Insights into Australia's growing two-way energy system

Export services network performance report 2024

December 2024

AUSTRALIAN ENERGY REGULATOR

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1 Executive summary

Distribution Network Service Providers (DNSPs) play a key role integrating consumer energy resources (CER), such as residential rooftop solar photovoltaic (PV) systems and batteries, into their network. This report, *Insights into Australia's growing two-way energy system,* presents analysis of the performance of DNSPs in providing services for consumers with CER. In accordance with 6.27A(a) of the National Electricity Rules (NER), the report includes important results relating to export capacity, battery penetration, export reward tariffs, export limits and curtailment.

Consumers are becoming increasingly significant suppliers of electricity through the energy transition. In the 2023-24 financial year more than 10% of energy delivered by electricity distribution networks was sourced from network customers with small-scale CER. More than 2.9 million distribution network customers exported electricity from on-site PV panels and 45,000 customers could export from a battery. Of note, in 2023-24 approximately 16% of new network-connected solar installations incorporated a battery.

Consumer investments in CER can help to lower costs for all electricity consumers. By effectively integrating these resources, it's possible to avoid the need for more costly investment in grid generation and transmission infrastructure. The Australian Energy Market Operator's (AEMO) 2024 Integrated System Plan (ISP) recognises the substantial role CER will play in the energy transition, noting that well-coordinated consumer batteries could avoid up to $4.1 billion of additional expenditure on utility-scale storage in the National Electricity Market (NEM).[1]

This report complements other work we undertake to ensure DNSPs effectively integrate their customers' CER. In October 2024 we introduced the export limits guidance note[2] which provides consistent guidance for DNSPs in the efficient and equitable setting of export limits for their customers. We also oversaw the introduction of export reward tariffs by some DNSPs, which allow DNSPs to better attribute network costs and benefits for customers installing network-connected CER. Reward tariffs began operating in New South Wales on 1 July 2024 and future tariffs are proposed in Queensland and South Australia.

An energy transition that effectively integrates and orchestrates CER will require collaboration across the energy industry to create well developed market and policy frameworks that provide the best outcomes for all consumers. By providing enhanced transparency of electricity network export service performance, *Insights into Australia's growing two-way energy system* supports more informed regulatory and policy decisions by government agencies and can inform investment and operating decisions made by consumers and CER service providers.

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1 AEMO, 2024 Integrated System Plan, P. 17, Australian Energy Market Operator

2 AER, Export limit guidance note, Australian Energy Regulator.

1.1 Key findings

Our analysis shows DNSPs accommodate a significant and increasing capacity of export services for their customers. DNSPs are currently hosting these export services with a relatively low proportion of their expenditure, however as the two-way energy system continues to evolve and CER penetration increases, so do the challenges for accommodating additional exports. DNSPs must equitably share available export capacity among their customers while achieving a high level of power quality and being prudent in their expenditure. The ongoing roll-out of flexible export limits, smart meters and more sophisticated inverters will help DNSPs to meet these goals.

Our report finds that for the 2023–24 financial year:

- **Export customer numbers increased at a lower rate**
  DNSPs served more than 2.9 million customers who exported electricity into the network (export customers), 200,000 more export customers than in 2022–23. This is a smaller increase than the previous year in which there were approximately 213,000 additional export customers.
- **The number of batteries installed with rooftop solar is accelerating**
  Approximately 16% of all rooftop solar installations included a battery system, up from 11% in the year before.[3]
- **Measured export volumes increased**
  Customers with exports that were measurable with smart meters exported more than 14 million megawatt hours (MWh) of electricity, representing 10% of all electricity delivered by DNSPs.[4] This is an increase from 11.8 million MWh in 2022–23, representing 8% of all electricity delivered.
- **Average static export limits increased**
  The average static export limit was 5.7 kilovolt-amperes (kVA), higher than the previous year and primarily driven by customers installing larger CER systems. DNSPs impose static limits on customer exports to ensure network power quality is maintained and network capacity is shared fairly between export customers. These limits vary between and within networks depending on network constraints.
- **The proportion of customers on static-zero export limits increased slightly**
  The proportion of customers on static-zero export limits increased from 0.57% in 2022–23 to 0.60%[5] in 2023–24. This indicates some localised network areas have constraints which significantly limit their export capacity.

