UTILITIES COMMISSION
OF THE NORTHERN TERRITORY

Northern Territory Power System Performance Review

2022-23

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Disclaimer

The Northern Territory Power System Performance Review (NTPSPR) is prepared using information sourced from participants in the electricity supply industry, Northern Territory Government agencies, consultant reports and publicly available information. The NTPSPR is in respect of the financial year ending 30 June 2023. The Utilities Commission understands the information received to be current as at January 2024, although some prior year network-related information was updated in March 2024 to accord for Power and Water Corporation Power Services' Electricity Industry Performance Code reporting errors identified through an audit of compliance.

The NTPSPR includes analysis and statements based on the Commission's interpretation of data provided by Territory electricity industry participants. The Commission has sought to align its data reporting with the other Australian jurisdictions where possible, to enable comparison. However, there are some differences and any comparisons should only be considered indicative.

Any person using the information in the NTPSPR should independently verify the accuracy, completeness, reliability and suitability of the information and source data. The Commission accepts no liability (including liability to any person by reason of negligence) for any use of the information in the NTPSPR or for any loss, damage, cost or expense incurred or arising by reason of any error, negligent act, omission or misrepresentation in the information in the NTPSPR or otherwise.

Any questions regarding the NTPSPR should be directed to the Utilities Commission, utilities.commission@nt.gov.au or by phone 08 8999 5480.

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About this review

Since 2018, the Utilities Commission of the Northern Territory (Commission) has published an annual Northern Territory Power System Performance Review (NTPSPR), which focuses on overall power system, generation and network performance in the Darwin-Katherine, Alice Springs and Tennant Creek power systems. Where possible and relevant, the NTPSPR compares current performance with historical data to identify trends and industry benchmarks to provide context to the results.

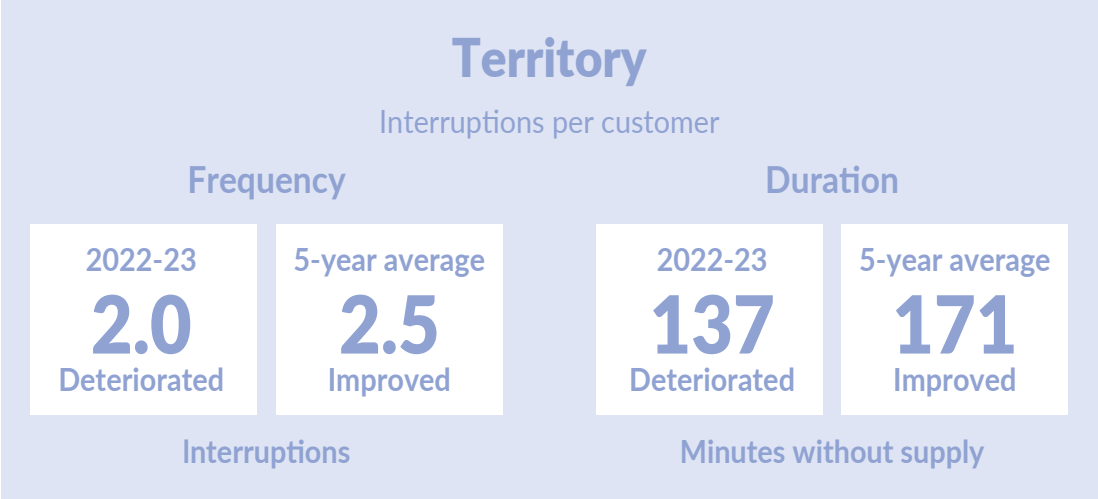
The NTPSPR's main purpose is to inform the responsible minister, government, electricity licensees and stakeholders on the performance of the Darwin-Katherine, Alice Springs and Tennant Creek power systems, and provide an assessment of generation and network performance in 2022-23, including by highlighting any areas of concern.

Regular reporting on the electricity supply industry helps increase understanding and transparency of issues, with a view to improving planning and investment decisions, understanding of value for money (price compared with level of service) and general performance by holding electricity licensees accountable for their decisions and performance, and the subsequent impacts on customers.

The 2022-23 NTPSPR is prepared by the Commission in accordance with section 45 of the *Electricity Reform Act 2000* and is restricted to the Darwin-Katherine, Alice Springs and Tennant Creek power systems, with the Darwin-Katherine power system further segmented into the regions of Darwin and Katherine for some indicators. The 2022-23 NTPSPR has been prepared with input from licensees through stakeholder consultation.

The 2022-23 NTPSPR continues to transition its 'look and feel' from that of earlier reviews, with the Commission revising the focus from a technical and broad-based review of overall power system, network and generation performance, to a review with a narrower scope and focus on standards of service and outcomes of licensee performance as experienced by customers. This change in focus realigned the NTPSPR with the Commission's role as an economic regulator, noting the Commission is not a technical regulator. However, when and where necessary, the Commission will undertake a 'deep dive' on a particular issue or issues, including of a technical nature, either as part of this publication or another publication.

Key findings and recommendations



On average across the Territory, overall power system performance, as measured by interruptions to customer's electricity supply, is improving over the long term. Nevertheless, performance deteriorated slightly in 2022-23 and still lags the National Electricity Market (NEM) benchmark in terms of frequency and duration of interruptions and the five-year average.

However, performance is not consistent across regions. Customers in the Katherine and Tennant Creek regions receive a lower standard of service when compared with customers in the Darwin and Alice Springs regions. There were some improvements in the standard of service for customers in the Katherine and Tennant Creek regions during 2022-23 when compared with the previous year.

In 2022-23, customers in the Katherine region experienced four more outages and 179 more minutes without supply than customers in the Darwin region, while customers in the Tennant Creek region experienced about three more outages than customers in the Darwin region. Positively, customers in the Tennant Creek region experienced fewer minutes without supply than customers in the Darwin region.

In 2022-23, there were five occasions in the Tennant Creek region when all or the majority of customers in the regions lost electricity supply. The Commission suspects this level of interruption would not be tolerated in the Darwin and Alice Springs regions.

Network-related performance is driving the higher level of interruptions in the Katherine region. Network and generation-related performance, and the coordination between those assets, is driving the higher level of interruptions in the Tennant Creek region.

In terms of broader network-related standards of service, the number and amount of guaranteed service level (GSL) payments decreased in 2022-23. However, the number of new connections not completed within five business days has continued to rise, with around 71% of new connections not meeting this standard of service. This deterioration is particularly concerning as it has occurred alongside a decrease in the number of new connections.

More detail regarding the performance in the Darwin, Katherine, Alice Springs and Tennant Creek regions in terms of overall power system, network and generation performance can be found in the following regional summaries and relevant chapters.

NTPSPR recommendations

The Commission has made a number of recommendations in the NTPSPR since 2017-18, against which the Commission is tracking progress. Some progress was made during 2022-23 in response to these recommendations, with three assessed as complete as part of this review.

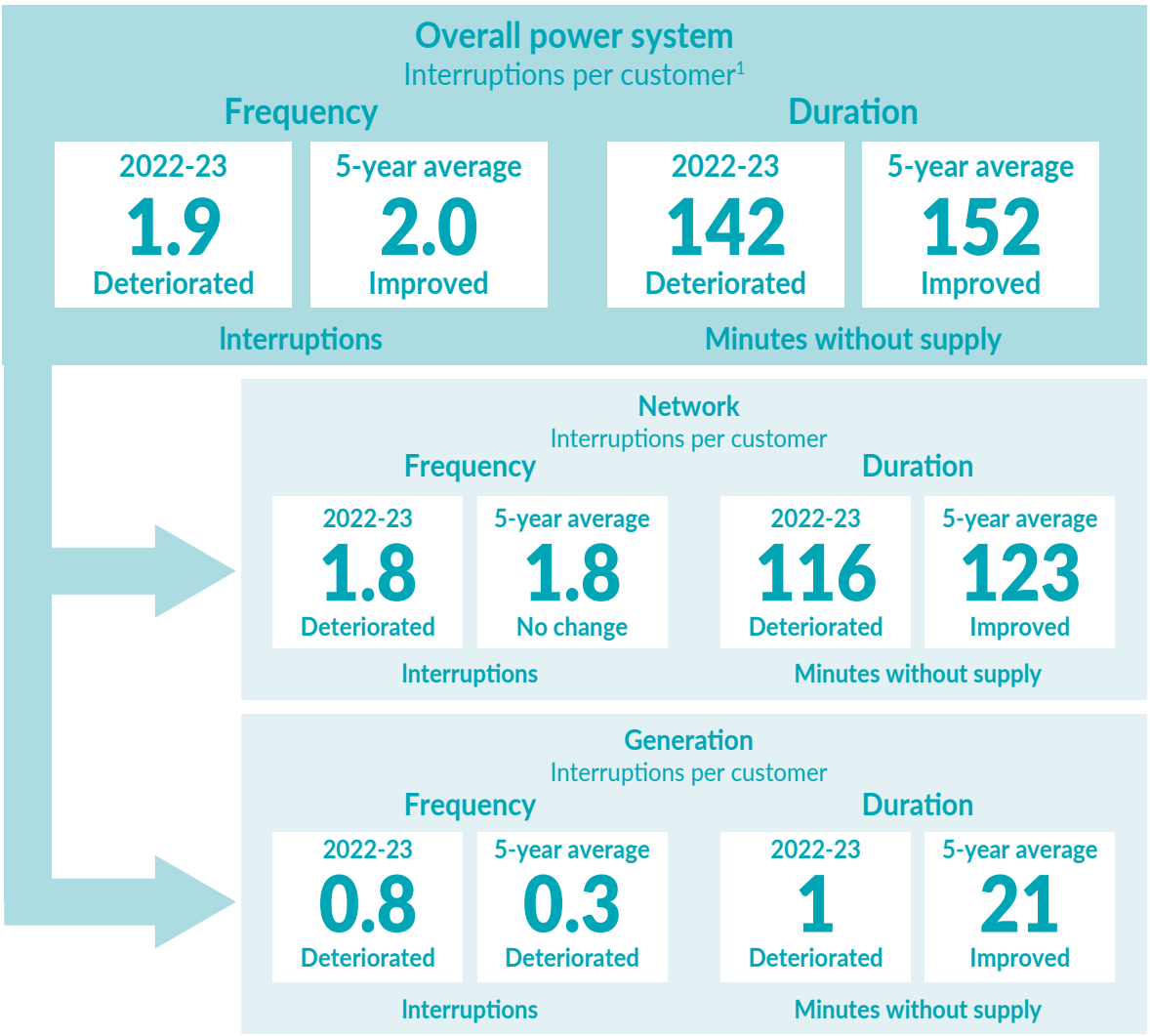
The Commission has not made any recommendations in this 2022-23 NTPSPR, noting it has made recommendations in previous NTPSPRs regarding the performance of the Katherine and Tennant Creek regions and these have been assessed as still in progress.

More information regarding the assessment of outstanding recommendations from previous NTPSPRs can be found in the Previous NTPSPR recommendations chapter.

Darwin

Darwin has been a relatively high-performing region over the past six years, with customers usually experiencing less frequent and shorter interruptions than customers in other regions considered in the NTPSPR. Performance in the region slightly deteriorated in 2022-23, however on average has continued to improve over the last six years. Had it not been for a significant interruption to customers in 2020-21, associated with a gas supply-related outage to the Channel Island power station, the five-year average performance would have been even better.

The majority of interruptions in the Darwin region are a result of network-related performance.



1 The sum of network and generation-related interruptions may not equal overall power system interruptions. Overall power system interruptions may include interruptions attributable to both network and generation-related events, or additional interruptions as a result of system control, safety or weather.

Network

Despite being the cause for the majority of interruptions in the Darwin region, network performance has improved over the last six years. The performance of the network in the Darwin region is only beaten by Alice Springs.

Customers on some feeders, such as those customers on the Goyder feeder, have consistently received a lower level of service over recent years, when compared with relevant Commission-approved network target standards, however Power and Water Corporation (PWC) appears to be taking appropriate steps to address the issues.

Generation

Had it not been for a gas supply-related outage to the Channel Island power station in 2020-21, generation performance would have had very little impact on customers in the Darwin region over the last six years.

However, the Commission notes the limited impact of generation performance on customers is likely due to PWC System Control changes to the operation of the power system a number of years ago, which included changes to the under frequency load shedding scheme settings, generation dispatch constraints and spinning reserve levels. The changes to generation dispatch constraints and spinning reserve levels have likely increased costs, particularly for Territory Generation. Under the current framework there is no competitive provision of essential system services to put downward pressure on these costs and limited regulatory requirements or oversight to ensure the efficient dispatch of essential system services by PWC System Control.

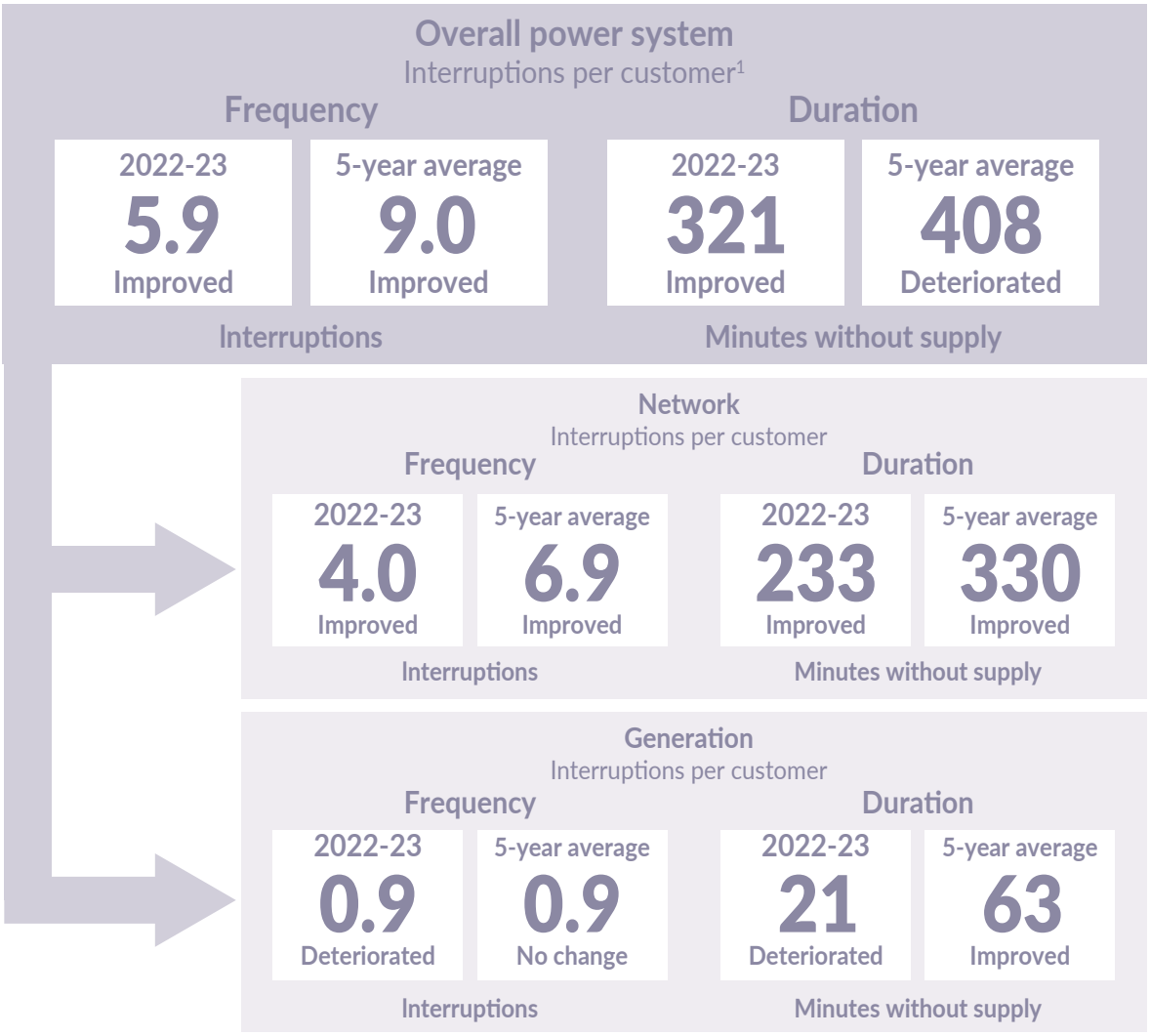
Generation availability deteriorated during the reporting period, and in particular for Territory Generation.

Katherine

In contrast to the Darwin region and despite a further improvement in 2022-23 compared with the previous year, the Katherine region, which is connected to Darwin by a transmission line, is the worst performing of the four regions considered in the NTPSPR. Customers on average experience more frequent and longer interruptions.

There was one occasion during 2022-23 when the entire Katherine region went without power, but this is an improvement on the nine occasions in 2020-21 and three occasions in 2021-22. The Commission suspects the level of interruptions over the last three years and the overall performance in the Katherine region would not be tolerated in the Darwin or Alice Springs regions.

The majority of interruptions in the Katherine region are a result of network-related performance and, more specifically, issues associated with the transmission line connecting the region to the rest of the Darwin-Katherine power system.



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Network

In terms of network-related performance, the Katherine region notably improved in 2022-23, however over the last six years, the network in the Katherine region has consistently performed worse than networks in other regions.

In addition to the overall network performance, customers on some feeders, such as those customers on the Florina feeder have consistently received a lower level of service over recent years, when compared with relevant Commission-approved network target standards. In 2022-23, customers on the Florina feeder experienced 847 minutes without supply, which is well above the feeder category target standard of 190 minutes.

Customer notifications to PWC regarding the quality of supply in the Katherine region have consistently been higher over recent years than in relation to the other regions, including in 2022-23, indicating the lower level of network-related performance has been noticed by customers.

