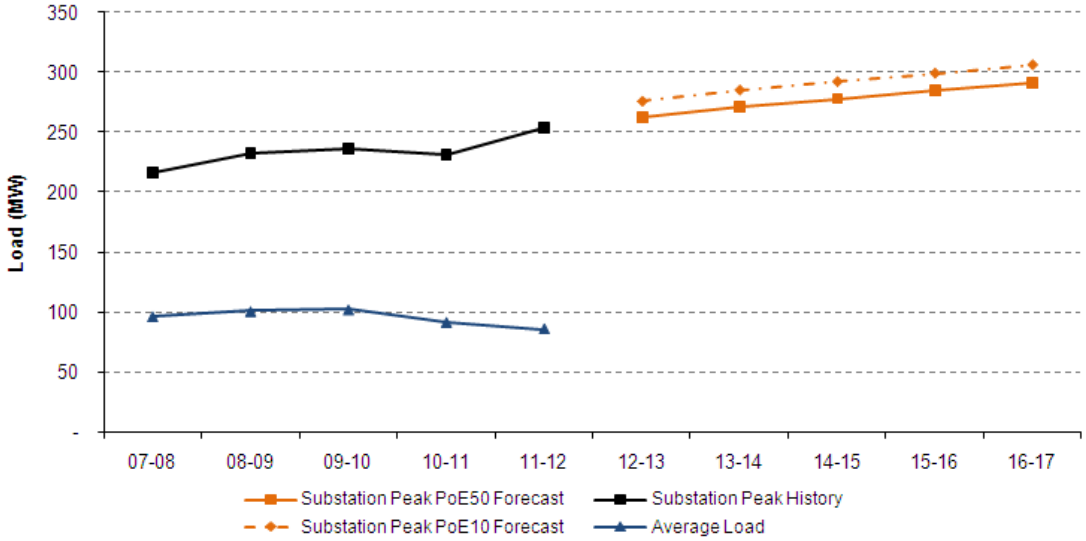

Figure 18: South Fremantle central forecast (2012/13 - 2016/17)

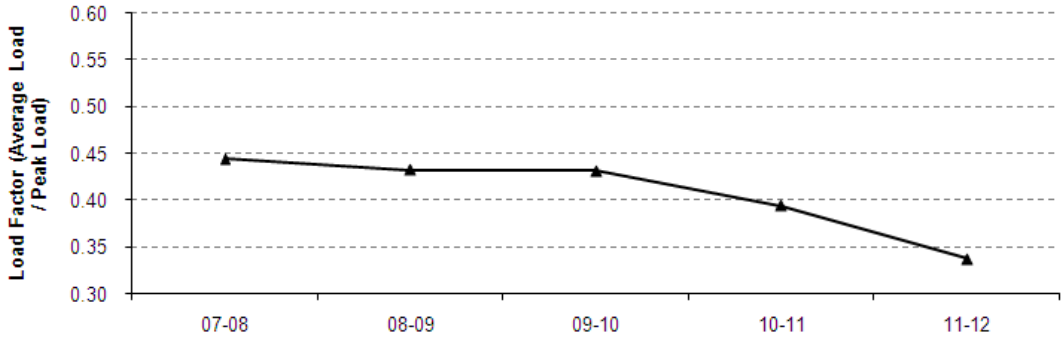

Figure 19: South Fremantle load factor

Cannington

The Cannington load area includes the South Perth, Victoria Park, Kewdale, Welshpool, Belmont, Cannington and Rivervale regions with a range of load types. Although there has been minimal growth in the last five years, peak demand is expected to rise because of increasing peak load from existing customers, the expansion of Curtin University and construction of the new Perth Stadium. Average demand (average energy consumption) has decreased slightly, with load factor remaining stable, as shown in Figure 21.