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3 Endeavour Energy reported the number of export customers batteries for the first time in 2023-24. However, data could not be backdated to determine which year the battery was installed. To avoid falsely inflating the percentage increase for 2023–24, Endeavour Energy were not included in this calculation.

4 10% of energy was measured to be sourced from exporting customers with smart meters. Since one quarter of exporting customers do not have smart meters, the total volume of energy exported by customers will be higher than the measured value of 10%.

5 This figure excludes Essential Energy (see section 4.2)

- **Flexible export limits were introduced by some DNSPs**
  Some DNSPs have started deploying flexible export limits to reduce the number of customers on static-zero export limits. Flexible export limits became available through 4 DNSPs in 2023–24 following the conclusion of successful trials in 2022–23.
- **Export services expenditure remained low**
  DNSPs used about 1% of their total expenditure to support the provision of export services.

Through the regulatory framework set out in the National Electricity Rules (NER) we will continue to monitor DNSPs to ensure they are efficient and prudent in providing services that accommodate and optimise the rapid growth in CER and enable customers to export into their networks.

Table 1.1 Summary of 2023–24 results

Key operational areas	Key operational findings	Key performance areas	Key performance findings
Export customer numbers 	27% of DNSP customers used export services in 2023–24, up from 25% in 2022–23.	**Static-zero export limits** 	0.6% of customers were on static-zero export limits in 2023–24, up from 0.5% in 2022–23. Power and Water had the highest increase up 1.1 percentage points.
Smart meter penetration 	76% of export customers had smart meters in 2023–24, up from 68% in 2022–23.	**Average static export limit** 	The average static export limit for residential customers in 2023–24 was 5.7 kVA, up from 5.5 kVA in 2022–23.
Average export capacity 	The overall average export capacity was 6.1 kVA per export customer. Essential Energy had the highest (7.7 kVA) and AusNet Services (5.0 kVA) had the lowest.	**Duration of export access** 	Duration of export access against the agreed export limit was 99% in 2023–24, up from 98% in 2022–23.
Expenditure 	On average, approximately 1% of capital and operational expenditure by DNSPs is specifically attributed to providing export services.	**Overvoltage** 	20% of export customers experienced overvoltage in 2023–24, down from 30% in 2022–23.
Battery penetration 	4% of export customers had batteries in 2023-24. This proportion was highest for Evoenergy (12%) and SA Power Networks (11%).	**Flexible export limits** 	Flexible export limits were available through 4 DNSPs in 2023–24 (AusNet Services, Energex, Ergon Energy and SA Power Networks).
Energy delivered 	10% of all energy delivered by electricity DNSPs was sourced from export customers with smart meters in 2023–24, up from 8% in 2022–23.	**Time to provide an offer** 	On average, DNSPs offered export customers a connection agreement for model standing offers within 3 days, except Essential Energy (5 days) and Power and Water (23 days).

2 Background

When Australia's electricity networks were built, distribution network services involved one-way flows of electricity – generators exported electricity into the network and customers imported electricity from the network for consumption. As more customers install consumer energy resources (CER), such as rooftop solar photovoltaic (PV) systems and batteries, and export electricity to the grid, parts of the network are becoming congested. This presents challenges for DNSPs to host and orchestrate the CER while efficiently maintaining a cost effective, safe and stable network.

In August 2021, the Australian Energy Market Commission (AEMC) published its access, pricing and incentive arrangements for distributed energy resources final determination.[6] The key aspects of this rule change included providing clear obligations on DNSPs to provide export services, enabling new network tariff options that reward customers[7] and strengthening customer protections and regulatory oversight by the AER. The rule change seeks to better manage minimum demand issues, support effective CER integration and enable future market designs in which consumer generation and storage play a larger role.

In March 2023 we published our report *Incentivising and measuring export service performance,* which outlined our consultation and final decision for delivering against 3 different workstreams of the rule change.[8] One of the workstreams discussed was our requirement to produce annual export services network performance reports.

The selection of measures we requested from DNSPs in our information request was determined through workshops with the DNSPs and informed by a concurrent research project led by the University of Technology Sydney.[9]

The 14 electricity DNSPs included in this report are located in every state and territory in Australia, except Western Australia.