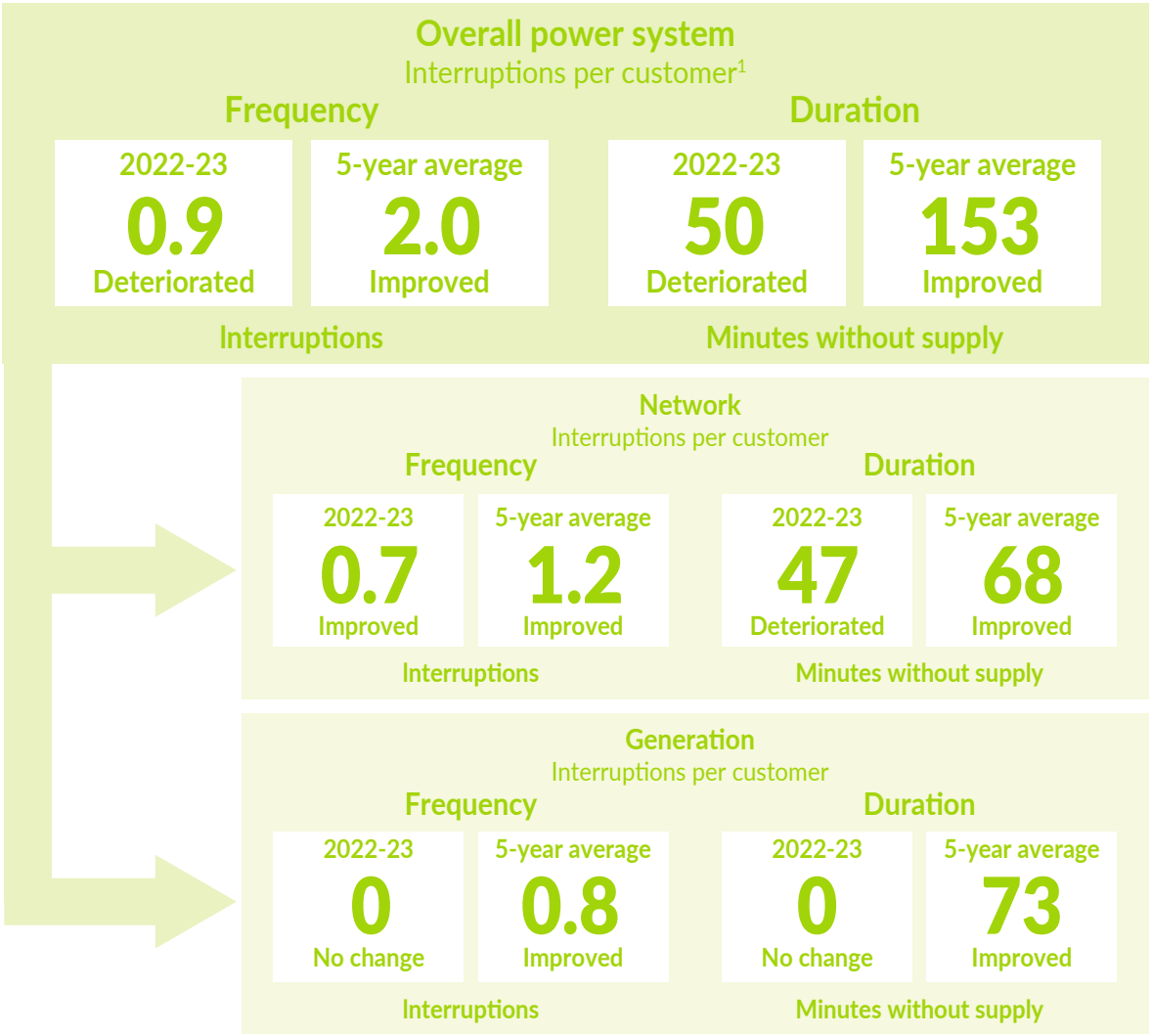
Generation

Similar to the Darwin region, had it not been for the gas supply-related outage to the Channel Island power station in 2020-21, generation performance over the last six years would have had very little impact on customers in the Katherine region in terms of interruptions when compared with the poor overall performance in the region. The level of generation performance in the Katherine region is not unexpected as the Commission understands that generation located in the Katherine region is rarely dispatched (online) due to its higher cost to run. The Commission notes generation issues in the Darwin region can impact the Katherine region due to the operation of protection systems.

Alice Springs

Despite the region recording a slight deterioration from the previous year, the Alice Springs region continued a general trend of improvement in 2022-23 and continued to perform better than the other three regions in both frequency and duration of customer interruptions. The five-year average in the Alice Springs region is now similar to the Darwin region, which is encouraging given the widespread and prolonged outages experienced in the region in 2017 and 2019.

There have been improvements in the region in both network and non-network-related performance, which includes generation.



1 The sum of network and generation-related interruptions may not equal overall power system interruptions. Overall power system interruptions may include interruptions attributable to both network and generation-related events, or additional interruptions as a result of system control, safety or weather.

Network

Regarding impacts on customers, the Alice Springs network has performed well over the last six years, with performance continuing to improve. Further, the network has consistently performed well compared with the other three regions.

Generation

Generation performance in the Alice Springs region has substantially contributed to customer interruptions over the last six years due to system blacks in 2017-18 and 2019-20. However, generation performance has improved over the last three years, particularly in the duration of interruptions as a result of generation performance, with no minutes without supply over the last two years. This level of improved performance is contributing to the overall improvement in the region.

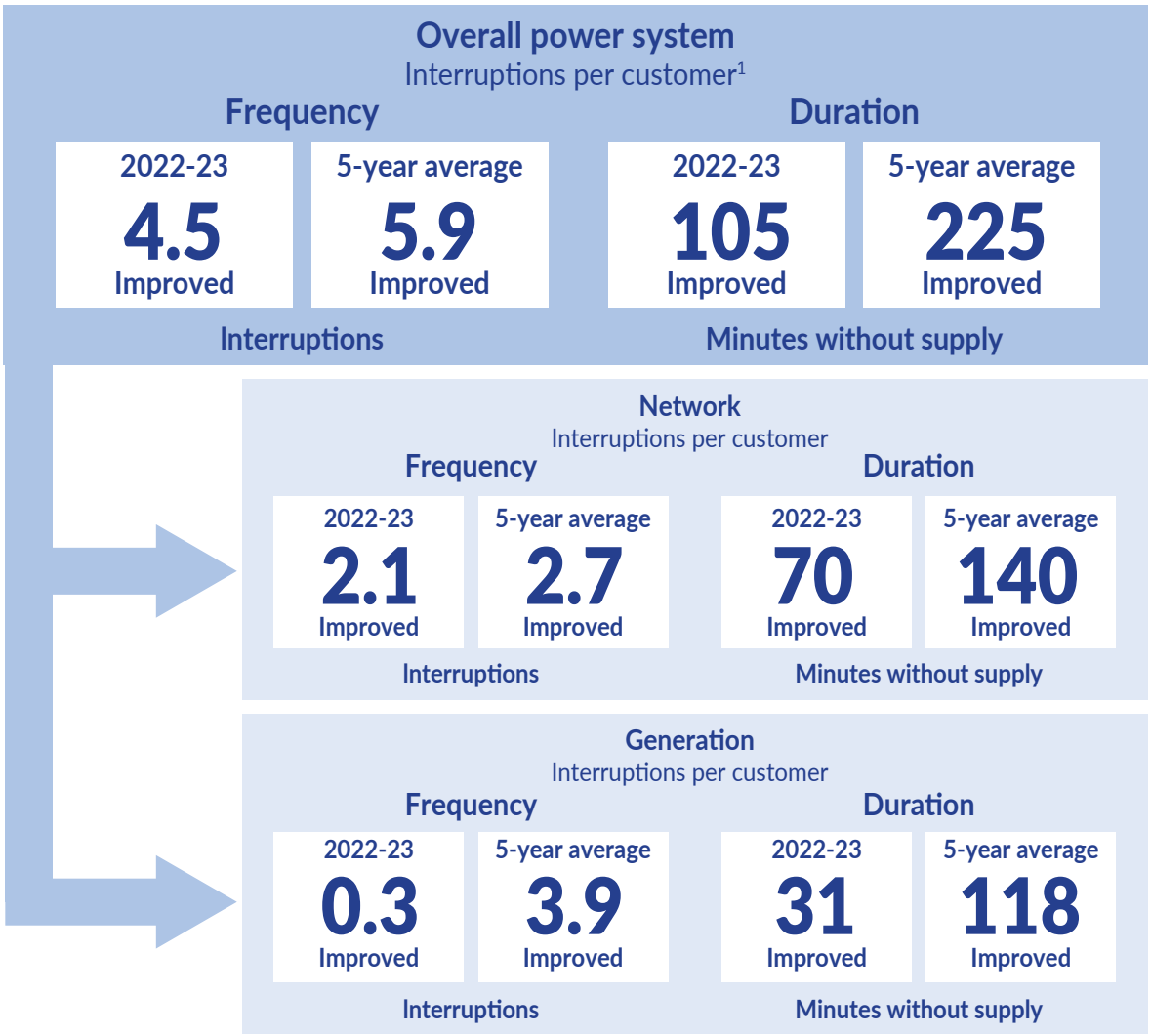
Notwithstanding the improved generation performance, generation availability in the Alice Springs region has been consistently lower than the other regions over the last six years. Availability of generation in the region was just under 77% in 2022-23, which compares poorly with 85% and 95% in the Darwin-Katherine and Tennant Creek regions, respectively. Two power stations at opposite ends of their lifecycle are driving the poor availability of generation in the Alice Springs region. The end-of-life Ron Goodin power station recorded a low level of availability (60%) and Owen Springs power station recorded a level of 84% availability in 2022-23.

Despite the low level of availability, the Ron Goodin power station may still be relied on to provide some back-up to the region and is likely to be required until the Owen Springs power station and Ron Goodin battery energy storage system have proven to operate without constraints. However, the availability of the Ron Goodin power station is likely to continue to diminish over time, noting Territory Generation has advised it will eventually be placed in a standby state. While the power station is being relied on, it will increase generation costs compared with running the newer, more efficient generators at Owen Springs power station.

Tennant Creek

The duration and frequency of interruptions in the Tennant Creek region improved during 2022-23 when compared with the previous year, with the duration of outages reaching its lowest level over the last six years. Consistent with the previous year, there were five occasions during 2022-23 when the majority of customers in the Tennant Creek region went without power. Similar to the Commission's comments in relation to the Katherine region, the Commission suspects this level of interruption would not be tolerated in the Darwin or Alice Springs regions.

The lower level of performance in the Tennant Creek region is being driven by network and generation-related performance, and coordination between these assets.



1 The sum of network and generation-related interruptions may not equal overall power system interruptions. Overall power system interruptions may include interruptions attributable to both network and generation-related events, or additional interruptions as a result of system control, safety or weather.

Network

In terms of customer interruptions, the network in Tennant Creek generally performs worse than the Darwin and Alice Springs regions, although better than the Katherine region. While the frequency of network performance-related interruptions has reduced over the last six years, the duration of interruptions largely remained unchanged until the improvement in 2022-23.

Generation

Generation performance in the Tennant Creek power system has routinely been the worst or second worst performing of the Territory power systems or regions over the last six years.

From PWC System Control incident reporting, the Commission has observed over recent years that when the Tennant Creek power system is dispatched in favour of the newer high-efficiency generation, a disturbance in the power system is often unable to be managed by the newer generation, resulting in an interruption to the majority of customers in the region. This appears to be due to the newer generators' slow response or lack of inertia. PWC System Control issued a direction in December 2022, which requires unit 15 at the Tennant Creek power station, an older and less efficient but more secure generator, to be dispatched at all times. This appears to have improved performance in the region in the second half of 2022-23.

Generation availability continued to be good in the Tennant Creek region during 2022-23 at around 95%, which compares favourably with a six-year low of around 80% in 2020-21.

Introduction

The NTPSPR focuses on the 2022-23 performance of the Darwin-Katherine, Alice Springs and Tennant Creek power systems. Separate chapters consider overall and regional power system performance, generation and network performance, and the status of recommendations from previous NTPSPRs. Where possible and relevant, the review compares performance with historical data to identify trends and benchmarks to provide context.

Power system description

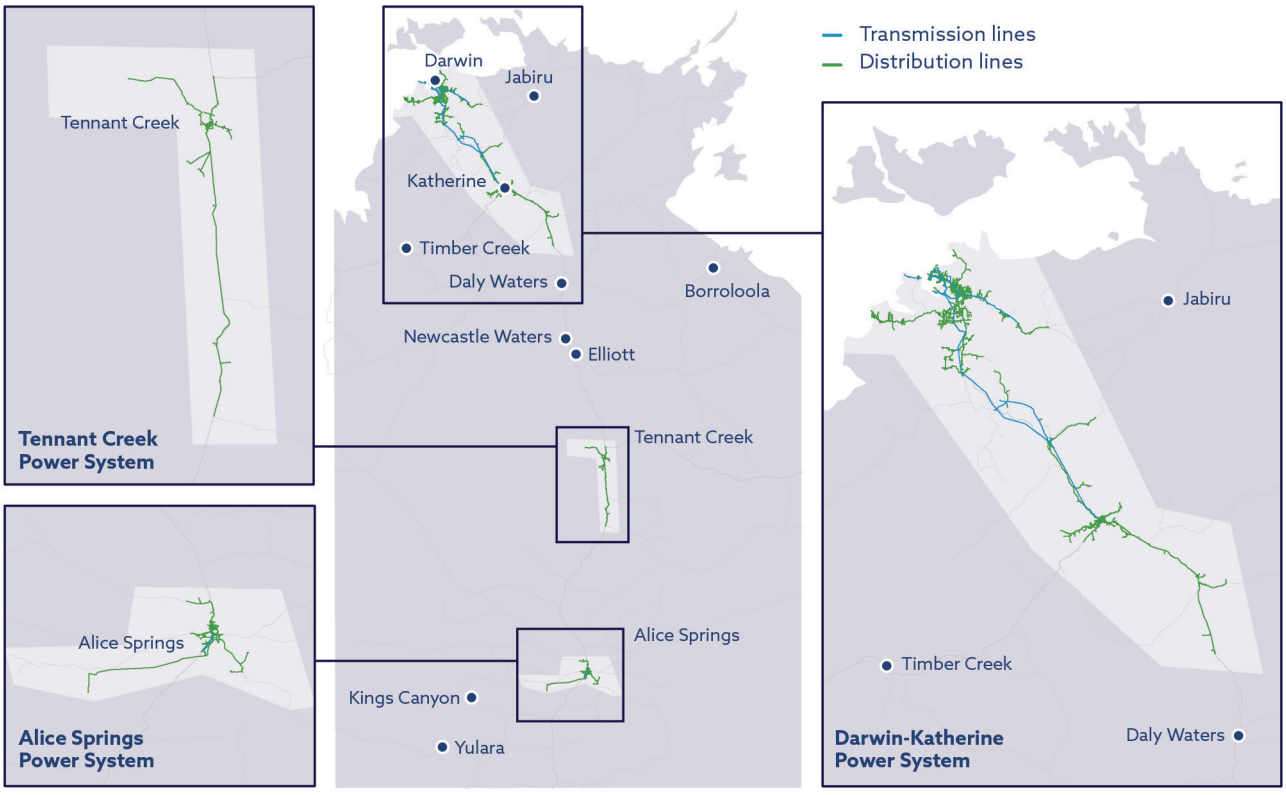
The Darwin-Katherine, Alice Springs and Tennant Creek power systems are the largest power systems in the Territory. They are the only Territory power systems where network access regulation applies and hence, have the greatest level of regulatory oversight.

The Darwin-Katherine, Alice Springs and Tennant Creek power systems are not interconnected with each other and not connected to power systems in other jurisdictions, such as the NEM, which supplies electricity to the majority of customers on the east coast of Australia. Accordingly, the Territory's power systems are smaller and do not have the same level of interconnectedness as other parts of Australia.

Further, within the Territory, there are significant differences between the three power systems, including in terms of size and density, customer numbers, geographical location and climate.

Figure 1 shows a map of the Territory with a visual representation of the location and size of the Darwin-Katherine, Alice Springs and Tennant Creek power systems.

Figure 1: Visual representation of the location and size of the Darwin-Katherine, Alice Springs and Tennant Creek power systems.



Source: Power and Water Corporation

The Darwin-Katherine power system is the largest power system in the Territory. It supplies the Darwin and Palmerston city centres, suburbs and surrounding areas, and the township of Katherine and its surrounding rural areas. The major transmission lines in the system are lines from Channel Island to Katherine and Channel Island to Hudson Creek. A double-circuit overhead 132 kilovolt (kV) transmission line from Channel Island to Hudson Creek (Channel Island-Hudson Creek) serves the Darwin area, while a 300 km single circuit 132 kV transmission line (Channel Island-Katherine) runs south from Darwin to Manton, Batchelor, Pine Creek and Katherine.

The Alice Springs power system is the second largest power system in the Territory. It supplies the township of Alice Springs and surrounding rural areas from the Owen Springs, Ron Goodin and Uterne (solar) power stations.

The Tennant Creek power system is the smallest power system covered in the NTPSPR. The power system supplies the township of Tennant Creek and surrounding rural areas from a centrally located power station.

Table 1 highlights some of the differences between the Darwin-Katherine, Alice Springs and Tennant Creek power systems, and the NEM, to provide context on the scale of the Territory power systems.

Table 1: Differences between the Darwin-Katherine, Alice Springs and Tennant Creek power systems, and the NEM (based on 2022-23 data)

		Power system		
	NEM	Darwin-Katherine	Alice Springs	Tennant Creek
Customer numbers	7 502 000[1]	74 000	12 000	1 600
System consumption (GWh)	188 400[2]	1 455	193	27
Maximum demand (MW)	32 569[3]	289	46	7

GWh: Gigawatt hours; MW: Megawatts

1 AER Schedule 2 – Retail Performance Data Q4 2022-23 spreadsheet: https://www.aer.gov.au/documents/schedule-2-quarter-4-2022-23-retail-performance-data.

2 AER Annual electricity consumption – NEM:https://www.aer.gov.au/wholesale-markets/wholesale-statistics/annual-electricity-consumption-nem.

3 AER Annual generation capacity and peak demand – NEM: https://www.aer.gov.au/wholesale-markets/wholesale-statistics/annual-generation-capacity-and-peak-demand-nem.

1 Power system

This chapter focuses on the overall performance of the Darwin-Katherine, Alice Springs and Tennant Creek power systems. The overall performance is assessed by considering the duration and frequency of customer interruptions. These interruptions may be a result of issues related to, among others, the network, generation, system control, safety or weather. The Commission notes this is the level of performance a customer experiences, with the customer often unaware, or not necessarily interested in, the cause of an interruption. The level of overall performance is shown by the green line and columns in Figure 2.

In terms of reporting, relevant licensees record the frequency and duration of customer interruptions, and two indices are then derived to show the average frequency and duration of interruptions per customer in the given system and period of time, which enables fair comparisons to be made between systems and time periods. The two indices are System Average Interruption Frequency Index (SAIFI) and System Average Interruption Duration Index (SAIDI), which show frequency (average interruptions per customer) and duration (average customer minutes without supply per customer), respectively.

The frequency and duration of customer interruptions as a result of all outages in the power system are referred to as unadjusted SAIFI and SAIDI. These outages can be as a result of numerous issues, including those listed above. Again, this level of performance is shown by the green line and columns in Figure 2.