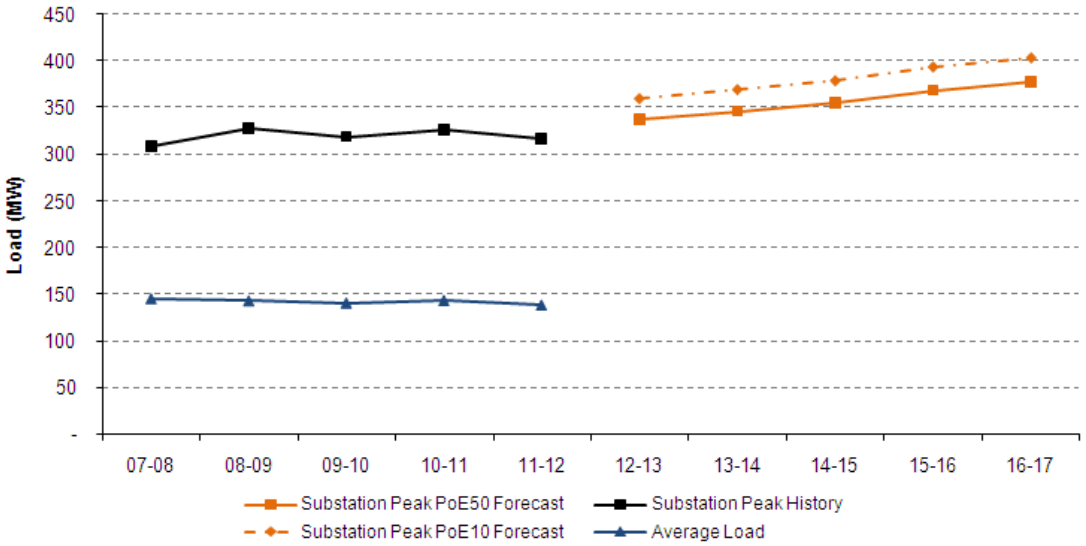

Figure 20: Cannington central forecast (2012/13 - 2016/17)

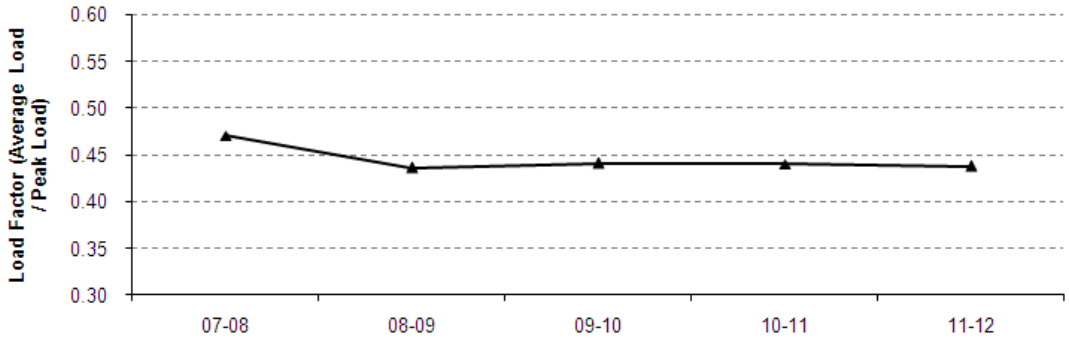

Figure 21: Cannington load factor

East Perth and CBD

The East Perth and CBD load area is characterised by growing commercial and residential high rise developments, which are expected to cause peak demand to rise. Average demand (average energy consumption) has not grown at the same rate and the combined result is a slowly declining load factor, as shown in Figure 23.