2.1 Scope

Insights into Australia's growing two-way energy system is published in accordance with 6.27A(a) of the National Electricity Rules (NER). It analyses the performance of electricity distribution network service providers (DNSPs) in providing services for embedded generators, such as residential solar and batteries, to export into their networks.

This report includes data from the 2020–21, 2021–22, 2022–23 and 2023–24 financial years, with a focus on performance in the 2023–24 financial year. Data in this report specifically covers services provided by DNSPs for exports from generating units with a nameplate rating

6 AEMC, Access, pricing and incentive arrangements for distributed energy resources, Australian Energy Market Commission, August 2021.

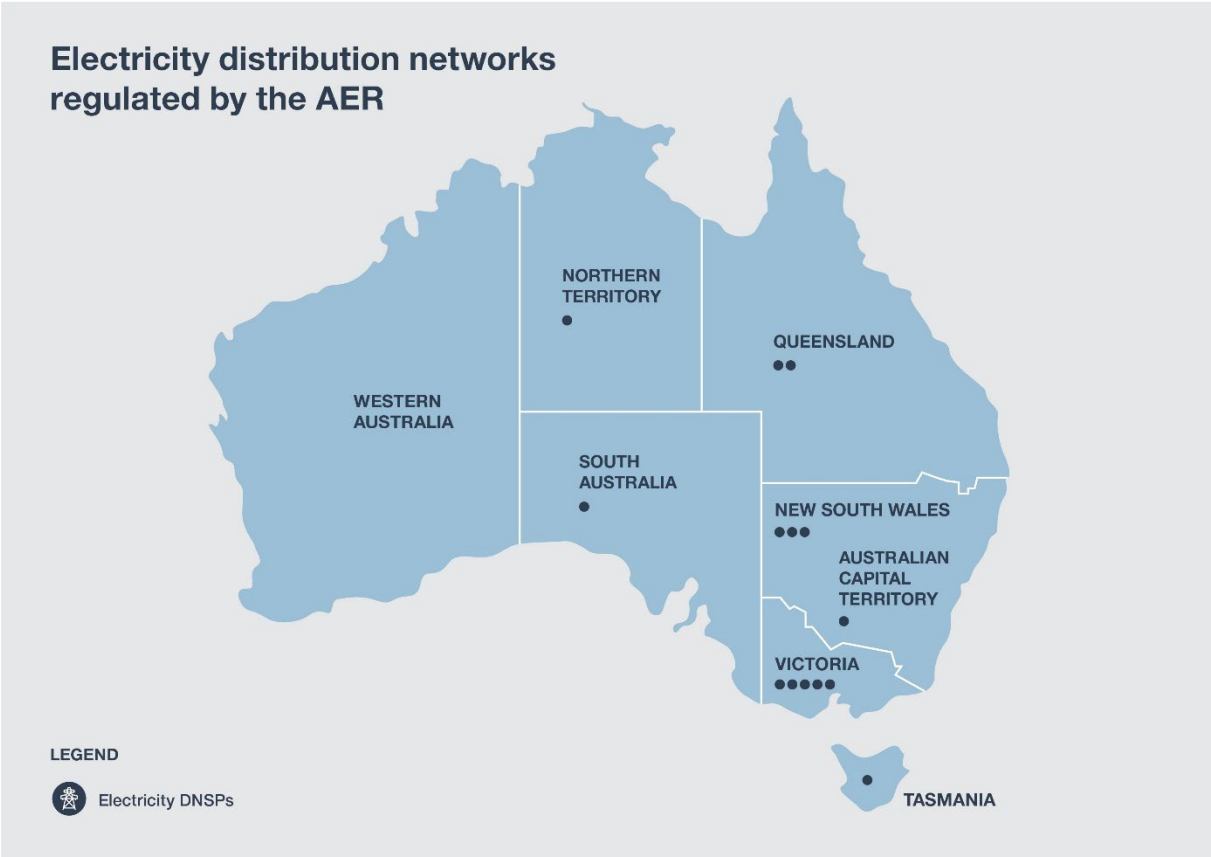
7 See section 3.5 on Export reward tariffs for more information.