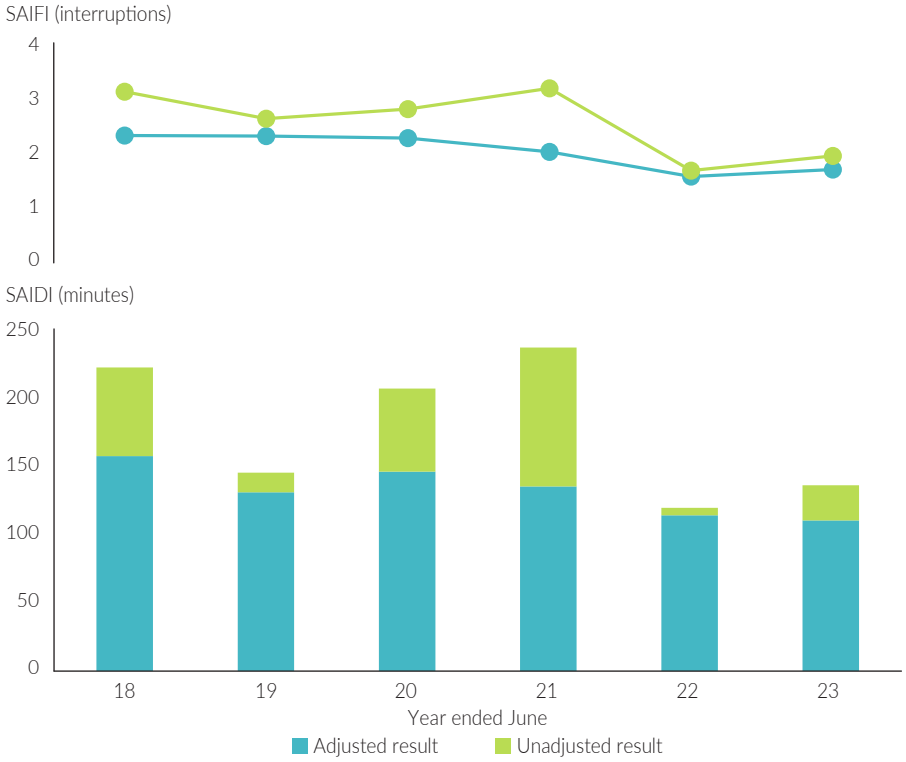
To separate out and understand what contribution network performance has to the overall level of performance experienced by customers (unadjusted SAIFI and SAIDI), interruptions that are not a direct result of network performance are excluded. Once these are removed, the remaining interruptions are referred to as the adjusted result, or adjusted SAIFI and SAIDI. Adjusted SAIFI and SAIDI provide insight into the performance of the network (shown by the blue line and columns in Figure 2), and this performance is assessed in more detail in the Network chapter.

As discussed above, another important contributor to the overall level of performance experienced by customers, and one that is assessed in this review, is the performance of generation. Some of this is accounted for in the difference between the unadjusted and adjusted SAIFI and SAIDI, or the difference between the green and blue lines and columns in Figure 2, respectively. A more detailed assessment of generation performance is included in the Generation chapter.

Territory

Figure 2 shows the level of power system performance (or interruption) experienced by customers in the Territory over the last six years (unadjusted SAIFI and SAIDI), represented by the green line and columns, which includes customers in the Darwin-Katherine, Alice Springs and Tennant Creek regions. Figure 2 also shows adjusted SAIFI and SAIDI (blue line and columns), which as discussed above, is the level of interruption as a result of network-related performance.

Figure 2: Territory unadjusted and adjusted SAIFI and SAIDI



The frequency and duration of interruptions experienced by customers in the Territory increased slightly from a six-year low in 2021-22, with customers on average experiencing two interruptions and 137 minutes without supply. The frequency and duration of interruptions experienced by customers in the Territory during 2022-23 was below the five-year average of 2.5 interruptions and 171 minutes without supply.

The Commission notes there was a large gas supply-related outage to the Channel Island power station in 2020-21, which impacted about 49,000 customers and resulted in about 7,712,000 customer minutes without supply. The outage was the second largest customer interruption in the Territory since the start of 2015, with the largest associated with Tropical Cyclone Marcus in Darwin in March 2018 (191,842,000 customer minutes without supply). Unlike the outage associated with Tropical Cyclone Marcus, the gas supply-related outage is not excluded from the data in this review as a major event day, as it does not meet the criteria to be considered a natural event, as defined by the Electricity Industry Performance (EIP) Code.

Accordingly, the gas-related outage has a large impact on the results shown in this review and, in particular, the 2020-21 results and historical averages of unadjusted SAIFI and SAIDI (and generation SAIFI and SAIDI) at a Territory level, and at the Darwin and Katherine regional level. While it could be argued that the root cause of the interruption was not directly related to the electricity supply industry and therefore does not reflect underlying power system performance, as discussed above, customers are often unaware or not necessarily interested in what caused an interruption.

The frequency and duration of interruptions experienced by customers in the Territory can be volatile from year to year, such as in 2020-21, and as shown by the green line and columns in Figure 2. However, although not shown in Figure 2, the five-year rolling average improved in 2022-23. When considering the five-year average SAIFI and SAIDI, the improvement is being driven by both network and non-network-related performance.

Australian Energy Regulator comparison

To provide context to the Territory result in terms of the frequency and duration of interruptions experienced by customers, the Commission collated data from the Australian Energy Regulator (AER) to create a benchmark (AER benchmark).

The Commission collated SAIFI, SAIDI and customer number data from regulatory information notices for the 13 distribution network service providers (DNSPs) the AER regulates outside the Territory. The Commission used the data published by the AER to create a customer number weighted unadjusted (and adjusted) SAIFI and SAIDI average for the 13 DSNPs from 2015-16 to 2022-23 (blue line and columns in Figure 3).

While the Commission acknowledges the distribution networks regulated by the AER are not directly comparable to the Territory, there is a high level of diversity in the AER-regulated distribution networks, and on this basis, the Commission considers the AER benchmark to be a useful benchmark.

Figure 3 shows the Territory and AER benchmark unadjusted SAIFI and SAIDI results from 2017-18 to 2022-23. The Territory unadjusted results are shown by the green line and columns, and the AER benchmark unadjusted results are shown by the blue line and columns.

Figure 3: Territory and AER benchmark unadjusted SAIFI and SAIDI

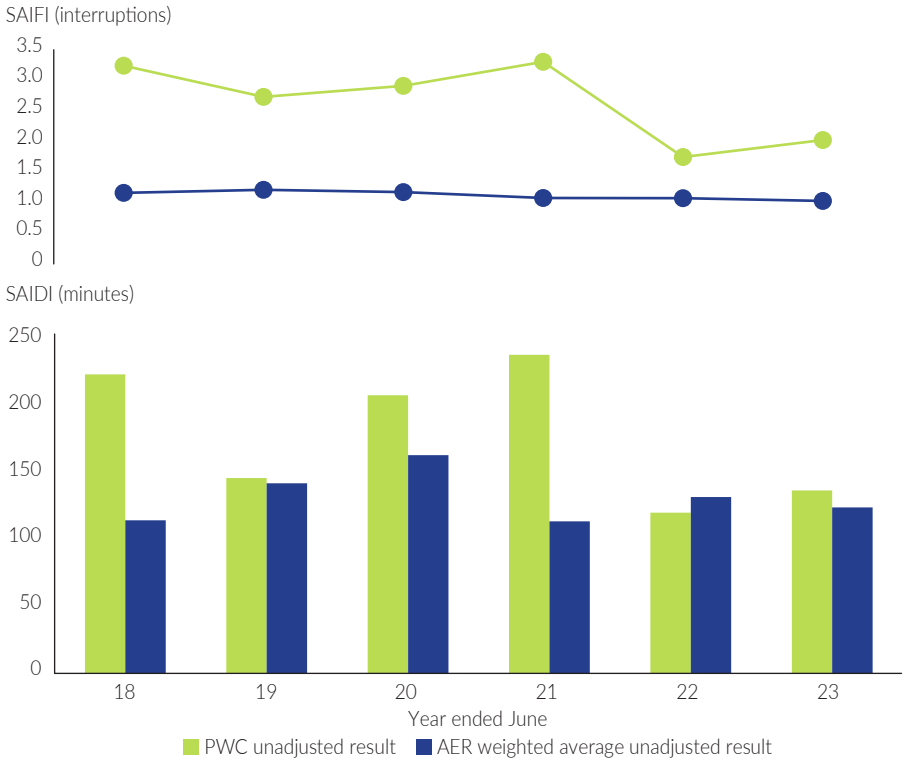


Table 2 shows the average frequency and duration of interruptions (unadjusted SAIFI and SAIDI, respectively) per customer in the Territory and the weighted average of the 13 DNSPs regulated by the AER in 2022-23, and a five-year average.

Table 2: Territory and AER weighted average unadjusted and adjusted SAIFI and SAIDI in 2022-23, and five-year average

	SAIFI (interruptions)		SAIDI (minutes without supply)	
	2022-23	5-year average	2022-23	5-year average
Territory:				
• unadjusted (all interruptions)	2.0	2.5	137	171
• adjusted (network-related)	1.8	2.1	111	129
AER weighted average:				
• unadjusted (all interruptions)	1.0	1.1	125	136
• adjusted (network-related)	0.9	1.0	112	115

When considering the five-year average, in 2022-23 a customer in the Territory is likely to experience almost one and a half times more frequent interruptions and 35 more minutes without supply than the AER benchmark.

In terms of the frequency and duration of interruptions in 2022-23, there was a slight deterioration compared with the AER benchmark, however 2021-22 and 2022-23 were much closer to the benchmark compared to earlier years, as shown in Figure 3.

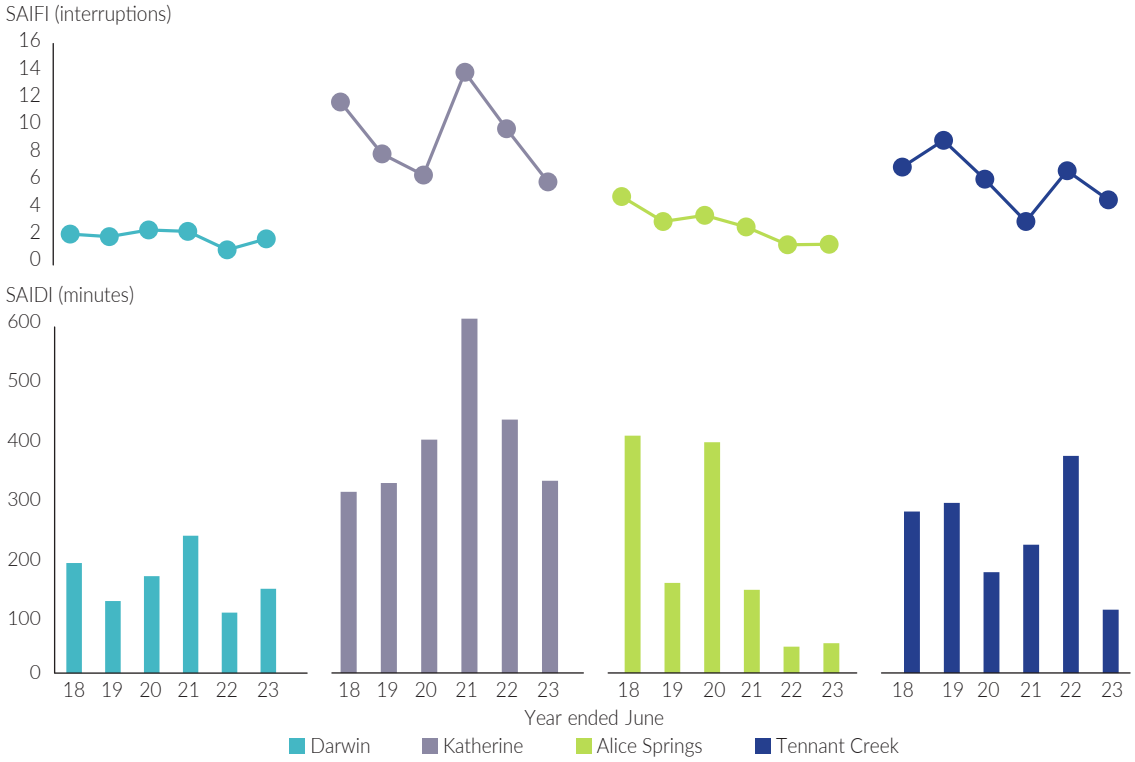
Although not shown in Figure 3, when comparing the five-year rolling averages in the Territory with the AER benchmark, there is a greater contribution in the Territory to the overall level of performance from non-network-related interruptions (which includes generation) than in the 13 other DNSPs regulated by the AER. The Commission has discussed in previous publications that generation performance has a bigger impact on overall performance in the Territory than in other, interstate power systems or regions, such as the NEM. This is due to the relative size of the generation compared with the power systems in the Territory, and the lack of redundancy and interconnectedness in those systems. This observation supports those statements.

While the level of performance in the Territory has improved over recent years, the level of performance experienced by customers is not consistent across power systems, or regions within those power systems in the case of Darwin-Katherine. The next section assesses those differences and, at a high-level, the main driving forces behind the level of performance in each region, with more detail on network and generation-related performance in subsequent chapters.

Regional

Figure 4 shows the average frequency and duration of interruptions (unadjusted SAIFI and SAIDI, respectively) per customer in the Darwin-Katherine, Alice Springs and Tennant Creek power systems, with the Darwin-Katherine power system further segmented into the regions of Darwin and Katherine.

Figure 4: Regional unadjusted SAIFI and SAIDI[1]



1 The 2020-21 results are different to those reported in the 2021-22 and 2020-21 NTPSPRs due to PWC Power Services updating the data to address errors identified through an EIP Code audit of compliance.

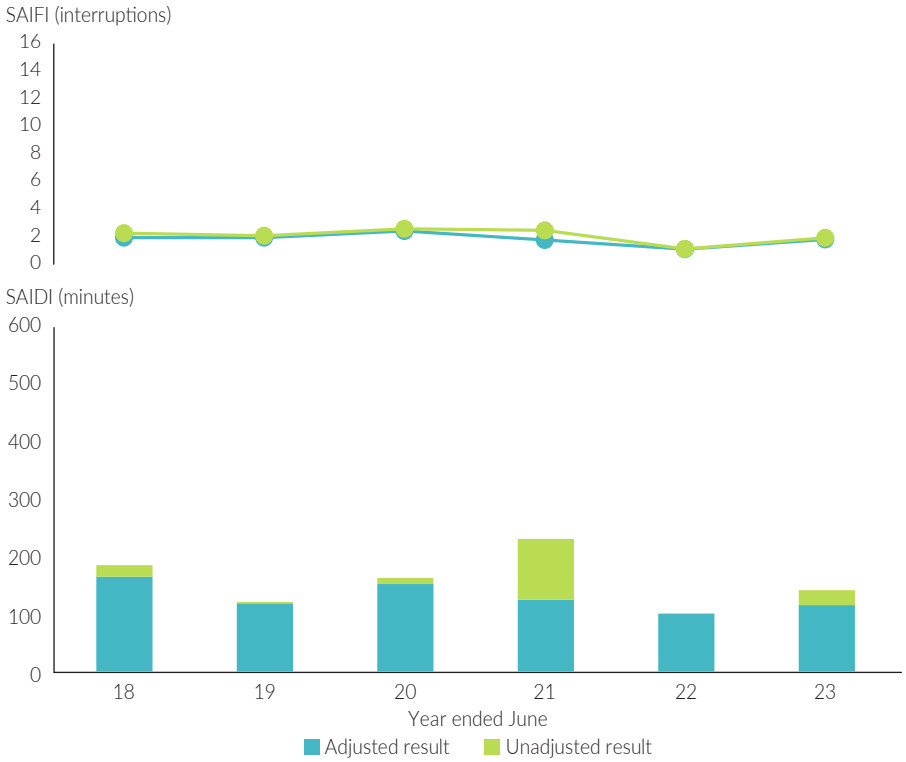
Table 3 shows the average frequency and duration of interruptions (unadjusted SAIFI and SAIDI, respectively) per customer in 2022-23, and the five-year average by region.

Table 3: Regional unadjusted SAIFI and SAIDI, 2022-23 and five-year average

	SAIFI (interruptions)		SAIDI (minutes without supply)	
	2022-23	5-year average	2022-23	5-year average
Darwin	1.9	2.0	142	152
Katherine	5.9	9.0	321	408
Alice Springs	0.9	2.0	50	153
Tennant Creek	4.5	5.9	105	225

Darwin

Figure 5: Darwin region unadjusted and adjusted SAIFI and SAIDI[1]



1 The 2020-21 results are different to those reported in the 2021-22 and 2020-21 NTPSPRs due to PWC Power Services updating the data to address errors identified through an EIP Code audit of compliance.

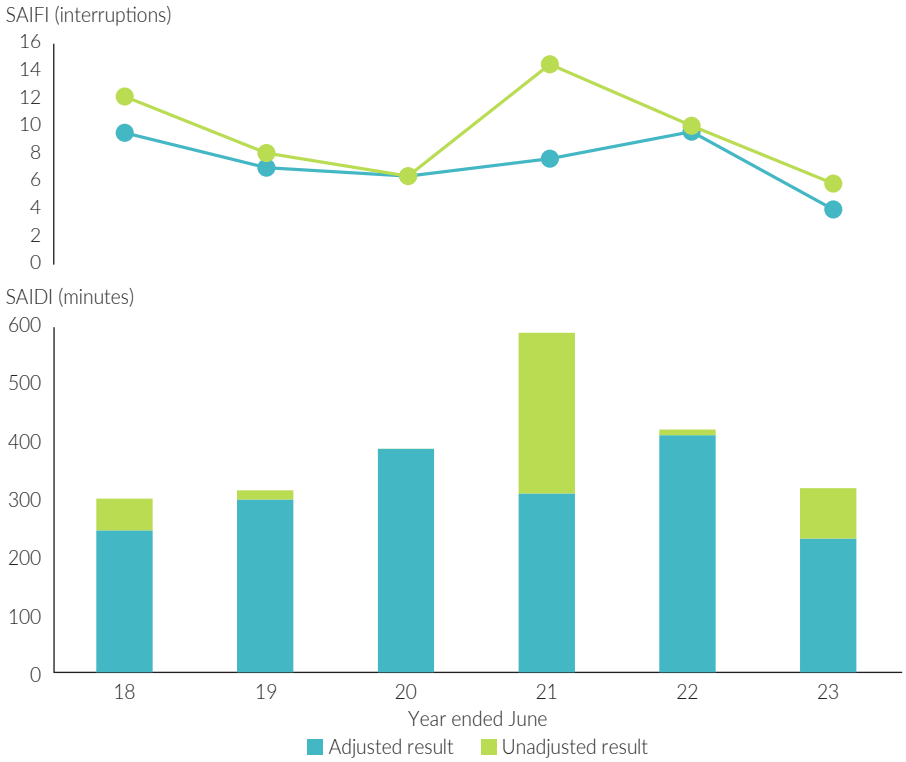
The frequency and duration of interruptions experienced by customers in the Darwin region of the Darwin-Katherine power system increased in 2022-23 compared with the previous year, with 1.9 interruptions and 142 minutes without supply per customer. The five-year average improved in 2022-23 to two interruptions and 152 minutes without supply per customer.

Generally, the frequency and duration of interruptions in the Darwin region is lower than the other regions in the Territory (discussed below).

While reducing, on average the majority of interruptions in the Darwin region over the last six years are network-related. Non-network-related interruptions, which include those related to generation, have also reduced over the last six years.

Katherine

Figure 6: Katherine region unadjusted and adjusted SAIFI and SAIDI[1]



1 The 2020-21 results are different to those reported in the 2021-22 and 2020-21 NTPSPRs due to PWC Power Services updating the data to address errors identified through an EIP Code audit of compliance.

The frequency and duration of interruptions experienced by customers in the Katherine region of the Darwin-Katherine power system improved in 2022-23 compared with the previous two years, to a level of 5.9 interruptions and 321 minutes without supply per customer. However, both the frequency and duration of interruptions remain high when compared with the other Territory regions. For example, customers in Katherine experienced four more outages and 179 more minutes without supply than customers in the Darwin region during 2022-23.