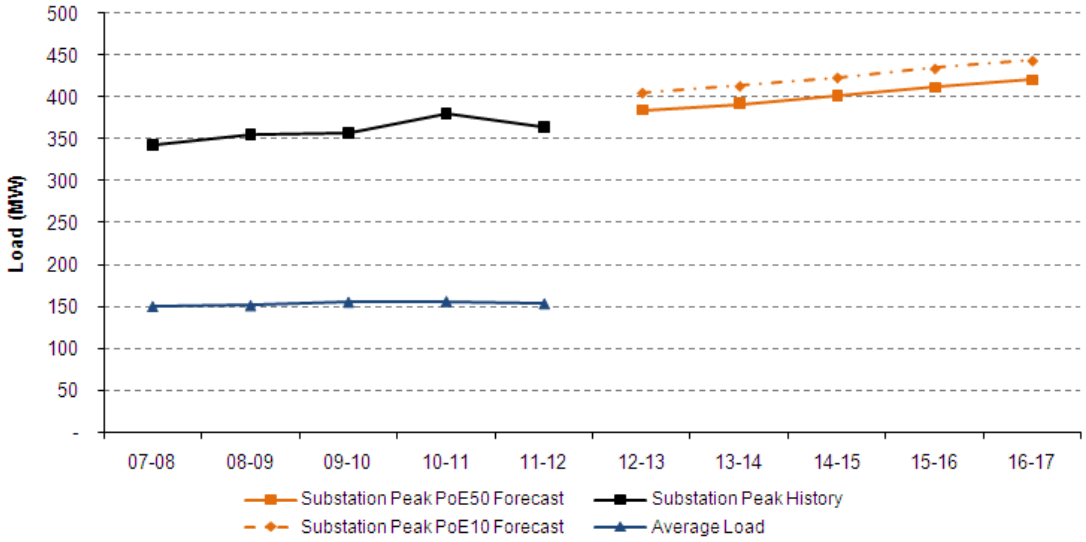

Figure 22: East Perth and CBD central forecast (2012/13 - 2016/17)

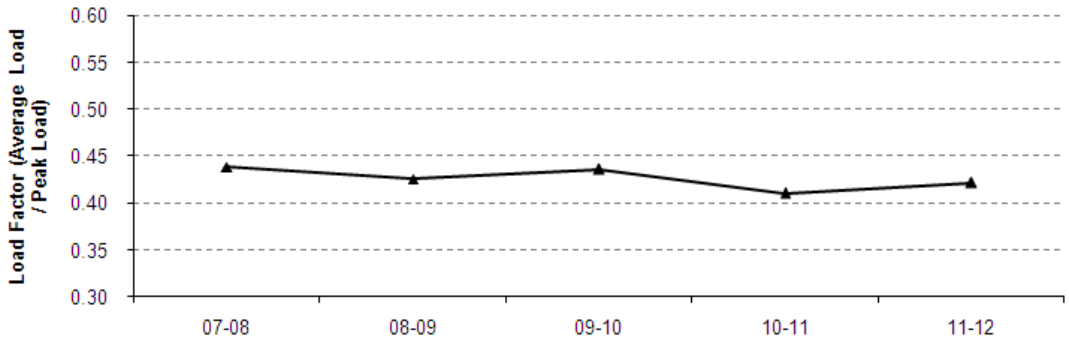

Figure 23: East Perth and CBD load factor

Western Terminal

The Western Terminal load area is characterised by residential and commercial growth in the western metropolitan suburbs, as well as the expansion of the QEII Medical Centre (including the construction of the new Children's hospital). As a result, peak demand is expected to rise, with a slight increase in average demand (average energy consumption). This result is a slowly declining load factor, as shown in Figure 25.

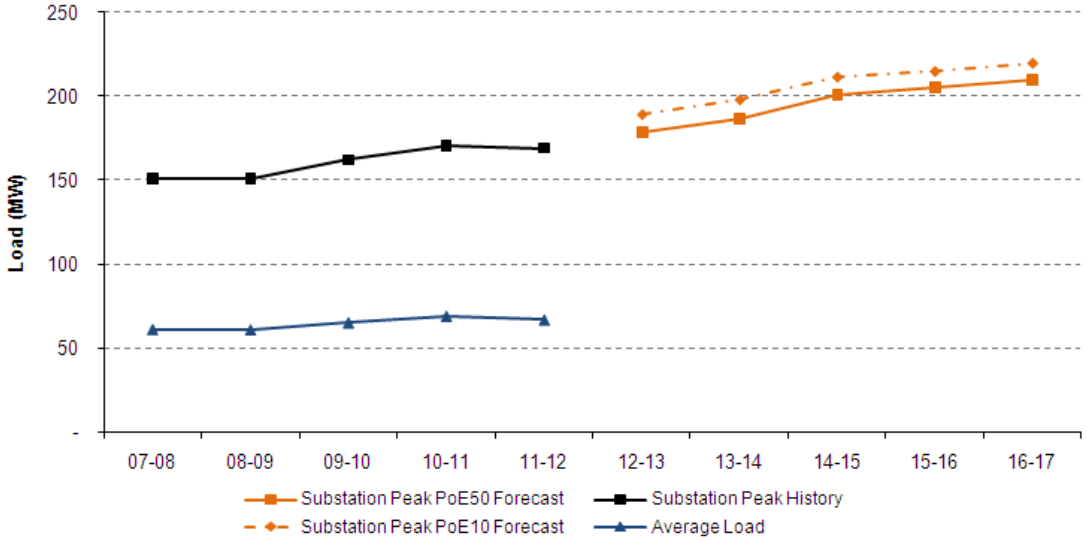

Figure 24: Western Terminal central forecast (2012/13 - 2016/17)