8 AER, Incentivising and measuring export services performance, Australian Energy Regulator.

9 RACE for 2030, Measuring and communicating network export service quality.

of less than 30 MW and which the Australian Energy Market Operator (AEMO) has exempted from the requirement to register as a generator.[10]

Figure 2.1 Electricity DNSPs regulated by the AER



The electricity DNSPs regulated by the AER are located in all states and territories except Western Australia:

Queensland: Ergon Energy and Energex

New South Wales: Ausgrid, Endeavour Energy and Essential Energy

Australian Capital Territory: Evoenergy

Victoria: AusNet Services, CitiPower, Jemena, Powercor and United Energy

South Australia: SA Power Networks

Tasmania: TasNetworks

Northern Territory: Power and Water

10 That is, exports from small generating units as defined by the National Electricity Rules.

2.2 Data collection

The datasets used in this report were obtained directly from electricity DNSPs and are published separately on the AER website. Data used in this report and accompanying datasets supersede data provided in the 2023 Export services network performance report as some DNSPs submitted updated or revised data. DNSPs have different measuring capabilities due to different levels of smart meter penetration and may use different methods to collect data.

A portion of the data that DNSPs have reported is sourced from AEMO's Distributed Energy Resource (DER) Register, where DER installers are required to record details of installations.[11] DNSPs do not have direct oversight of the installers who input data in the DER register. In some cases, DNSPs correct for apparent mistakes in the DER Register before submitting data to the AER (for example, some installers may report installation size in watts, where installation size in kilowatts may be requested by the DER Register).

We are continuing to work with DNSPs to improve measurement consistency for future export services performance reporting.

2.3 Stakeholder engagement

Our stakeholders value the opportunities for transparency provided by our efforts to engage with them. Engagement with our stakeholders is an ongoing priority as we develop our reporting on the rapidly evolving export services space.

Following the publication of our first export services network performance report in 2023, we engaged with DNSPs to further understand the challenges in capturing and providing consistent information.

In the course of preparing this report, we also held meetings and consulted with DNSPs, jurisdictions and consumer representatives to provide additional information on the matters discussed in this report, particularly in relation to export limits.[12]

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11 AEMO, Distributed Energy Resource Register, Australian Energy Market Operator.

12 We completed this consultation in compliance with 8.7.4 (a), (b), & (c) of the National Electricity Rules.

3 Services provided

The electricity DNSPs we regulate have different numbers of export service customers, technology and export capacity on their networks. Subsequently, they face different challenges and opportunities in managing export services. This chapter focuses on metrics that describe the operational contexts of the different networks.

Export service customers

In this report, an export service customer is a customer of a DNSP who has requested to be able to export from on-site CER into the network. If the DNSP does not allow the customer to export (i.e. applies a static-zero export limit), that customer is still considered to be an export service customer.

When an export customer connects their CER to the network, the DNSP typically applies a maximum allowance for what the customer is allowed to export to the network (an export limit). In general, customers may install systems of a larger capacity than their export limit and use any excess capacity over the export limit for self-consumption.

There was a total of 2.9 million export customers (27% of around 11 million total customers) across all DNSPs in 2023–24.

More than 99% of all export services customers used on-site solar photovoltaic panels (PV) and approximately 4% of all export customers used batteries in conjunction with PV. Other uses of export services were much less common, with only 0.1% of export customers using batteries without PV and only 0.04% of customers being reported as using neither PV or batteries.[13]

kVA definition

kVA (kilovolt-ampere) is a measure of apparent power. Some readers may be more familiar with the metric kW (kilowatt), which is a measure of usable power. Our analysis of network data found that networks have different approaches to labelling export figures with kVA and kW. For the sake of simplicity, although at the cost of some technical accuracy, readers of this report may consider one kVA to be equal to one kW of export capacity.

A summary of the operational metrics for each of the DNSPs is provided in Table 3.1.

[13] In 2024, 1050 export services customers were reported as using neither PV nor batteries. Some DNSPs have included systems in this category from AEMO's DER Register that are marked as "unknown". Some DNSPs have suggested renewable generation sources in this category may include wind, hydro and biogas. Non-renewable sources may include diesel and gas fuel generators. Inaccuracies in recording this figure may be significant given the relatively small numbers involved.