This disparity between regions is not isolated to 2022-23, with the Katherine region more often than not being the worst performing region in the Territory over the last six years. The current five-year average for the frequency and duration of interruptions in the Katherine region is nine interruptions and 408 minutes without supply (just under 7 hours) per customer, which is about seven more outages and 256 more minutes without supply than experienced by customers in the Darwin region. Positively, the five-year rolling average SAIFI improved in 2022-23, but this was offset by the five-year rolling average SAIDI deteriorating by about 4 minutes.

The 2021-22 NTPSPR discussed how the performance in the region is being driven by network-related outages, rather than non-network-related outages. Further, the Commission has raised power system performance in the Katherine region as an issue in several NTPSPRs, and made a number of associated recommendations as far back as 2017-18 (three recommendations directly related). Through the tracking of those recommendations, licensee reporting, regular interactions with licensees and general monitoring of power system performance, the Commission is aware work has been completed or is underway that attempts to improve performance in the Katherine region.

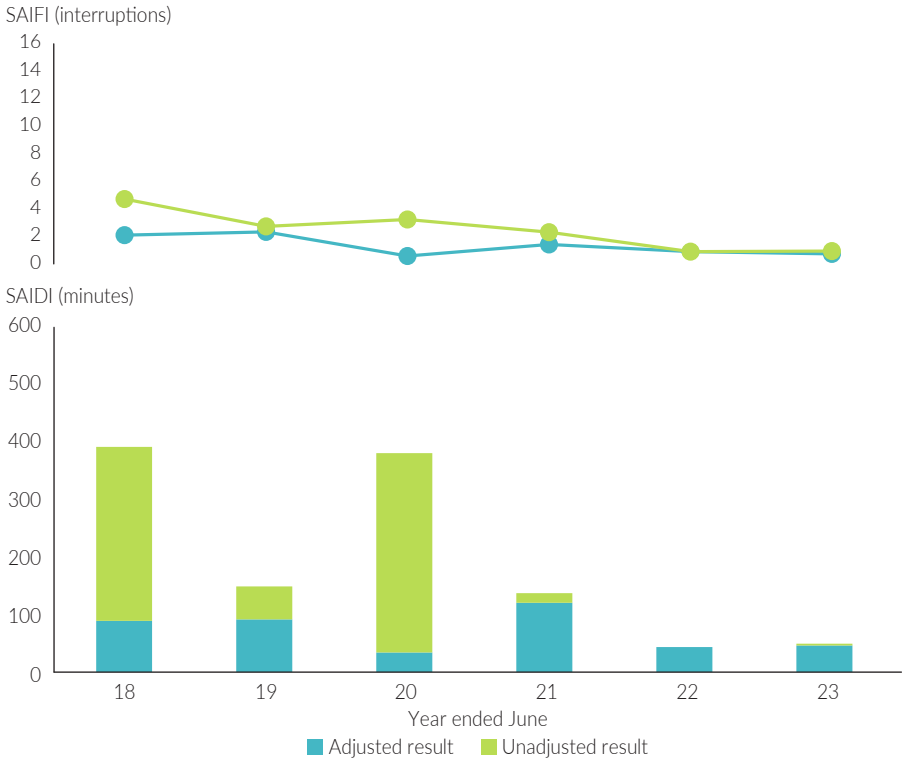
PWC System Control incident reporting shows there was one occasion during 2022-23 when the entire Katherine region went without power, which is an improvement from the three occasions in 2021-22 and nine occasions in 2020-21. Notwithstanding this improvement, the Commission suspects the level of interruptions over the last three years and overall poor power system performance in Katherine would not be tolerated in the Darwin or Alice Springs regions.

Katherine is a regional economic centre, has access to local generation and is connected to the rest of the power system by a transmission line, albeit a single transmission line. Accordingly, while the Commission acknowledges there is no formal reliability standard in the Territory for any of the power systems, given the disparity between power system performance in Katherine compared with the other regions, as stated in the previous review, the fundamental question for the Territory Government and relevant stakeholders to consider is whether customers in the Katherine region should receive a level of service closer to that in the other regions.

Further, as stated in the 2021-22 NTPSPR, should the Territory Government and relevant stakeholders conclude that the Katherine region should receive a level of service more consistent with other regions, investment and or a fundamental shift in how the power system operates in the region may need to be investigated. Any such investigation should consider the balance between costs, standard of service and customers' willingness to pay, noting increased costs that do not flow through to the majority of customers due to protections under the electricity pricing order flow through to government and ultimately taxpayers by way of the associated community service obligation payment to retailers.

Alice Springs

Figure 7: Alice Springs region unadjusted and adjusted SAIFI and SAIDI[1]



1 The 2020-21 results are different to those reported in the 2021-22 and 2020-21 NTPSPRs due to PWC Power Services updating the data to address errors identified through an EIP Code audit of compliance.

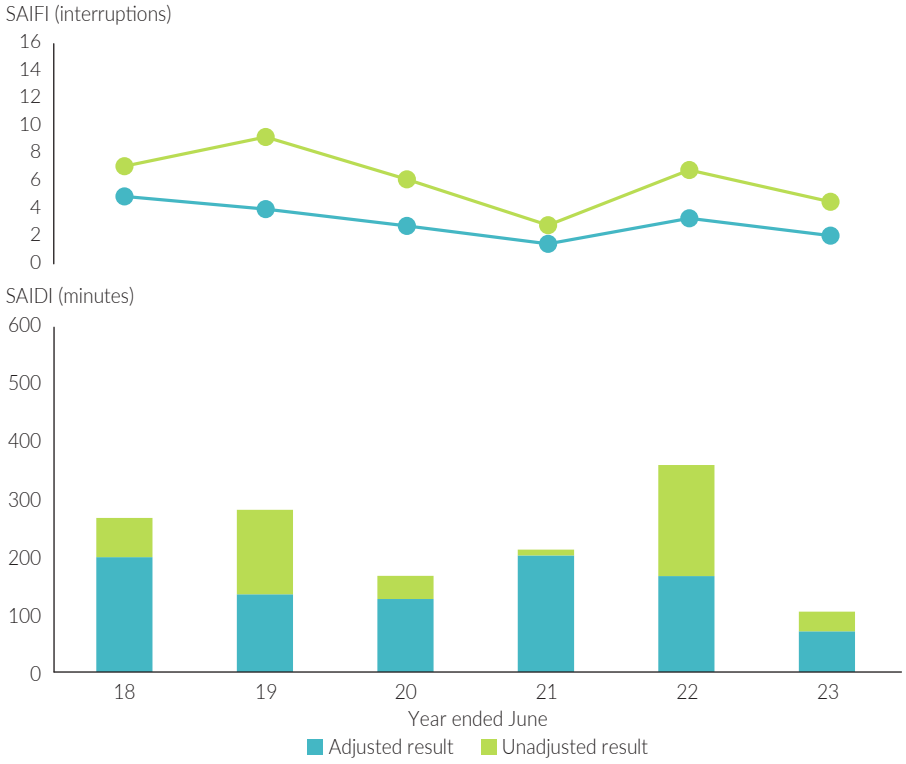
While performance in the Alice Springs region deteriorated slightly in 2022-23, with 0.9 interruptions and 50 minutes without supply per customer, the level of performance is still considered good when compared with levels observed between 2017-18 and 2020-21. Further, for the second year running, Alice Springs was the best performing region of the four considered in the NTPSPR in terms of frequency and duration of interruptions.

The level of performance in 2022-23 was better than the five-year average of two interruptions and 153 minutes without supply, with the average continuing to improve. The five-year average is similar to the one seen in the Darwin region, which is encouraging given the widespread and prolonged outages experienced in the region in 2017 and 2019.

In terms of the driving force behind the improved performance, over the last six years this has come from a decrease in both network and non-network-related outages. Towards the start of the last six years, non-network-related interruptions generally accounted for over half of the total frequency and duration of interruptions experienced by customers in the Alice Springs region. However, the five-year rolling average reflected a more even contribution between network and non-network-related causes in 2022-23.

Tennant Creek

Figure 8: Tennant Creek region unadjusted and adjusted SAIFI and SAIDI[1]



1 The 2020-21 results are different to those reported in the 2021-22 and 2020-21 NTPSPRs due to PWC Power Services updating the data to address errors identified through an EIP Code audit of compliance.

The frequency and duration of interruptions in the Tennant Creek region improved during 2022-23, when compared with the previous year, to 4.5 interruptions and 105 minutes without supply per customer. The duration of outages went from its highest level over the last six years in the previous year to the lowest level in 2022-23.

The level of performance in 2022-23 was better than the five-year average of 5.9 interruptions and 225 minutes without supply. When comparing the five-year average, a customer in Tennant Creek experiences about four more outages and about 73 more minutes without supply than customers in the Darwin and Alice Springs regions.

Consistent with the previous year, PWC System Control incident reporting shows there were five occasions during 2022-23 when the majority of customers in the Tennant Creek region went without power. Similar to the Commission's comments in relation to the Katherine region, the Commission suspects this level of interruption would not be tolerated in the Darwin or Alice Springs regions.

It has generally been the frequency of interruptions in the Tennant Creek region that have been of concern to the Commission, noting electricity is often restored and the power system returned to a normal operating state relatively quickly (about 40 minutes on average based on PWC System Control incident reporting to the Commission).

The lower level of performance in the Tennant Creek region, and in turn, higher number of interruptions experienced by customers when compared with the Darwin and Alice Springs regions, appears to be driven by network and generation performance, and coordination between these assets.

PWC Power Services' reporting continues to show that the majority of excluded events in 2022-23, those that account for the gap between the green (unadjusted) and blue (adjusted) line and columns, are related to under frequency load shedding. From PWC System Control incident reporting, the Commission has observed over recent years that when the newer high-efficiency generators at Tennant Creek power station are dispatched in favour of other generators, a disturbance in the power system leads to a decline in frequency and is often unable to be stopped by the generation. This results in an interruption to customers in the region through automatic under frequency load shedding. Under frequency load shedding is intended to reduce the likelihood of a cascading failure, which may result in a system black (large scale black out of the power system). The inability of the newer high-efficiency generation to stop a decline in system frequency appears to be due to the generators' slow response or lack of inertia, noting these capabilities could also be provided by other technologies.

The Commission made a recommendation in the 2019-20 NTPSPR in relation to coordinating generation and network requirements, which mainly relates to Tennant Creek. The Commission is aware that following this recommendation, work has been completed or is underway that attempts to improve performance in the Tennant Creek region. However, as discussed in previous NTPSPRs, investment and or a change in how the power system is operated may need to be investigated if performance is to improve to a level more consistent with the Darwin and Alice Springs regions.

As with the Katherine region, any such investigation should consider the balance between costs, standard of service and customers' (or taxpayers in relation to customers protected by the electricity pricing order) willingness to pay.

2 Network

This chapter focuses on network performance at the Territory, regional and feeder category level in the Territory's three largest power systems, Darwin-Katherine, Alice Springs and Tennant Creek. The chapter also considers network performance in terms of customer connections, guaranteed service levels, customer service and complaints.

Table 4 details the maximum voltage, line lengths and number of zone substations in each region in the Territory to provide context on the size of the networks.

Table 4: Maximum voltage, line length (including underground cables) and zone substations by region in 2022[1]

		Line length (km)			
Network	Maximum voltage (kV)	Transmission (132 and 66 kV)	Distribution (22 and 11 kV)	Low voltage	Zone substations
Darwin-Katherine	132	718	3 417	1 623	22
Alice Springs	66	47	602	222	3
Tennant Creek	22	0	343	45	1

1 PWC Transmission and distribution planning report: Transmission and Distribution Planning Report | Power and Water Corporation (powerwater.com.au).

Network performance

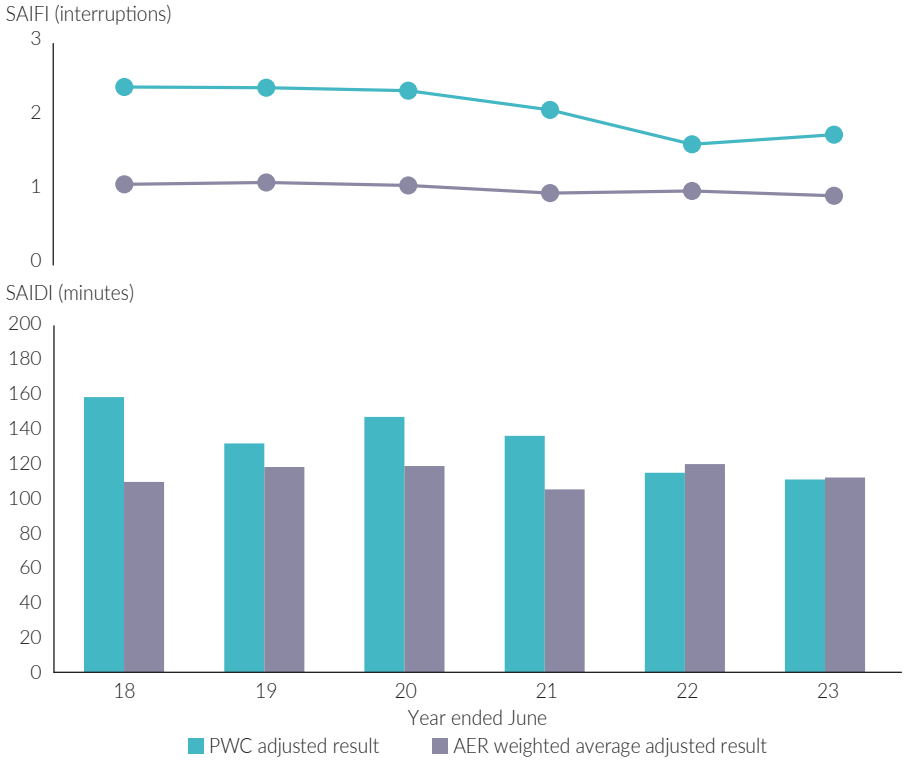
Similar to overall power system performance and generation performance, one way to assess the level of network performance is to consider the impact on the frequency and duration of interruptions experienced by customers as a direct result of that performance. Again, this is achieved through the reporting of SAIFI and SAIDI.

Territory

Figure 9 shows the frequency and duration of customer interruptions as a direct result of network performance (adjusted SAIFI and SAIDI, respectively). This is shown by the blue line and columns in Figure 9.

As with overall power system performance, to provide context to the Territory result in terms of the frequency and duration of interruptions experienced by customers, the Commission has collated data from the AER in relation to the 13 DSNPs that it regulates, excluding PWC, to create a benchmark from 2017-18 to 2022-23 (AER benchmark). This is shown by the purple line and columns in Figure 9. Again, due to the high level of diversity in the AER-regulated distribution networks, the Commission considers the AER benchmark to be a useful benchmark.

Figure 9: Territory adjusted and AER weighted average SAIFI and SAIDI



Network performance in the Territory has been improving over the last six years both in terms of frequency and duration of customer interruptions. While there was a slight increase in the frequency of interruptions compared with the previous year, performance was still good in 2022-23 when compared with earlier years, with customers on average experiencing 1.8 interruptions and 111 minutes without supply due to network performance. The result in 2022-23 was better than the five-year average of 2.1 interruptions and 129 minutes without supply per customer as a result of network performance.

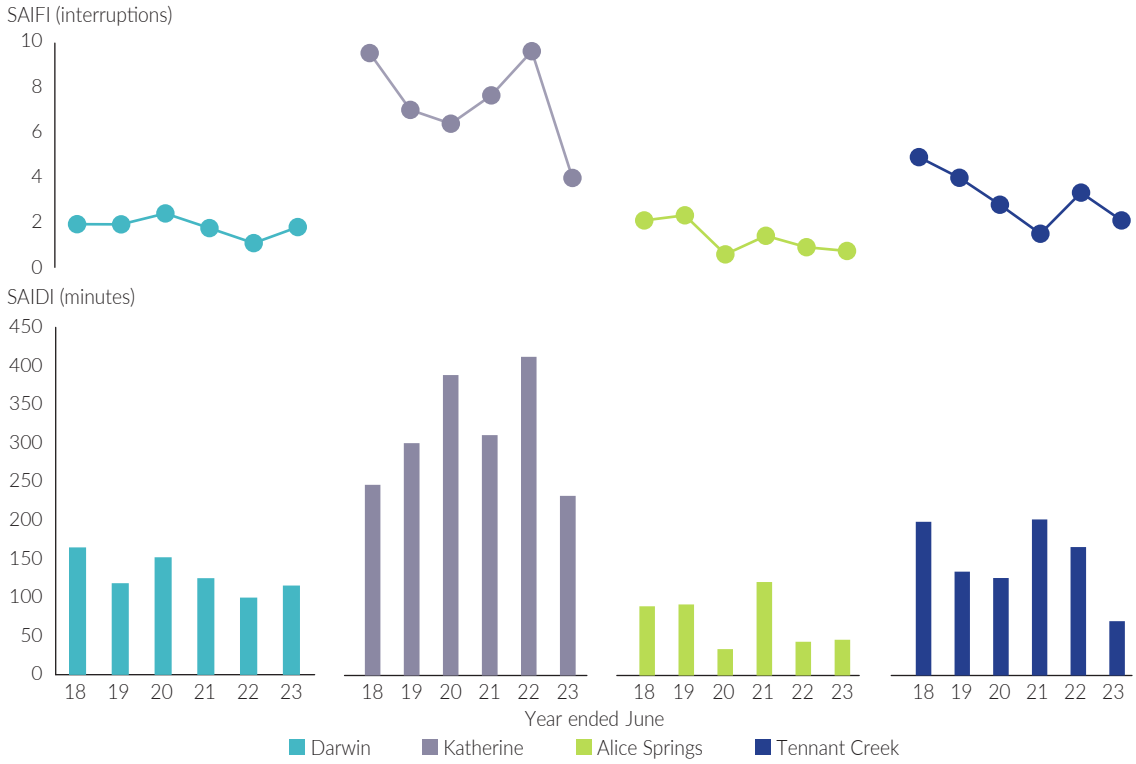
Further, when compared with the AER benchmark, network performance in the Territory is trending closer towards the benchmark, particularly in relation to the duration of interruptions. Comparing the five-year averages in 2022-23, network performance in the Territory resulted in an additional interruption and 13 more minutes without supply than in the networks of the 13 DNSPs regulated by the AER.

As with overall power system performance in the Territory, the level of network performance in the Territory has improved over recent years, including against the AER benchmark. However the level of performance, or interruptions experienced by customers, is not consistent across Territory networks or regions within those networks. The next section assesses those differences between regions.

Regional

Figure 10 shows the average frequency and duration of interruptions per customer in the Darwin-Katherine, Alice Springs and Tennant Creek regions directly as a result of network performance (adjusted SAIFI and SAIFI, respectively), with the Darwin-Katherine network further segmented into the regions of Darwin and Katherine.

Figure 10: Regional adjusted SAIFI and SAIDI[1]



1 The 2020-21 results are different to those reported in the 2021-22 and 2020-21 NTPSPRs due to PWC Power Services updating the data to address errors identified through an EIP Code audit of compliance.