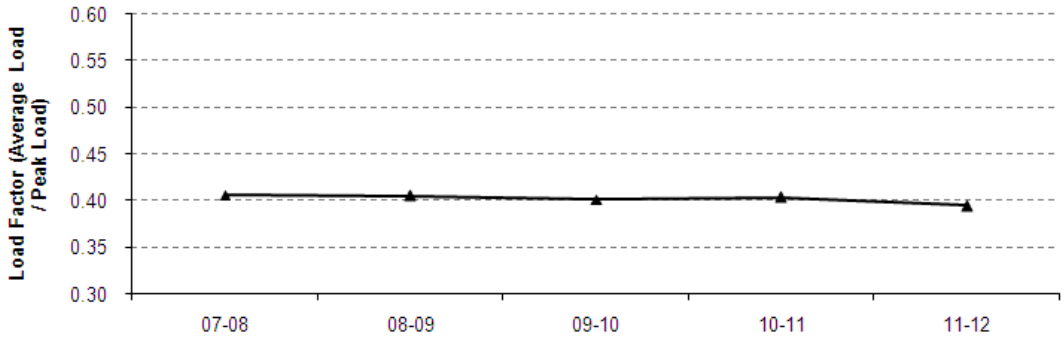

Figure 25: Western Terminal load factor

Guildford

The Guildford load area comprises residential, commercial and industrial customers. The demand reduction observed in this area may be attributable to the Perth Solar City program and its various trials (e.g. time-of-use tariff, residential solar PV systems, residential hot water systems).

Despite this decline, the forecast peak demand is expected to rise in the next five years due to new connections and expansion projects at Perth Airport and a local shopping centre. While peak demand has grown, average demand (average energy consumption) has not kept up. Although network utilisation has increased over the last two years, load factor has declined over the last five years, as shown in Figure 27.

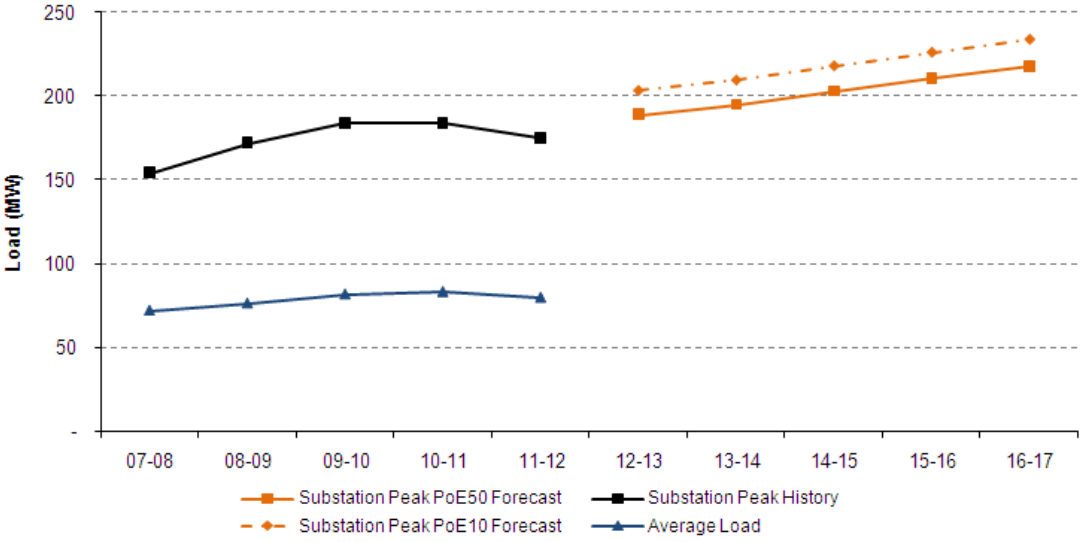

Figure 26: Guildford central forecast (2012/13 - 2016/17)