Table 3.1 Export service operational metrics summary – 2023–24

State/ territory	DNSP	Proportion of customers using export services	Average export capacity per export customer (kVA)	Proportion of export customers with a battery	Measured exports as a proportion of all energy delivered
–	All DNSPs	27%	6.1	4%	10%
ACT	Evoenergy	24%	7.2	12%	11%
NSW	Ausgrid	15%	6.8	6%	6%
	Endeavour Energy	27%	6.8	6%	9%
	Essential Energy	31%	7.7	4%	11%
NT	Power and Water	21%	5.3	4%	3%
Qld	Energex	43%	5.2	2%	9%
	Ergon Energy	34%	5.6	3%	7%
SA	SA Power Networks	38%	6.9	11%	21%
Tas	TasNetworks	16%	6.1	4%	7%
Vic	AusNet Services	28%	5.0	3%	19%
	CitiPower	6%	5.4	3%	1%
	Jemena	18%	5.5	2%	6%
	Powercor	25%	6.1	2%	14%
	United Energy	18%	5.8	3%	7%

Table 3.1 shows that Energex, Ergon Energy and SA Power Networks have the highest proportion of customers using export services, while CitiPower, TasNetworks and Ausgrid have the lowest. SA Power Networks and AusNet Services have the highest proportions of energy delivered attributed to measured exports from customers, while Evoenergy and SA Power Networks have the highest battery penetration.

The operational data on the services provided by each of the DNSPs are described in more detail throughout the remainder of this chapter.

3.1 Customers using export services

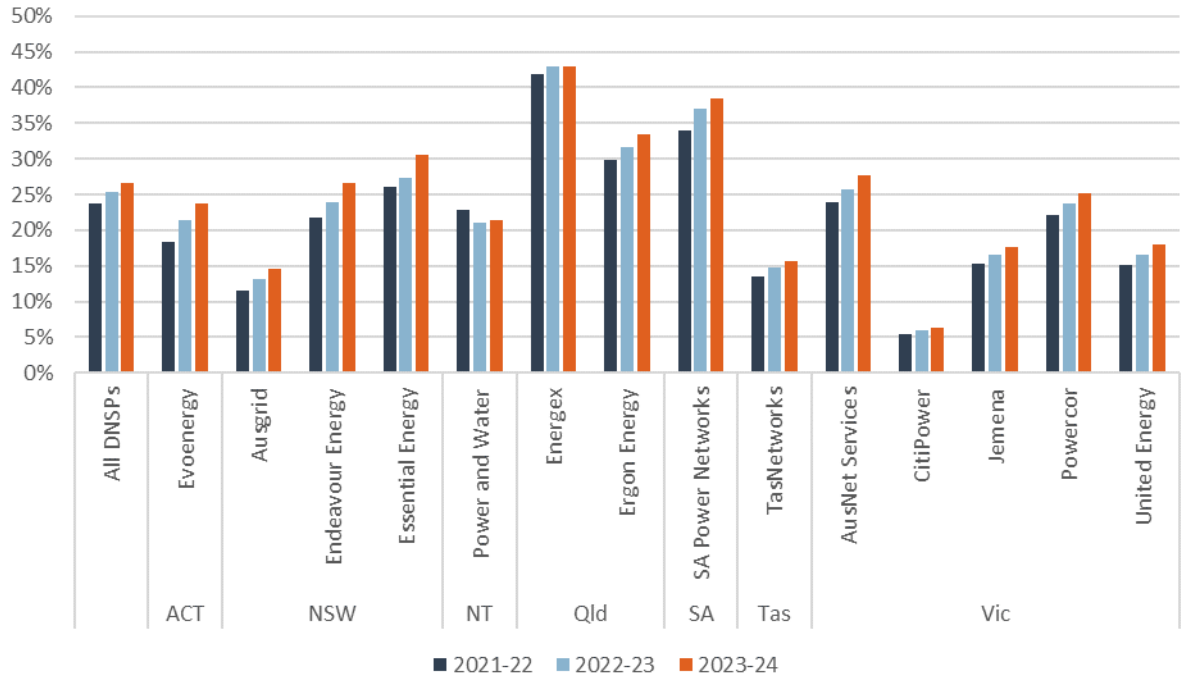
The number of customers using export services increased for all DNSPs over the last year. Twenty-six point five percent (26.5%) of DNSP customers used export services in 2023–24, up from 25.4% in 2022–23 and 23.7% in 2021–22. Ausgrid, Essential Energy, Evoenergy and Endeavour Energy had the highest increases, with each DNSP's export customer numbers increasing by at least 12% in 2023–24.