Table 5: Regional adjusted SAIFI and SAIDI, 2022-23 and five-year average

	SAIFI (interruptions)		SAIDI (minutes without supply)	
	2022-23	5-year average	2022-23	5-year average
Darwin	1.8	1.8	116	123
Katherine	4.0	6.9	233	330
Alice Springs	0.7	1.2	47	68
Tennant Creek	2.1	2.7	70	140

Darwin

Network performance in the Darwin region has improved over the last six years (Figure 10), with customers in 2022-23 experiencing on average 1.8 interruptions and 116 minutes without supply due to network performance. While a slight deterioration compared with the previous year, the level of performance in 2022-23 is consistent with or below the falling five-year rolling average of 1.8 interruptions and 123 minutes without supply per customer as a result of network performance, respectively. The Darwin region compares well with the other regions in the Territory, although is outperformed by the Alice Springs region over the last six years.

Katherine

Performance in the Katherine region markedly improved in 2022-23 compared with the previous year, recording the best performance over the last six years. In 2022-23, customers in the Katherine region experienced on average 4 interruptions and 233 minutes without supply (almost four hours) as a result of network-related performance. This level of performance is better than the five-year rolling average of 6.9 interruptions and 330 minutes without supply per customer.

Notwithstanding the improvement, network performance in the Katherine region compares poorly with the other Territory regions. As a result of network performance, customers in 2022-23 were interrupted just over twice as often and experienced 117 more minutes without supply than customers in the Darwin region, despite being part of the same Darwin-Katherine power system.

The issues facing the network in the Katherine region are discussed in more detail in the Power system chapter of this review and the 2021-22 NTPSPR.

Alice Springs

The Alice Springs network has performed well over the last six years when measured by customer interruptions. Although not as good as the best result (2019-20) over the last six years, customers in Alice Springs in 2022-23 experienced on average 0.7 interruptions and 47 minutes without supply as a result of network performance. This level of performance was better than the five-year average of 1.2 interruptions and 68 minutes without supply per customer due to network performance.

Tennant Creek

In terms of customer interruptions, the network in Tennant Creek consistently performs worse than the Darwin and Alice Springs regions, although better than the Katherine region. In 2022-23, customers experienced on average 2.1 interruptions and 70 minutes without supply as a result of network performance. The level of performance in 2022-23 was better than the five-year average of 2.7 interruptions and 140 minutes without supply per customer due to network performance.

Network performance in the Tennant Creek region has improved over the last six years in terms of the frequency of interruptions, however the duration of interruptions has remained largely unchanged over the same period, only demonstrating a notable improvement in 2022-23.

Feeder

As well as by region, PWC Power Services record and report network performance against feeder categories. Feeders from across the Territory's Darwin-Katherine, Alice Springs and Tennant Creek networks are grouped together into the feeder categories of central business district (CBD), urban, rural short and rural long.

Under the EIP Code, PWC Power Services is required to develop and submit network target standards for each feeder category to the Commission for approval for each regulatory control period. The current target standards apply for the five-year period from 1 July 2019 to 30 June 2024. PWC Power Services must use its best endeavours to meet the target standards.

PWC Power Services is also required to report on the top five worst-performing feeders in each feeder category over the year, as determined by the SAIDI performance of the feeder. The Commission acknowledges that feeders will perform poorly from time to time due to unforeseen issues, and therefore has limited its focus to those that have performed worse than the feeder category target standard over multiple years.

CBD

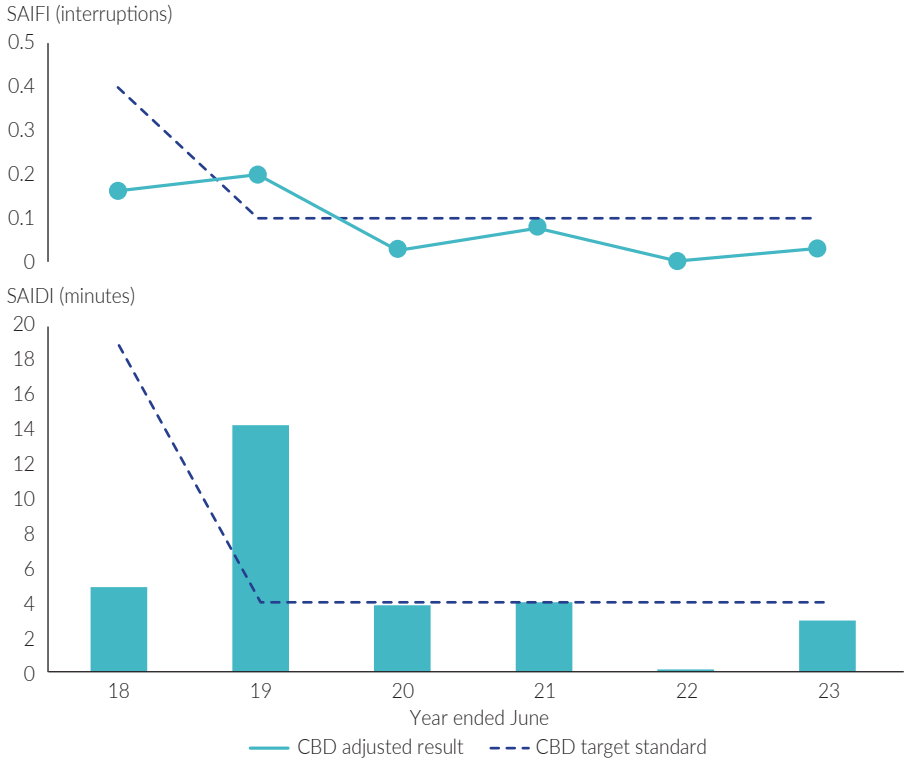
A CBD feeder is defined as a feeder mostly supplying commercial high-rise buildings predominantly through an underground distribution network that contains significant

interconnection and redundancy when compared to urban areas. CBD feeders account for around 12% of feeders in the Territory.

Figure 11 shows the frequency and duration of CBD customer interruptions as a direct result of network performance (adjusted SAIFI and SAIDI, respectively), and the approved target standard. This is shown by the light blue line and columns (SAIFI and SAIDI, respectively) and dark blue dotted lines (approved target standards) in Figure 11.

The current Commission-approved PWC target standard for CBD feeders is 0.1 interruptions and four minutes without supply per year.

Figure 11: CBD feeder category adjusted SAIFI and SAIDI[1, 2]



1 The Commission approved new network target standards in 2018, which apply to PWC between 2018-19 and 2022-23.
2 The 2021-22 results are different to those reported in the 2021-22 NTPSPR due to PWC Power Services updating the data to address errors identified through an EIP Code audit of compliance.

Feeders in the CBD category performed within the Commission-approved target standard during 2022-23 and have done so over the last six years, apart from the SAIFI target in 2018-19 and SAIDI target in 2018-19 and 2020-21.

Although not shown in Figure 11, the five-year rolling averages improved in 2022-23, with the SAIFI five-year average now better than the Commission-approved target standard.

Four individual CBD feeders (11FB04 Searcy, 11MS10 Shadforth, 11WS04 Lindsay 1 and 11FB03 Parliament) performed worse than the category target standard during 2022-23, however no individual feeder has consistently performed worse than the category target standard over the last six years.

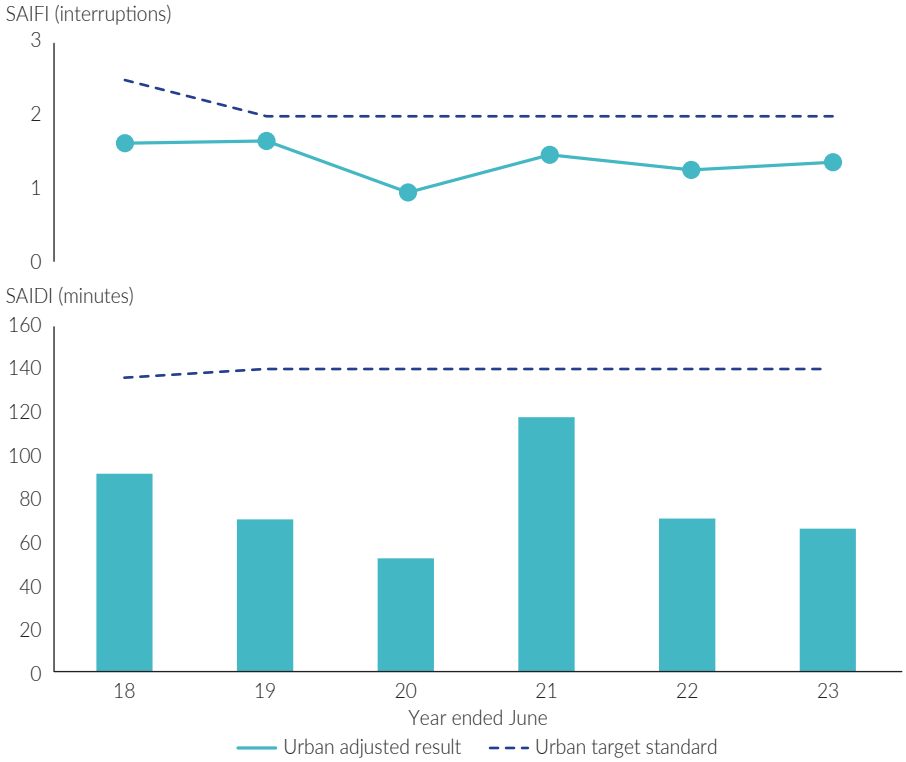
Urban

An urban feeder is defined as a feeder that is not a CBD feeder and has a maximum demand over the feeder route length greater than 0.3 megavolt ampere (MVA)/km. Urban feeders account for just over 40% of all feeders in the Territory.

Figure 12 shows the frequency and duration of urban customer interruptions as a direct result of network performance (adjusted SAIFI and SAIDI, respectively) and the approved target standards. This is shown by the light blue line and columns (SAIFI and SAIDI) and dark blue dotted line (approved target standard) in Figure 12.

The current Commission-approved PWC target standard for urban feeders is 140 minutes without supply and two interruptions per year.

Figure 12: Urban feeder category adjusted SAIFI and SAIDI[1, 2]



1 The Commission approved new network target standards in 2018, which apply to PWC between 2018-19 and 2022-23.
2 The 2021-22 results are different to those reported in the 2021-22 NTPSPR due to PWC Power Services updating the data to address errors identified through an EIP Code audit of compliance.

Feeders in the urban category have performed within the Commission-approved target standard over the last six years in terms of both SAIFI and SAIDI. When considering the five-year rolling average, there has been a slight improvement in the level of performance over the last six years.

However, some individual urban feeders have consistently performed poorly during the last six years. The Commission highlighted two feeders of concern last year, 11WN22 Ludmilla (Darwin region) and 22KA22 Katherine (Katherine region), and notes that performance on these feeders improved in 2022-23 to a level where they are not reported in the top five worst performing feeders.

The 11WN13 Goyder feeder (Darwin region) has been reported in the top five worst performing feeders for the last two years, and has performed worse than the feeder category target standard in both of those years. PWC Power Services reported the feeder was impacted by the failure of a high voltage link in 2021-22, and the link was replaced. However, PWC Power Services reported again in 2022-23 that the feeder was impacted by the failure of high voltage links (as well as a bird-related incident), and the high voltage link was replaced.

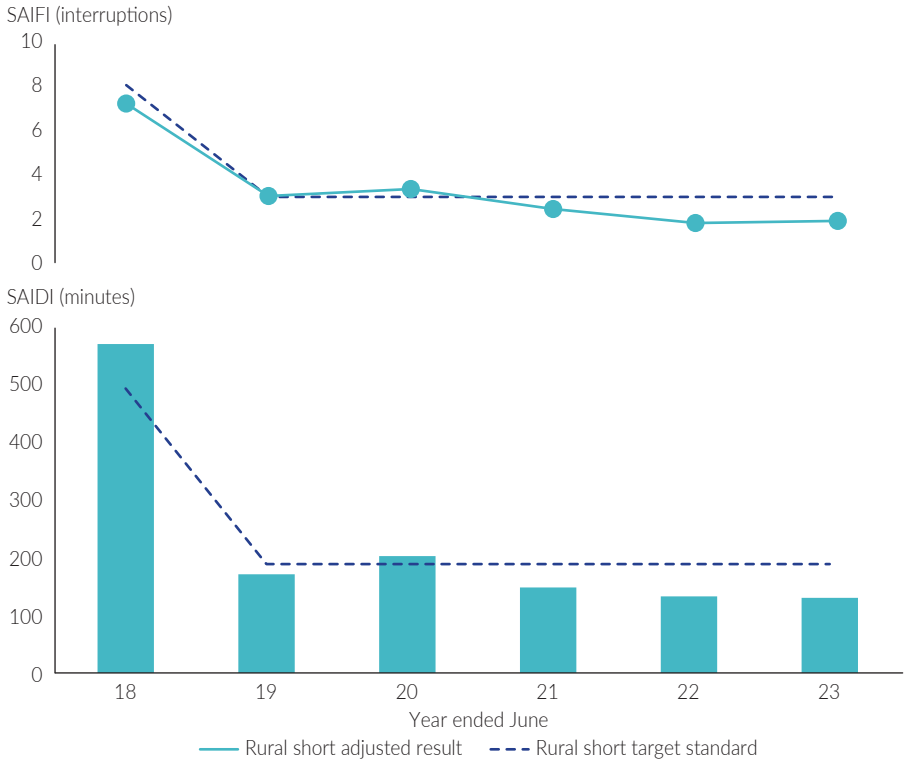
Rural short

A rural short feeder is defined as a feeder that is not a CBD or urban feeder and has a total feeder route length of less than 200 km. Rural short feeders account for just over 45% of all feeders in the Territory.

Figure 13 shows the frequency and duration of rural short customer interruptions as a direct result of network performance (adjusted SAIFI and SAIDI), and the approved target standard. This is shown by the light blue line and columns (SAIFI and SAIDI) and dark blue dotted line (approved target standard) in Figure 13.

The current Commission-approved target standard for rural short feeders is 190 minutes without supply and three interruptions per year.

Figure 13: Rural short feeder category adjusted SAIFI and SAIDI[1, 2]



1 The Commission approved new network target standards in 2018, which apply to PWC between 2018-19 and 2022-23.
2 The 2021-22 results are different to those reported in the 2021-22 NTPSPR due to PWC Power Services updating the data to address errors identified through an EIP Code audit of compliance.

Feeders in the rural short category performed within the Commission-approved target during 2022-23 .

The performance of rural short feeders has improved over the last six years, with both SAIFI and SAIDI five-year rolling averages now better than the Commission-approved target standard. Relevantly, based on PWC Power Services' reporting, the rural short feeder category has received the most capital expenditure over the last four years compared with the other feeder categories.

However, some individual rural short feeders have consistently performed poorly during the last six years. One of the feeders highlighted by the Commission last year was the 22KA03 Florina (Katherine region) feeder. The feeder has continued to perform poorly in 2022-23, and has been reported in the top five poorly performing rural short feeders for four of the last six years (including in 2022-23). Customers on the feeder experienced 730, 697, 1,358 and 847 minutes without supply in 2018-19, 2020-21, 2021-22 and 2022-23, respectively. This is between 12 and 23 hours in those years. This compares poorly with the feeder category target standard of 190 minutes without supply.

PWC Power Services continued to report the 22KA03 Florina feeder as being impacted by transient faults and suggests bat-related activity in the region may be the cause. PWC Power Services has installed electrostatic animal protection on parts of the feeder to address the issue and advised no other upgrades are currently planned.

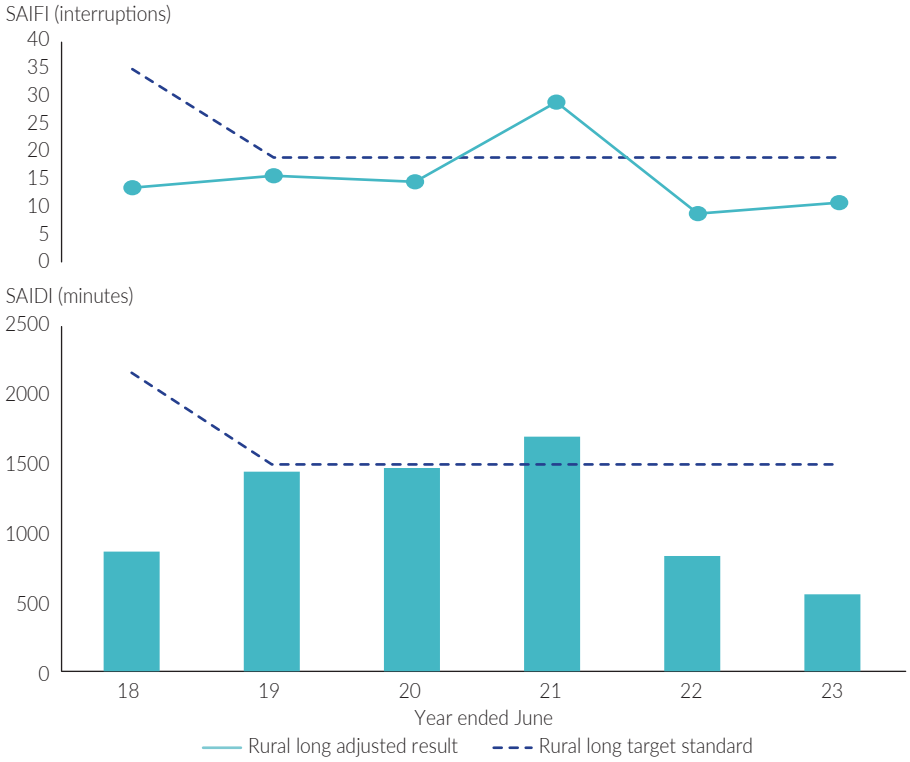
Rural long

A rural long feeder is defined as a feeder that is not a CBD or urban feeder and has a total feeder route length greater than 200 km. There are only three rural long feeders in the Territory, which account for under 2% of feeders.

Figure 14 shows the frequency and duration of rural long customer interruptions as a direct result of network performance (adjusted SAIFI and SAIDI, respectively), and the approved target standard. This is shown by the light blue line and columns (SAIFI and SAIDI) and dark blue dotted line (approved target standard) in Figure 14.

The current Commission-approved PWC target standard for rural long feeders is 1500 minutes without supply and 19 interruptions per year.

Figure 14: Rural long feeder category adjusted SAIFI and SAIDI[1]



1 The Commission approved new network target standards in 2018, which apply to PWC between 2018-19 and 2022-23.

Feeders in the rural long category performed within the Commission-approved target during 2022-23, and have done so over the last six years, apart from 2020-21.

When considering the long-term average performance of rural long feeders, the SAIFI and SAIDI five-year rolling averages improved slightly in 2022-23 and are better than the Commission-approved target standard. Relevantly, based on PWC Power Services' reporting, the rural long feeder category has received the second highest level of capital expenditure over the last four years compared with the other feeder categories.

All three rural long feeders continued to perform better than the feeder category target standard of 1,500 minutes without supply during 2022-23.

Notifications

Figure 15 shows the percentage of customers in the Territory notifying PWC of supply quality issues, including in relation to no power, and part, fluctuating or low power.