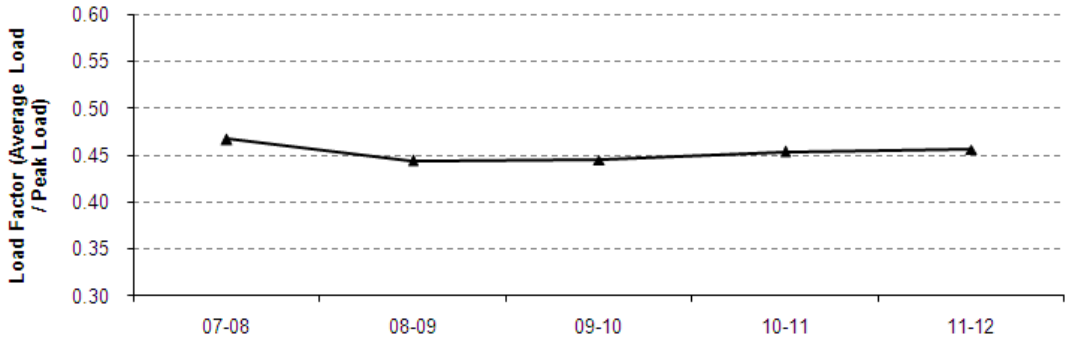

Figure 27: Guildford load factor

Neerabup

The Neerabup load area is one of the fastest-growing regions in Western Australia, incorporating primarily residential outer northern suburbs (including Sorrento, Clarkson, Wanneroo and Yanchep) and the mainly commercial / industrial Joondalup and Wangara. A rapid increase in peak demand is being driven by both new and existing connections. Average demand (average energy consumption) is not growing at the same rate, resulting in a declining load factor, as shown in Figure 29.

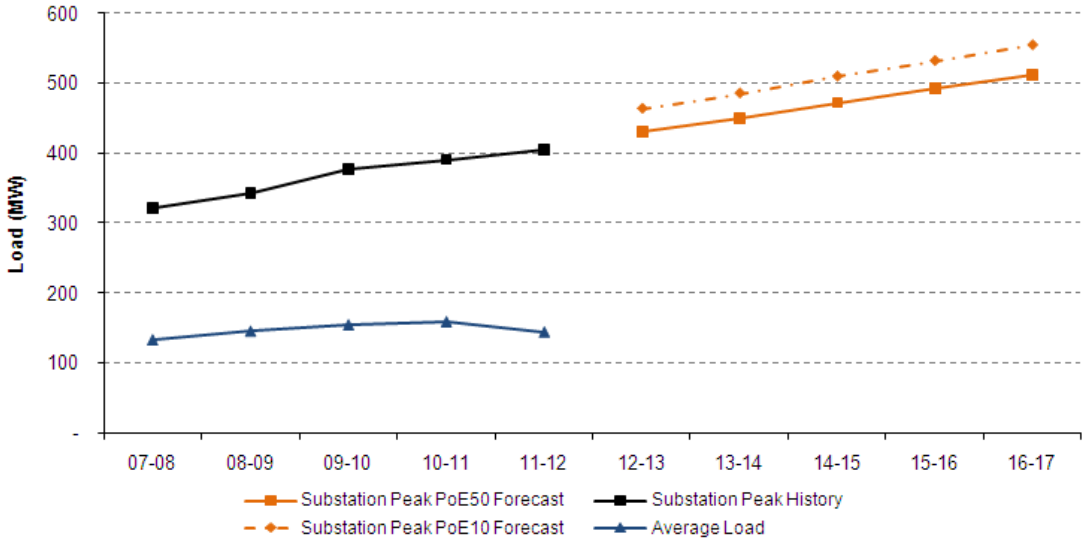

Figure 28: Neerabup central forecast (2012/13 - 2016/17)