Figure 15: Territory quality of supply notifications per customer, by notification type

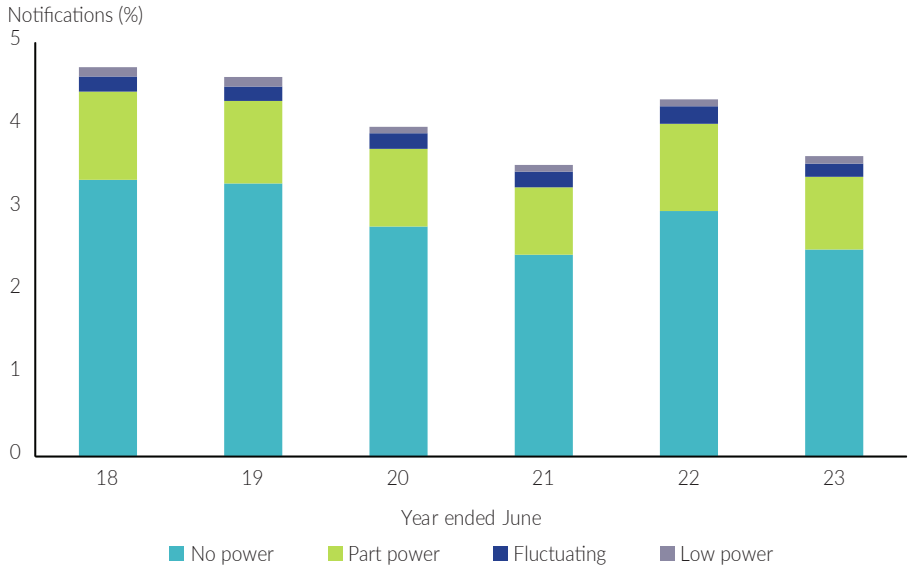
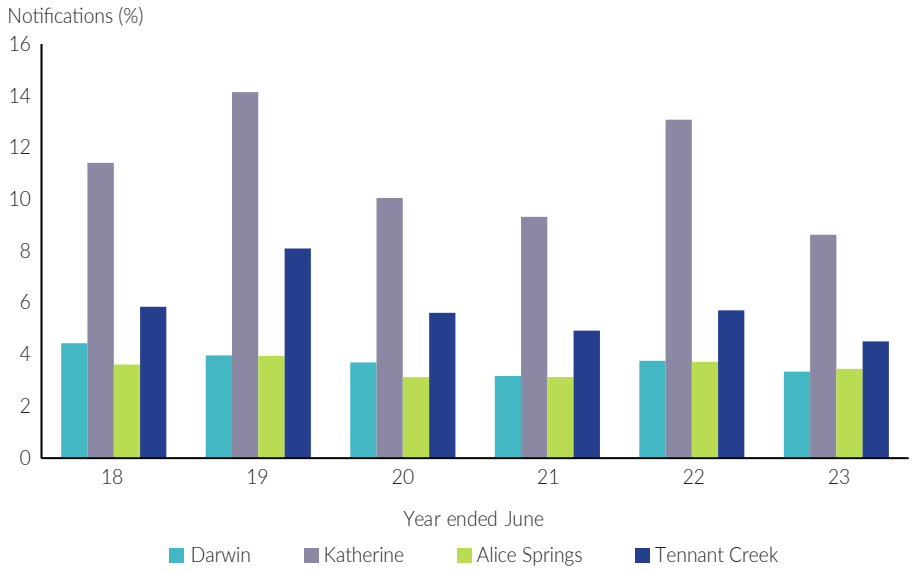


Figure 15 shows that over the last six years, notifications to PWC Power Services in relation to the quality of supply were mostly related to no power, rather than part, fluctuating or low power. In 2022-23, 2.5% of customers in the Territory notified PWC Power Services of no power, which compares with 1.1% of customers making a notification in relation to other quality of supply issues.

However, notifications regarding the quality of supply are not evenly distributed across regions, as shown by Figure 16.

Figure 16 shows the same total customer notifications regarding supply quality issues as in Figure 15, however shown as the percentage of customers in each region in the Territory.

Figure 16: Quality of supply notifications from customers (as a percentage of total customers, by region)



Over the last six years, there have been more notifications from customers in the Katherine region, and to a lesser extent Tennant Creek, than in the Darwin and Alice Springs regions regarding the quality of supply. This is consistent with the higher duration and frequency of interruptions in those regions, which is discussed earlier in this chapter and elsewhere in this review.

Customer connections

Figure 17 shows the number of new connections (segmented by region) and the average time to complete those connections across the Territory. Under the EIP Code, the Commission has set a standard of service of within five business days for new connections of premises (excluding connections requiring network extension or augmentation).

Figure 17: Territory average new customer connection time and total connections, further segmented by region

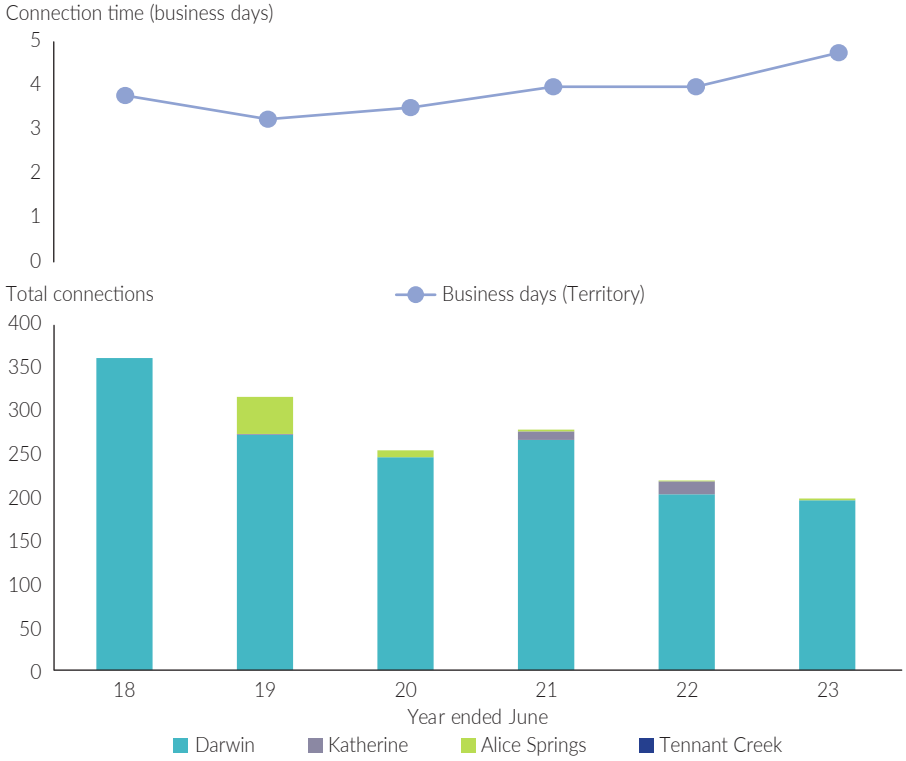


Figure 17 shows the number of new connections in the Territory has fallen over the last six years, with around 200 new connections in 2022-23. The majority of new connections over the last six years have been in the Darwin region.

The average time to establish a new connection in the Territory has varied between 3.3 and 4.8 days over the last six years, and while trending up, is still within the Commission's standard of service of within five business days. However, as shown in the next section in relation to GSL payments, the Commission notes the number of new connections not completed within the required five business days has continued to rise, with 142 payments made in 2022-23, up from 86 in 2021-22. This accounts for around 71% of new connections across the Territory in 2022-23 .

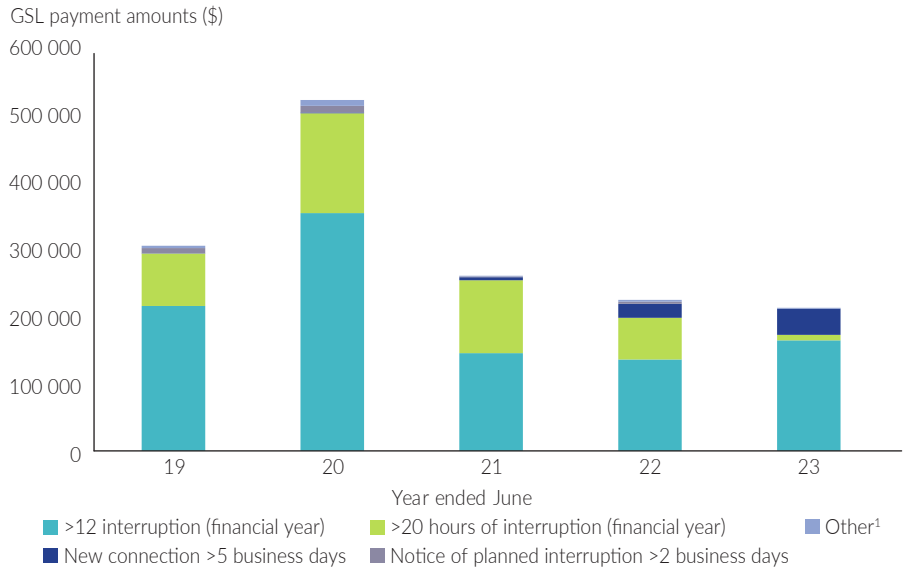
Guaranteed service levels

GSLs provide for payments to eligible customers when performance does not meet the defined standard of service. The Commission sets these payment amounts and standards of service in the EIP Code.

GSL payment amounts are intended to acknowledge the inconvenience eligible customers experience due to interruptions associated with network performance, and act as an incentive for the network entity to provide an appropriate level of service. Importantly, GSL payments are not intended to provide insurance-style compensation for any loss or damage a customer may suffer from an interruption, noting the costs for making GSL payments to eligible customers are ultimately borne by all customers (and taxpayers in relation to the majority of customers protected by government's electricity pricing order) through network charges.

Figure 18 shows the dollar amount of GSL payments PWC made over the last five years for not meeting the required standard of service across the Territory, segmented by GSL.

Figure 18: Guaranteed service level payment amounts, by guaranteed service level[1, 2]



1 The 'other' category includes the following GSLs: >12 and <20 hours of interruption (single event); >20 hours of interruption (single event); re-connection of existing premises >24 hours; and >30 minutes late for appointment.

2 Total GSL payments in 2021-22 and 2022-23 were higher than required by the EIP Code due to PWC errors identified through an audit of compliance.

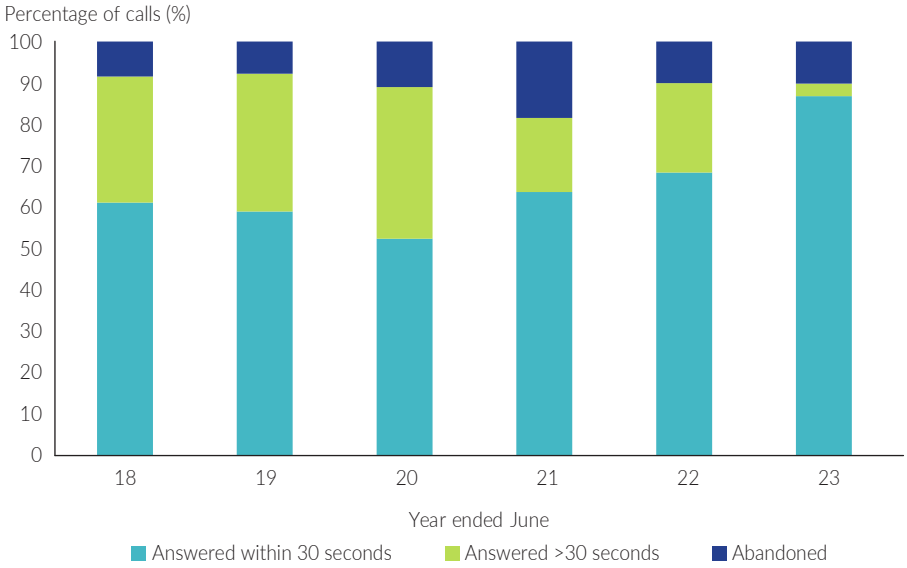
The number and amount of GSL payments continued to fall in 2022-23 to 1,925 payments totalling just under $215,900, following a high in 2019-20 of around 5,320 payments totalling $529,500. Over the five years shown in Figure 18, most GSL payments have been in relation to customers experiencing more than 12 interruptions and greater than 20 hours without supply over a financial year. However, in 2022-23 there was a reduction in the number of GSL payments for customers with greater than 20 hours without supply over the year, while the number of GSL payments associated with completing new connections in less than five days increased.

Customer service

The EIP Code (S.3.6.3) requires licensees providing network services in the Darwin-Katherine, Alice Springs and Tennant Creek power systems to report on customer service performance indicators, which includes telephone answering-related indicators. As the only licensee providing network services in the Darwin-Katherine, Alice Springs and Tennant Creek power systems, Figure 19 shows PWC Power Services' telephone answering performance (during business hours) at a Territory level over the last six years.

Figure 19 shows the percentage of calls answered within 30 seconds (light blue sub-bars) and calls abandoned (dark blue sub-bars), and the percentage of calls answered but fall outside of those criteria (green sub-bars).

Figure 19: Network telephone answering performance[1]



1 The performance indicator percentages in 2020-21 and 2021-22 are inconsistent with that reported in the 2021-22 NTPSPR due to PWC Power Services updating some 2020-21 and 2021-22 data to address errors identified through an EIP Code audit of compliance.

Changes in the total number of calls to a network provider may be an indicator of the level of customer satisfaction with the standard of service. The percentage of calls answered within 30 seconds, average waiting time before a call is answered and percentage of calls abandoned before being answered provide an indication of how long a customer has to wait to speak to the network operator, and whether this wait is considered reasonable by a customer. The Commission considers it is not always reasonable for a customer to expect to speak to an operator within 30 seconds, especially during spikes in call volumes. However, the Commission considers it reasonable to expect a customer's call to be answered before the point where a customer feels the need to abandon their attempt to speak to the network operator, potentially leading to issues going unresolved, which may cause distress. Accordingly, the Commission is particularly interested in the percentage of calls being abandoned before being answered.

Consistent with last year, PWC Power Services reported a reduction in the total number of calls received in 2022-23 to about 10,000, which is a six-year low.

The level of performance in terms of calls answered within 30 seconds improved in 2022-23, while the percentage of calls abandoned before being answered deteriorated, despite the reduction in calls.

As a useful benchmark, the AER uses a rating system in its 2022-23 Annual Retail Markets report[1] to provide an overview of retailers' performance in relation to call centre responsiveness-related indicators. In terms of calls taken within 30 seconds, the AER's highest 'best' category is assigned to a retailer with 80% or more calls taken within 30 seconds. PWC Power Services' 2022-23 performance of 87% of calls answered within 30 seconds was an improvement and for the first time in the last six years falls into the AER's 'best' category. In prior years, PWC Power Services' performance has been within the AER's middle 'within range' category, which includes retailers that achieved 51% to 79% of calls taken within 30 seconds.

1 https://www.aer.gov.au/publications/reports/performance/annual-retail-markets-report-2022-23

In relation to PWC Power Services' performance of 10% of calls abandoned before being answered, when compared with the AER's rating system, PWC Power Services slipped back into the AER's lowest 'poor' category (10% or more calls abandoned before being answered).

Complaints

The EIP Code requires PWC Power Services to report on the percentage and total number of complaints it receives that are associated with network-related activities.

Figure 20 shows the percentage of Territory customer complaints to PWC by complaint category, including complaints related to administration processes and customer service, reliability of supply, customer connections, technical quality of supply and other.

Figure 20: Territory network complaints per customer, by complaint category

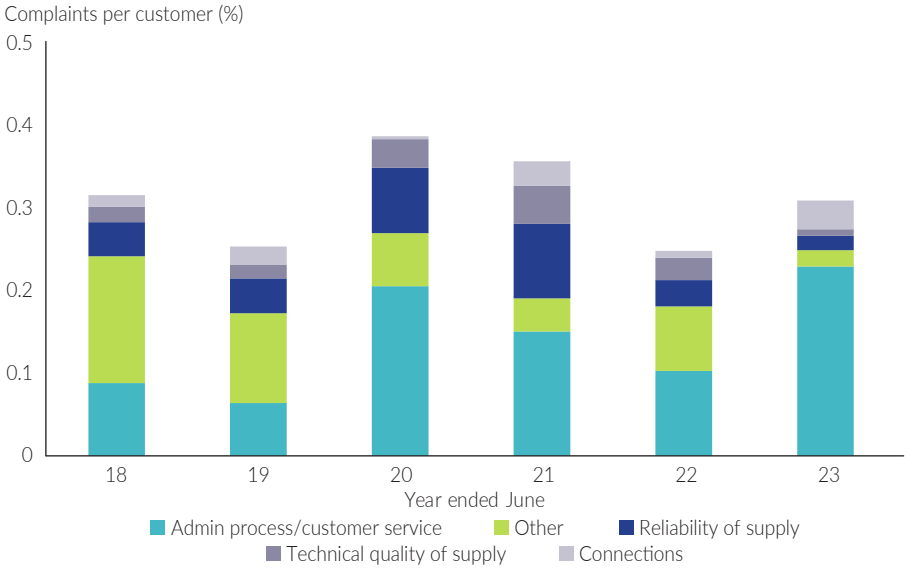


Figure 20 shows that as a percentage of total customers in the Territory, few customers are making complaints to PWC. Further, there has been little change in the level of complaints over the last six years.

The Commission noted in its 2021-22 Northern Territory Electricity Retail Review that the Ombudsman NT has discussed in a number of its annual reports that both PWC and Jacana Energy are heavily involved in the consumer experience in the Territory through their respective roles as network provider and retailer. Accordingly, it is possible that customers may contact their electricity retailer regarding a network-related complaint, and this may contribute to the low level of complaints reported by PWC.

Figure 21 shows the same total customer complaints as in Figure 20, however it is segmented by region and shown as the percentage of customers in the respective regions.

Figure 21: Regional network complaints per customer

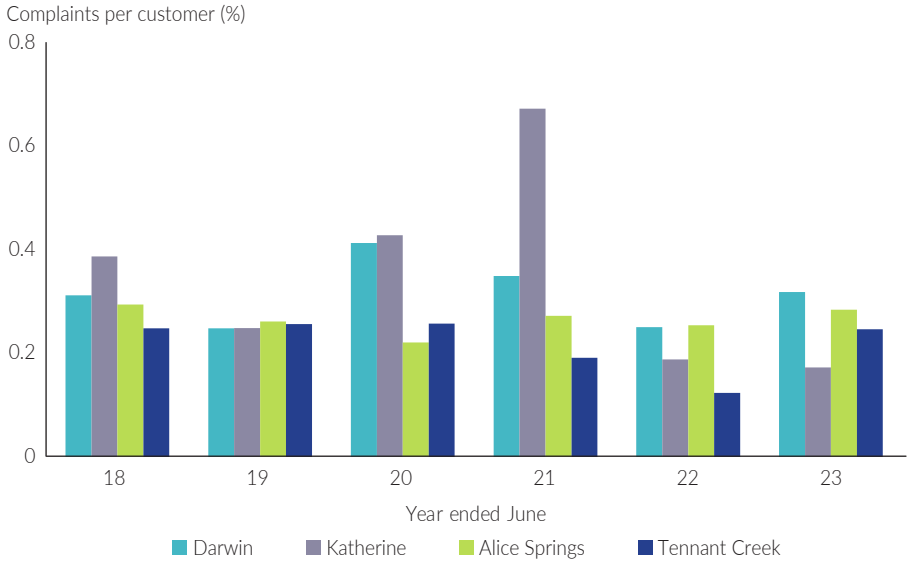


Figure 21 shows that while few customers in each region are making complaints to PWC, the complaints are not always evenly distributed across regions.

An example of the disparity between regions is seen in the Katherine region in 2020-21. The higher level of complaints in the Katherine region during 2020-21 (when compared with other regions) coincided with Katherine region customers experiencing poor performance when compared with the other regions. While performance in the Katherine region is still not comparable with other regions in 2022-23, the number of complaints has decreased since 2020-21.

3 Generation

This chapter focuses on the performance and availability of generation in the Darwin-Katherine, Alice Springs and Tennant Creek power systems. More specifically, it covers generation at Territory Generation's Channel Island, Weddell, Katherine, Owen Springs, Ron Goodin and Tennant Creek power stations, and EDL NGD (NT) Pty Ltd's (EDL) Pine Creek power station. While there were other generators operating in or connecting to the power systems during 2022-23, they were not required to report against the EIP Code because they were not fully operating and or operating commercially, and therefore the Commission's assessment of generator performance and availability in this chapter does not include them.

For generators that reported against the EIP Code, their power station location, fuel type and capacities are shown in Table 6.

Table 6: Generator power station locations, fuel type and capacities, as reported by the licensee in EIP Code reporting

	Fuel type	Capacity (MW)
Darwin-Katherine		491.4
Territory Generation		
Channel Island	Gas/diesel and heat recovery steam	298.4
Weddell	Gas	129.0
Katherine	Gas/diesel	37.0
EDL		
Pine Creek	Gas and heat recovery steam	27.0
Alice Springs		119.2
Territory Generation		
Owen Springs	Gas/diesel	80.9
Ron Goodin	Gas/diesel	38.3
Tennant Creek		21.9
Territory Generation		
Tennant Creek	Gas/diesel	21.9

Generation performance

Similar to overall power system and network performance, one way to assess the level of generation performance is to consider the impact on the frequency and duration of interruptions experienced by customers as a direct result of that performance. This is again achieved through the reporting of SAIFI and SAIDI.

The Commission has discussed the limitations of assessing generation performance using the metrics of SAIFI and SAIDI in previous NTPSPRs. One of the main limitations is associated with the potential for unplanned interruptions being negatively impacted by the performance of power system assets, such as generation, which are not directly related to the root cause. These assets are not allocated a 'share' of the SAIFI and SAIDI. This is related to another limitation as there is no explicit responsibility in apportioning the impact between power system assets or licensees. In some cases, it may be unclear or too complex to apportion SAIFI and SAIDI between licensees.

These limitations may result in licensees under or over reporting, and double counting across licensees.

The Commission intends to consider generation performance reporting in a future review of the EIP Code. In the interim, the Commission made a recommendation in the 2020-21 NTPSPR for PWC System Control to clearly identify and apportion the customer impact for customer interruptions between relevant licensees in each major incident report as appropriate. However, this recommendation is not enforceable.

Regardless of the limitations, the Commission still considers generator SAIFI and SAIDI reporting provides a level of insight into the performance of generators. Figure 22 shows the average frequency and duration of interruptions per customer, respectively, as a result of generation performance in the Darwin-Katherine, Alice Springs and Tennant Creek power systems, with the Darwin-Katherine power system further segmented into the regions of Darwin and Katherine.

Figure 22: Generation SAIFI and SAIDI performance by region

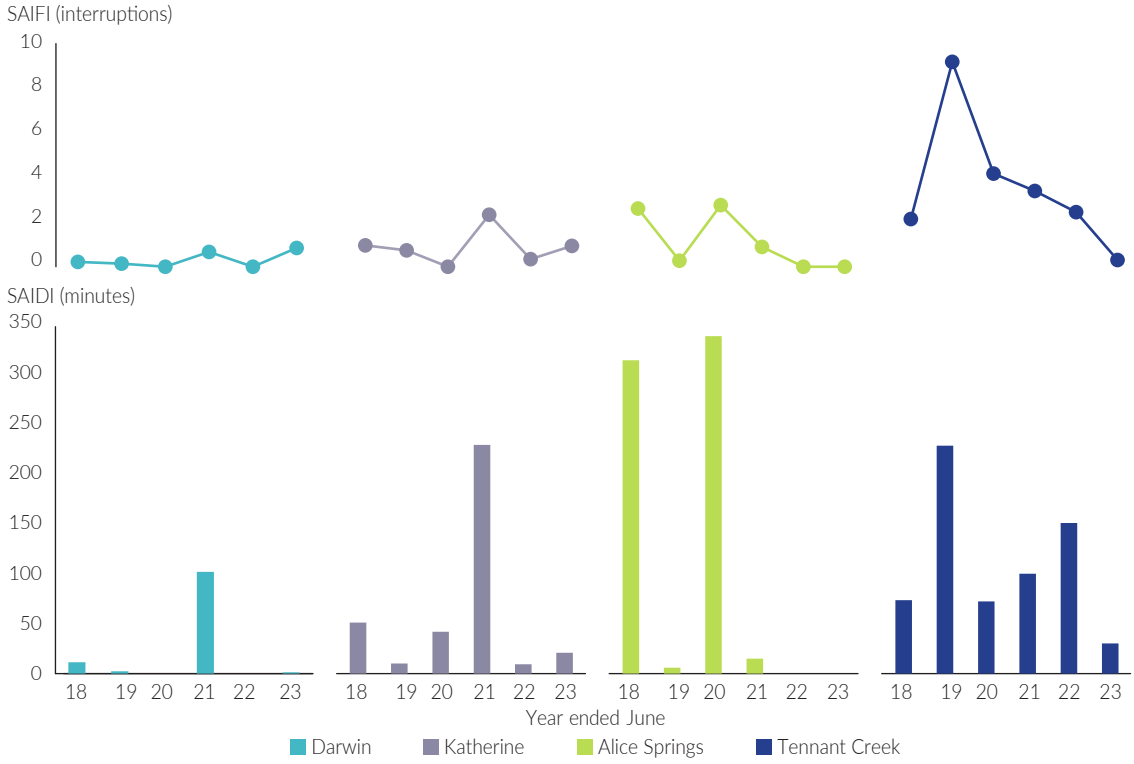


Table 7 presents the average frequency and duration of interruptions (SAIFI and SAIDI, respectively) per customer as a result of generation in 2022-23 and the five-year average by region.

Table 7: Generation SAIFI and SAIDI performance by region, 2022-23 and five-year average

	SAIFI (interruptions)		SAIDI (minutes without supply)	
	2022-23	5-year average	2022-23	5-year average
Darwin	0.8	0.3	1	21
Katherine	0.9	0.9	21	63
Alice Springs	0.0	0.8	0	73
Tennant Creek	0.3	3.9	31	118

Darwin

As discussed earlier in this review, there was a gas supply-related outage to the Channel Island power station in 2020-21. If it was not for this outage, generation performance over the last six years would have had very little impact on customers in the Darwin region in terms of interruptions.

Notwithstanding the inclusion of the gas supply-related outage in the generation performance reporting, when generation performance is measured in terms of the impact on customer interruptions, it performed well in the Darwin region, especially when compared with other power systems or regions in the Territory. This is highlighted by the current five-year average of 0.3 interruptions and 21 minutes without supply per customer in the region as a result of generation performance.

The Commission has noted in previous NTPSPRs that historically the Darwin-Katherine power system was dispatched in such a way that under frequency load shedding (interruptions to some customers) was inevitable to protect the overall power system following a trip of most large generating units in the region. PWC System Control made changes in an attempt to improve power system performance through, among other things, to the under frequency load shedding scheme settings, generation dispatch constraints and spinning reserve levels.

PWC System Control's changes have achieved a stark reduction in interruptions due to generation performance, however has likely increased costs, particularly for Territory Generation, although this would be difficult to quantify. Relevantly, under the current framework there is no competitive provision of essential system services to put downward pressure on these costs and limited regulatory requirements or oversight to ensure the efficient dispatch of essential system services by PWC System Control. While this is the current situation, the Commission is aware the Territory Government is reviewing essential system service arrangements.

Katherine

Similar to the Darwin region, including in relation to the gas supply-related outage to the Channel Island power station in 2020-21, generation performance over the last six years would have had very little impact on customers in the Katherine region in terms of interruptions when compared with the poor overall performance in the region over recent years, as discussed in the earlier chapters.

The five-year average in the Katherine region in 2022-23 was 0.9 interruptions and 63 minutes without supply per customer as a result of generation performance, with this result remaining consistent with or improving from the previous year, respectively.

This level of generation performance is not unexpected as the Commission understands generation located in the Katherine region is rarely dispatched (online) due to its higher cost to run. It is the Katherine region's unreliable connection to the rest of the power system, or management of the region once islanded, that has caused the poor performance over recent years, not generation.

It is important to note generation issues in the Darwin region can result in interruptions in the Katherine region due to the application of power system protection settings. While less likely, the reverse is true, although this may become a greater risk as more generation connects to the region and flow on the 132 kV transmission line reverses at times in the direction of the Darwin region.

Alice Springs

When the last six years is considered, generation performance has significantly contributed to customer interruptions in the Alice Springs region due to system blacks in 2017-18 and 2019-20. The system blacks have negatively impacted the five-year rolling average in the region, which were 0.8 interruptions and 73 minutes without supply as a result of generation performance per customer in 2022-23.

However, generation performance in the region over the last three years has been better than the five-year rolling average, with no interruptions as a result of generation performance over the last two years.

This level of improved performance is contributing to the overall improvement in the region discussed earlier in the Power System chapter, and is reassuring given the issues in the region in previous years.

Tennant Creek

Generation performance in the Tennant Creek power system has consistently been poorer than the other Territory power systems or regions over the last six years.

The five-year average in 2022-23 was 3.9 interruptions and 118 minutes without supply per customer as a result of generation performance, which is higher than the other Territory power systems (and regions) covered in the NTPSPR. However, while generation performance had been on a deteriorating trend, there has been a sustained reduction in the frequency of interruptions since a peak in 2018-19 to 0.3 interruptions per customer in the current reporting period, and the duration of interruptions dramatically reduced in the current reporting period to 31 minutes without supply per customer.

System Control issued a direction in December 2022 (through a Risk Notification) requiring Territory Generation to dispatch unit 15 at the Tennant Creek power station at all times, when available. Unit 15 is a larger and 'heavier' generator compared with the others in the region, and while it improves system security, which is likely behind the improved generation performance in the region, comes at an increased cost when compared with running the newer, 'lighter' and more efficient generation in the region.

It appears further investment in supporting technologies may be needed in the region if the power system is to move away from its reliance on unit 15 to greater utilise the newer and more efficient generation investments already made, while maintaining system security. Any consideration of investment should include a cost benefit analysis, including the cost of continuing to use unit 15 against investment in new assets, and an acceptable level of reliability in the region, noting not all interruptions can be or should be avoided.

The improved performance in terms of the frequency of interruptions due to generation performance is positive given Tennant Creek has generally seen a higher frequency of interruptions when compared with the Darwin-Katherine (as a whole) and Alice Springs power systems.

Generation availability

A number of indices are calculated to provide insight into the availability of the generating units, and to some degree, allow an assessment to be made of the adequacy of condition monitoring and preventative maintenance. These include:

- availability factor
- unplanned availability factor
- equivalent availability factor
- forced outage factor
- equivalent forced outage factor.

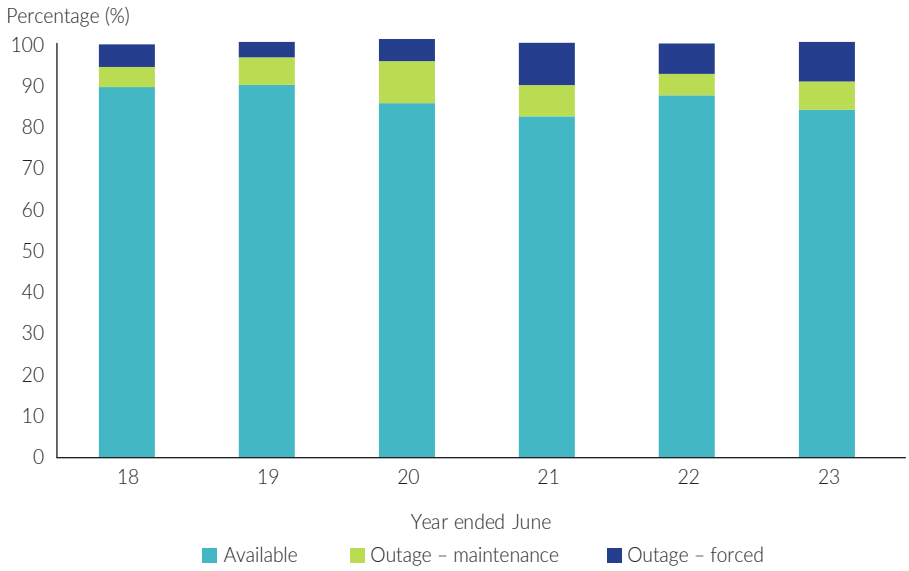
Territory

Figure 23 combines the generators' reported indices against the EIP Code to show the capacity weighted generation availability over the last six years, including the level of both planned maintenance and forced outages.

Ideally, planned maintenance (green sub-bars) should be to a level that maximises generation availability (light blue sub-bars) while minimising unplanned maintenance or forced outages due to faults (dark blue sub-bars) as much as reasonably practicable, noting it is unreasonable to expect zero unplanned maintenance or forced outage events.

Maximising generation availability provides generators and system controllers greater flexibility in managing the generation fleet and the power system, and improves generation reliability. While planned maintenance activities are part of standard operations, and generators and system controllers can plan for them, unplanned maintenance or forced outages can lead to system reliability and security risks, and therefore should be minimised where possible.

Figure 23: Generation availability weighted by capacity, Territory



Following an improvement in 2021-22, generation availability in the Territory in 2022-23 deteriorated due to increases in planned maintenance and forced outages.

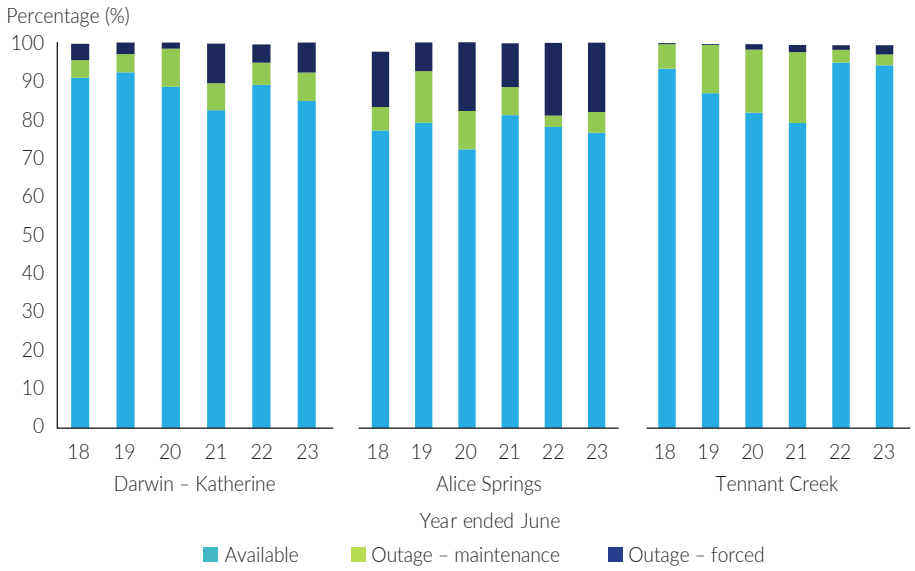
Increases in forced outages in the Darwin-Katherine region during 2022-23 contributed to the second highest level of forced outages in the Territory over the last six years.

The availability of generation at the Territory level during 2022-23 (85%) is the second lowest level of availability over the last six years.

Regional

As with Figure 23 above, Figure 24 combines generators' reported indices, however this time segmented by power system to show the capacity weighted generation availability in the Darwin-Katherine, Alice Springs and Tennant Creek power systems over the last six years, including the level of both planned maintenance and forced outages.

Figure 24: Generation availability weighted by capacity, by region



Darwin-Katherine

Due to the larger proportion of generation capacity in the Darwin-Katherine region compared with Alice Springs and Tennant Creek, the Territory result (weighted average) is heavily influenced by the Darwin-Katherine results.

Following an improvement in 2021-22, generation availability in Darwin-Katherine decreased in 2022-23. The decreased availability is due to increases in planned maintenance and forced outages. In particular, there were increases in forced outages at all four power stations in the region and increases in planned maintenance at the Channel Island and Weddell power stations.

Generation availability in 2022-23 was at its second lowest level over the last six years, at around 85%. Territory Generation has advised that protected industrial action and major overhauls on two large generators slightly impacted availability and forced outages in 2022-23.

The five-year rolling average of availability at the Channel Island power station is continuing to show a steady deterioration. As with last year, it is important this deterioration is closely monitored by Territory Generation, and more broadly government and the Commission (noting the Commission has a role in providing advice to government, such as through this review), given the power station is the largest in the Darwin-Katherine region and is heavily relied on for maintaining a secure and reliable Darwin-Katherine power system.

The 2020-21 NTPSPR discussed how the generating units at the power station are ageing, with some nearing end-of-life (starting in 2026-27), and therefore the probability of extended outages may increase. Relevantly, the Commission is aware from licensee reporting that a number of constraints apply to the operation of some generators at the Channel Island power station, including constraints on those scheduled for retirement in the medium-term due to generator, or generator component failures or limitations. These constraints limit the system controller's flexibility in dispatching generation to meet customer demand.

The Commission considers these observations support its view in the 2022 Northern Territory Electricity Outlook Report (NTEOR) that urgent investment in new generation, storage and or demand response is needed, noting the NTEOR assumes these end-of life generators at the Channel Island power station remain serviceable and available until their retirement.

Alice Springs

Generation availability slightly deteriorated in Alice Springs in 2022-23 compared with the previous year and is at the second lowest level over the last six years.

The availability of generation in the Alice Springs power system has been lower than the Darwin-Katherine and Tennant Creek power systems for five of the last six years, with Tennant Creek recording a slightly lower level of availability in 2020-21.

In 2022-23 the availability of generation in the Alice Springs power system was just under 77%, which compares poorly with 85% and 95% in the Darwin-Katherine and Tennant Creek power systems, respectively. The highest level of availability in the region over the last six years was in 2020-21, with a result of 81%.

Two power stations at opposite ends of their lifecycle have been driving the poor availability of generation in the Alice Springs region. The relatively new generation at the Owen Springs power station has had a consistently elevated level of planned maintenance over the four years prior to 2021-22, with an increase again in 2022-23. The end-of-life generation at the Ron Goodin power station has had a very high level of forced outages over the last six years.

After recording its highest level of availability in 2021-22, at around 90%, the Owen Springs power station returned to a level of 84% in 2022-23. This was driven by increases in planned maintenance and forced outages, with forced outages reaching its second highest level over the last six years. While still very low, the availability of the Ron Goodin power station increased when compared with the previous year to around 60%. The low level of availability is mainly due to a high rate of forced outages, which is not unexpected given the age of the generators.