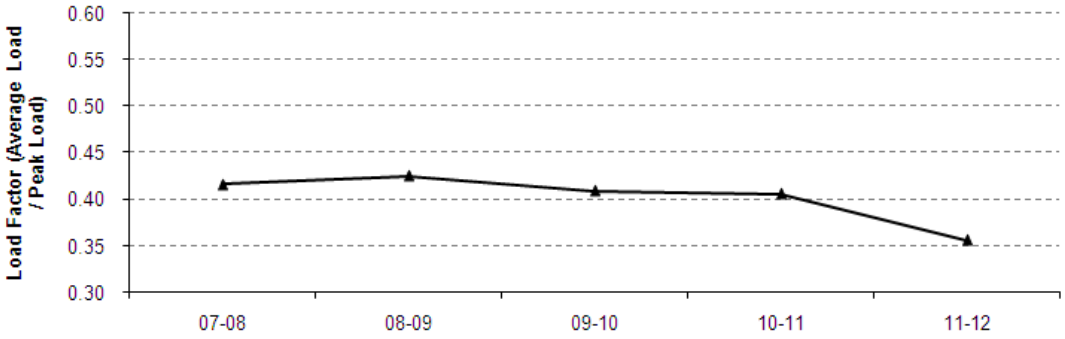

Figure 29: Neerabup load factor

Northern Terminal

The Northern Terminal load area covers most of the mid-northern suburbs of Perth, including Scarborough, Yokine, Morley and Bassendean. While the load is primarily residential, it includes commercial areas such as Osborne Park. Peak demand in the region has grown over the past five years, with average demand remaining fairly constant. The result is a slowly declining load factor, as shown in Figure 31.

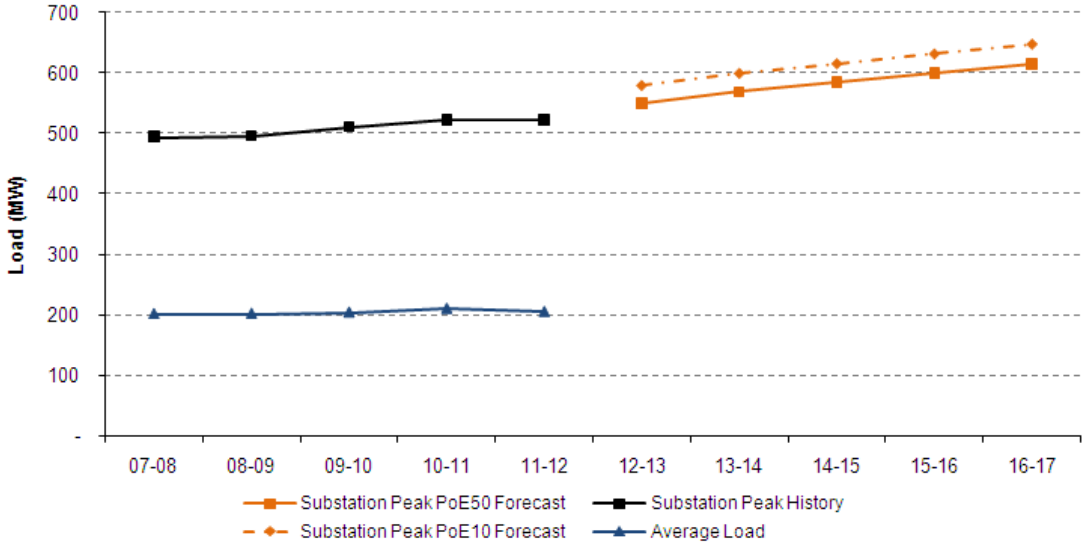

Figure 30: Northern Terminal central forecast (2012/13 - 2016/17)

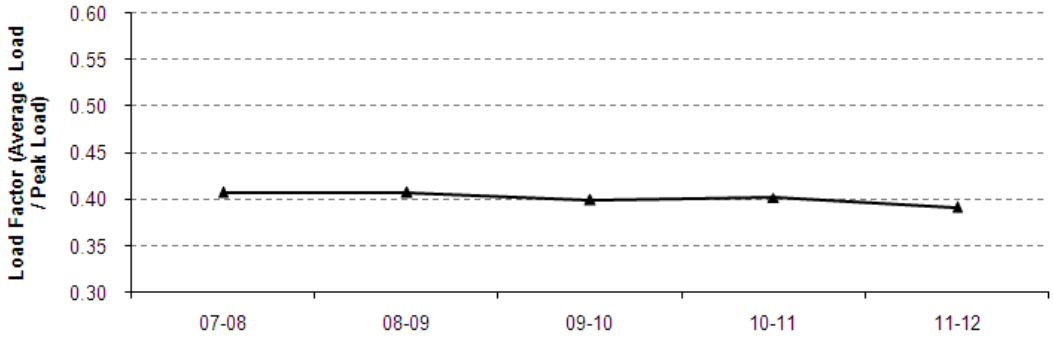

Figure 31: Northern Terminal load factor