Despite the low level of availability, the Ron Goodin power station may still be relied on to provide a level of back-up to the region and is likely to continue to do so until the Owen Springs power station and battery energy storage system have proven to operate without constraints. However, the availability of the Ron Goodin power station is likely to continue to diminish over time, noting Territory Generation has advised it will eventually be placed in a standby state. While the power station is being relied on, it will increase generation costs compared with only running the newer, more efficient generators at Owen Springs power station.

The Commission notes the level of availability in the Alice Springs region is likely to continue to be poor in subsequent years while the Ron Goodin power station is still operating and, in turn, it will continue to drag down the regional result.

Tennant Creek

Generation availability in the Tennant Creek power system continued to be high in 2022-23, at around 95%, following a dramatic improvement during 2021-22, from a low over the last six years of around 80% in 2020-21. The improvement in 2021-22 was driven by a reduction in planned maintenance, which had been steadily increasing over the previous three years. Territory Generation advised in its EIP Code reporting that it has utilised the new Jenbacher generators during the reporting period, while it also retired older generators from service over recent years.

Forced outages in the power system have been consistently low over the last six years.

Availability of generation in the Tennant Creek power system has been inconsistent over the last six years, primarily due to planned maintenance. This is preferable to forced outages, which as discussed earlier in this chapter, should be minimised where possible as high levels of forced outages can increase risks to system reliability and security due to the limited or no notice inherent to forced outages.

4 Previous NTPSPR recommendations

This chapter provides an assessment of the status of recommendations from previous NTPSPRs that were assessed as not complete in the 2021-22 NTPSPR. Some progress has been made against these recommendations during 2022-23, with three recommendations assessed as complete as part of this review.

It is important to note the recommendations are those of the Commission and where they do not relate to non-compliance, such as with licence conditions or relevant legislation, are not enforceable.

The Commission has grouped the recommendations to highlight related issues or overlapping recommendations, where possible.

Table 8 provides a summary of the Commission's assessment of the status of previous NTPSPR recommendations in terms of whether the recommendations are considered as open or complete.

Table 8: Summary of assessed status of previous NTPSPR recommendations

	NTPSPR					
	2017-18	2018-19	2019-20	2020-21	2021-22	Total
Open	2	5	2	3	0	12
Complete	8	1	4	3	0	16

Katherine region operation

In addition to the two recommendations below, which are related to the operation of the Darwin-Katherine power system in the Katherine region, the Commission made a recommendation in the 2017-18 NTPSPR in relation to Katherine and Pine Creek island management, however this was closed as an overlapping recommendation was made in the 2018-19 NTPSPR (shown below).

Recommendation: Review and improve the operation of the Katherine/ Pine Creek island

NTPSPR: 2018-19 Page: vi

Accurate and reliable islanding identification and clear and robustly implemented protocols are required.

Relevant licensee or stakeholder:	PWC System Control
	PWC Power Services
	Territory Generation
	EDL
Status:	In progress

Recommendation: Katherine island operation

NTPSPR: 2020-21 Pages: v and 22

It is recommended that PWC System Control investigates how generating units in the Katherine region could be normally operated in both voltage and frequency droop modes to assist power system recovery from a separation event.

Relevant licensee or stakeholder: PWC System Control
Territory Generation
EDL

Status: In progress

While the recommendations above, and the one in 2017-18 are specific and technical in nature, they all relate to improving the performance of the power system and customer experience in the Katherine region, which as discussed elsewhere in this review is poor compared with the other Territory regions.

Relevant licensees provided the Commission with an update and in summary, work and consideration is underway regarding the operation of the power system in the Katherine region. Given this work is not complete, and consistent improvements in performance across multiple years have not been seen, the Commission continues to assess these recommendations as in progress.

Generation asset management

Recommendation: Balance pro-active and reactive system improvement strategies

NTPSPR: 2018-19 Pages: v and 15

Good electricity industry practices, such as in relation to condition monitoring and preventative maintenance, and visibility and knowledge of plant limits, should be adopted by generators, with more formal auditing.

Part A – Improved condition monitoring and preventative maintenance practices.

Part B – Better visibility and knowledge of plant limits, in particular where these plant limits vary.

Relevant licensee or stakeholder: Territory Generation (part A and B)
EDL (part A and B)
PWC System Control (part B)

Status: In progress

In relation to part A of the recommendation, Territory Generation previously advised it has a new incident reporting process and dedicated frontline staff now undertake regular condition monitoring. Further, reporting of reliability statistics has commenced and a condition monitoring dashboard has been created to assist with oversight.

In its latest update, Territory Generation advised that generation availability slightly deteriorated over 2022-23 due to protected industrial action.

EDL advised it has an agreement in place with the original equipment manufacturer for its generating units, which includes various activities to review the factors that influence turbine life and operating reliability. Further, EDL is satisfied its condition monitoring and preventative maintenance practices meet industry good practice.

As shown in the Generation chapter of this review, in general across the Territory, generation availability deteriorated in 2022-23. The Commission continues to look for an improvement over a longer term to consider part A of the recommendation as complete.

Recommendation: More thorough investigation of single unit trips

NTPSPR: 2019-20 Pages: v and 14

It is important for generation licensees to understand why their generation units trip. Single generator trips will continue to occur (and seemingly at greater frequency) unless more thorough investigation of the cause of single unit trips occurs and identified issues are addressed.

Relevant licensee or stakeholder: Territory Generation

EDL

Status: Complete

Territory Generation previously advised (following the recommendation) it now has an incident reporting and investigation process, and associated database. It is also utilising fault codes. Further, Territory Generation has created two new Senior Control System Technician positions, one to manage the northern regions and one to manage the southern regions of its operations, with one of the focuses of these positions the investigation and reporting (to PWC System Control) of all unit trips.

In addition, for the 2022-23 NTPSPR, Territory Generation advised it has developed a defect elimination process.

EDL advised it maintains records of each trip and performs a monthly review of power station performance, which includes consideration of fault trends, escalation of recurring issues and underlying casual analysis. Further, EDL considers its level of investigation of single generator trips is consistent with good industry practice.

Since the recommendation was made in the 2019-20 NTPSPR, single generator trips have started to reduce in the Darwin-Katherine and Alice Springs power systems (based on licensee reporting), with both short (two year) and medium (five year) term averages starting to show a downward trend.

Given improvements have been made to system, processes and resourcing in relation to the investigation of single unit trips (by Territory Generation), and overall single generator trips appear to be reducing following the recommendation, the Commission considers this recommendation is complete for the purposes of the NTPSPR. However, as noted in the original recommendation, while it is rare in recent years for a single generator trip in the Darwin-Katherine and Alice Springs power systems to lead to the operation of load shedding and subsequently impact customers, it remains important for generation licensees to understand why their generation units tripped in the first place. Accordingly, the Commission will continue to monitor single generator trips through licensee reporting.

Reporting

Recommendation: Incident reporting – incident recovery

NTPSPR: 2020-21 Pages: vi and 49

It is recommended that more focus on the recovery phase after major incidents be included in PWC System Control's major incident reports.

Relevant licensee or stakeholder: PWC System Control

Status: Complete

PWC System Control previously advised this recommendation has been partially implemented through an updated final incident report template, and the Commission reported in the 2021-22 NTPSPR it had seen evidence of a more detailed final incident report in terms of the recovery phase in the most recent reports. The Commission has continued to see evidence of more detailed information regarding the recovery phase in final incident reports during 2022-23.

Further, PWC System Control advised more focus on the recovery phase in final incident reports is likely to be sustained with amendments to incident reporting-related provisions in the System Control Technical Code and an associated guideline, likely to commence in 2023-24.

The Commission considers this recommendation is complete, however encourages PWC System Control to continue placing sufficient focus on the recovery phase of incidents in its investigations to ensure customers are without power for no longer than needed or reasonable, and any instances where this is not the case, improvements are identified and implemented through the relevant frameworks and processes.

Recommendation: Incident reporting – clarity on generation SAIFI and SAIDI apportioning in incident reports

NTPSPR: 2020-21 Pages: vi and 29

It is recommended that PWC System Control clearly identify and apportion the customer impact for a particular event between the relevant licensees in each major incident report, noting the EIP Code requires generators to report on their SAIFI and SAIDI performance.

Relevant licensee or stakeholder: PWC System Control

Status: In progress

PWC System Control previously advised it considers there is enough information in its current incident reports, which are provided to all relevant licensees including licensed generators, to apportion SAIFI and SAIDI. However, System Control has continued to indicate it will consider whether this can be made clearer as part of its biannual reporting obligations under the System Control Technical Code.

Noting this is an interim solution until the Commission has amended the EIP Code to address the issue, the Commission considers the recommendation is in progress, as PWC System Control incident reports (or biannual reporting) do not yet explicitly identify and apportion SAIFI and SAIDI between licensees.

Planning and coordination

The following recommendations relate to the lack of or inadequate frameworks and structures in the Territory's electricity supply industry, or overall explicit responsibility, accountability and authority for coordination in the Territory.

Recommendation: Planning and modelling

NTPSPR: 2017-18 Page: vi

Better planning, including modelling of system changes and associated operations, by PWC Power Services in consultation with PWC System Control and licensees.

Relevant licensee or stakeholder: PWC System Control
PWC Power Services
Territory Generation

Status: In progress

Recommendation: Ensure generation and demand changes are planned for with a view to efficiency and robustness

NTPSPR: 2018-19 Pages: v and 35

Detailed planning work is required to understand the operability of the three power systems with increased variable renewable energy penetration. This should include consideration of frequency and voltage control and regulation.

Relevant licensee or stakeholder: PWC System Control
PWC Power Services
Northern Territory Government

Status: In progress

The Commission considers there is some overlap between the two recommendations above from the 2017-18 and 2018-19 NTPSPRs, and has therefore grouped them together. Further, the recommendations highlight the lack of or inadequate modelling, frameworks and structures, or overall explicit responsibility, accountability and authority for coordination, and are relevant across the three power systems in the Territory.

In terms of the recommendations above, the Commission considers relevant stakeholders have made progress since the recommendations were made, albeit slow. The Commission notes work is ongoing and accordingly the recommendations are assessed as in progress.

The following recommendations under the 'planning and coordination' heading relate to specific power systems or regions in power systems, rather than all three power systems.

Recommendation: Managing Ron Goodin power station retirement

NTPSPR: 2017-18 Pages: iv and 43

Care should be taken to ensure a robust set of operating protocols is developed to allow for safe and secure operation of the Alice Springs network without the support of the Ron Goodin power station.

Relevant licensee or stakeholder: Territory Generation
PWC System Control

Status: In progress

Territory Generation advised that the Ron Goodin power station will continue to be available in the short term, however will eventually be lowered in the merit order and act as standby or peaking capacity only. Further, the Commission understands Territory Generation is investigating new investments in Alice Springs in order to support the power system.

PWC System Control previously advised work completed on the Jenbacher generators at the Owen Springs power station has allowed restrictions on those generators and reliance on the Ron Goodin power station to be lowered. Once all issues with the battery energy storage system have been addressed, the reliance on generators at the Ron Goodin power system should be removed altogether.

Further, PWC System Control has also advanced a number of technical studies to ensure a smooth transition to operations without the Ron Goodin power station.

Consistent with last year, the Commission considers it positive that reliance on the end-of-life generation at the Ron Goodin power station is diminishing, especially given the poor reliability of that generation (discussed elsewhere in this review). However, the Ron Goodin power station is still in operation and the retirement process has not commenced. Accordingly, the Commission considers this recommendation is still in progress.

Recommendation: Investigate alternatives to the Weddell power station constraint

NTPSPR: 2019-20 Pages: v and 23

A constraint imposed on the operation of the Weddell power station under certain load conditions due to thermal capacity limits in the network to allow for secure operation.

Relevant licensee or stakeholder:	PWC System Control
	PWC Power Services
	Territory Generation
Status:	Complete

The Commission understands there are three transmission lines that export electricity from the Weddell power station, with two going to the Archer zone substation and one to the Strangways zone substation. The transmission line to the Strangways zone substation has a design thermal rating of 64 MVA, which is much lower than the 90 MVA rating of each of the two transmission lines to the Archer zone substation.

PWC Power Services previously advised that work was completed to improve the thermal rating of the transmission line to the Strangways zone substation, and final modelling confirmed an improved rating of 82 MVA. Subsequently, PWC System Control advised it had been notified by PWC Power Services of the improved thermal rating and a review of the Weddell power station constraint would commence in May 2023.

On 23 January 2024, PWC System Control advised the Commission that its review of the Weddell power station constraint was completed in late 2023 with some uplifted transmission capability. PWC System Control advised there are still Weddell power station restrictions in place as the ratings do not allow for full utilisation under all circumstances, however for the majority of times, the actual constraint does not apply based on the current dispatch structure. PWC System Control stated very low load and very high load days do cause a constraint to be adhered to, but it is generally met in the way dispatch is approached, although machine availability may also cause the constraint to bind.

As the review of the Weddell power station constraint is complete and improvements have been made, the Commission considers this recommendation is complete.

Recommendation: Coordination of generation protection and network requirements

NTPSPR: 2019-20 Pages: vi and 48

The setting of protection limits for over and under voltage and frequency on generating units should always represent the capability of the generation units themselves rather than the power system limits. This recommendation relates mainly to Tennant Creek.

Relevant licensee or stakeholder: PWC System Control
PWC Power Services
Territory Generation

Status: In progress

This recommendation relates to the Tennant Creek power system. In terms of generation protection, Territory Generation has completed an audit of its generation protection at the Tennant Creek power station. The audit identified protection settings that require changes, with changes to be implemented following review and acceptance by PWC System Control. Territory Generation expects the work to be completed by the end of 2023-24.

In terms of network protection, PWC Power Services previously advised it has completed a review of and implemented sensitive (earth) settings in the Tennant Creek network. Further, PWC Power Services has implemented a scheme on two network feeders to reduce the impact of network restoration post auto reclose on generators.

Both licensees previously advised that despite the work, challenges in the Tennant Creek power system remain.

Given Territory Generation's audit identified protection setting changes are required, and these are still to be implemented, the Commission has assessed this recommendation as in progress.

Recommendation: Unusual system conditions – islanding investigation

NTPSPR: 2020-21 Pages: v and 22

It is recommended that PWC System Control, in consultation with PWC Power Services and relevant licensees, investigates the possible island or weakened areas of the network that can form in the aftermath of a contingency event and uses a risk-based approach to determine which of these scenarios require planning actions. Planning actions may take the form of constraints, network investment or localised ancillary service requirements, among others.

Relevant licensee or stakeholder: PWC System Control

Status: In progress

PWC System Control previously advised that work to address this recommendation is associated with improvements to the Katherine islanding scheme, which is yet to be completed. Accordingly, the Commission considers this recommendation is yet to be completed.

Network low voltage supply

Recommendation: Management of low voltage supply voltages in Darwin-Katherine network

NTPSPR: 2018-19 Pages: vi and 28

The voltage quality statistics for the Darwin-Katherine network, and more specifically in the Katherine region, show supply voltages are trending towards the high end of the allowable spectrum.

Relevant licensee or stakeholder: PWC Power Services

Status: In progress

PWC Power Services advised it has commenced with the procurement of two reactors (5 MVAr) to address the voltage issues in the Darwin-Katherine network, with the assets expected to be commissioned by October 2024. Further, the project scope for a new zone substation in the Darwin region (Trevor Horman zone substation), includes the installation of switched inductive compensation (four reactors; 12 MVAr), with the project estimated to be commissioned by November 2025.

Given projects to address the management of low voltage supply voltages in the Darwin-Katherine power systems are underway, the Commission considers this recommendation to be in progress.

Recommendation: Management of voltage in Alice Springs

NTPSPR: 2019-20 Pages: vi and 42

A need for investigation of, and potential investment in, managing supply voltages in the low voltage parts of the distribution network in the Alice Springs power system.

Relevant licensee or stakeholder: PWC Power Services

Status: In progress

PWC Power Services advised that a project business case to install switched inductive compensation (two reactors ; 5.5 MVAr) at the Lovegrove zone substation has been approved, and the project is estimated to be commissioned by the end of June 2025.

Given steps to address the management of voltage in the Alice Springs power system have not been completed, the Commission considers this recommendation to be in progress.

Process

Recommendation: Manage testing and abnormal plant conditions

NTPSPR: 2018-19 Page: vi

Outage protocols including switching sheets, isolations and workspace delineation need greater focus from plant owners to ensure the number of inadvertent trips and faults are minimised.

Relevant licensee or stakeholder: Territory Generation

PWC Power Services

Status: In progress

Territory Generation previously advised all switching now requires a switching schedule, and it has increased the number of supervisory positions to concentrate on ensuring compliance.

PWC Power Services provided analysis that compared the impact of network-related switching and protection errors on customers with other relevant AER-regulated distribution networks. The analysis showed that human error-related events accounted for 0.2% of total customer minutes lost due to PWC Power Services in 2022-23, which is within the range of 0.0% - 0.6% observed in other distribution networks, with performance varying each year. PWC Power Services suggested the consistency of reported human error impacts on networks across Australia reflects the complex nature of operating and maintaining electricity networks and that PWC Power Services' performance is consistent with the wider industry.

Further, PWC Power Services advised it (and System Control) investigates the cause of outages in detail, and implements changes to procedures and test plans to avoid reoccurrence. While human error is unavoidable, changes to the design and configuration of equipment are ongoing to limit the consequences. PWC Power Services suggests expecting all possible error scenarios to be anticipated and eliminated through proactive design changes or procedures is unreasonable, as demonstrated through its analysis of the performance of other AER-regulated distribution networks. PWC Power Services advised it has addressed several risks to avoid future errors in the current period and provided examples, which it says demonstrates how it applies good industry practices to the management and execution of complex maintenance works on both the distribution and transmission systems.

The Commission agrees with PWC Power Services' analysis, which compares its performance with seven other AER-regulated distribution networks between 2019-20 and 2021-22, and expecting all possible error scenarios to be anticipated and eliminated through proactive design changes or procedures is unreasonable. However, from Commission analysis of System Control incident reporting, which considers the system as a whole and therefore includes human or operational error-related interruptions due to generation, networks and system control, these errors are still occurring in 2023-24 and to a notable level. Accordingly, the Commission would like to observe performance in this area in a future version of this report before considering this recommendation as complete.

Appendix: Glossary

AER	Australian Energy Regulator
CBD	Central business district
Customer minutes without supply	Number of minutes customers are without supply, calculated by multiplying the number of customers impacted by the duration of the incident
DNSP	distribution network service provider
EDL	EDL NGD (NT) Pty Ltd
EIP Code	Electricity Industry Performance Code
GSL	guaranteed service level
GWh	gigawatt hours
kV	kilovolt, 1 kV = 1 thousand volts
MVA	megavolt ampere
MVAr	megavolt ampere of reactive power
MW	megawatt, 1MW = 1 million watts
NEM	National Electricity Market
NTEOR	Northern Territory Electricity Outlook Report
NTPSPR	Northern Territory Power System Performance Review – this review
PWC	Power and Water Corporation
SAIDI	system average interruption duration index
SAIFI	system average interruption frequency index