Energex had the lowest increase in export customers (up one percent compared to 2022-23), however they have the highest proportion of export customers at 43.0%. The smaller

increase in export customers, and growth in Energex's customer base, resulted in a lower increase in its overall proportion of customers using export services.

The overall slowing in the rate of increase in customer numbers may be driven by changing costs and benefits for installing CER, which vary by location. Current cost of living pressures may also be contributing to a slowing rate of increase. Locations with lower CER costs, higher daytime electricity supply tariffs and higher feed-in tariffs are likely to have a faster rate of uptake of CER and export services. As the customer base for each DNSP grows, and new CER technologies become more readily available, effectively integrating and orchestrating CER will be crucial to ensuring there are ongoing opportunities for new export customers, and upgrades by existing export customers. Figure 3.1 shows the proportions of export customers for each electricity DNSP over the measured period.

Figure 3.1 Proportion of customers using export services



3.1.1 Smart meter usage

Smart meters are electricity meters that can automatically measure certain customer data at regular intervals. Smart meters support the deployment of export services because they allow DNSPs to see local customer voltage levels and the timing and volume of exports. This helps them to better manage the peaks and troughs in demand on their network. For consumers with CER who are willing and able to participate in demand response and change the time of some of their consumption or generation throughout the day or night, smart meters also present an opportunity to reduce their electricity costs. All Victorian electricity customers have had smart meters since 2013 under Victorian Government policy, while other networks have less smart meter penetration.

New solar customers have been increasingly required to have net-metering capabilities (via smart meters) since 2010.[14] While this has resulted in a gradual increase in the proportion of export customers with smart meters, many customers remain without smart meters.

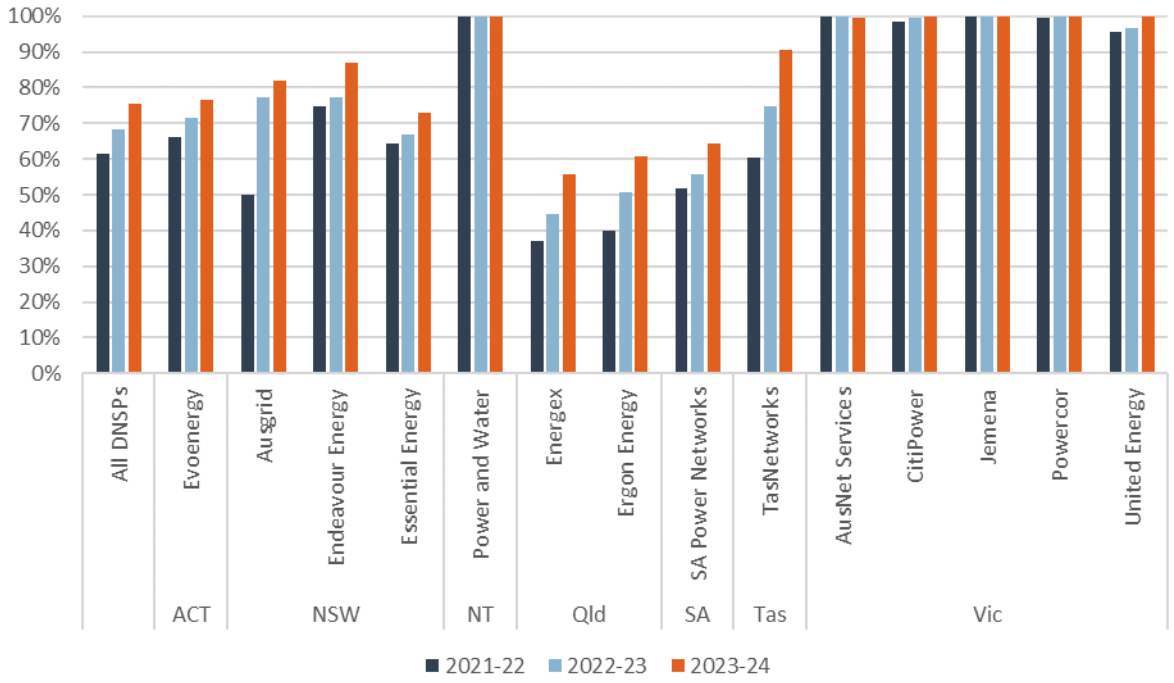
In November 2024, the AEMC published a rule change to accelerate the deployment of smart meters by 2030. The rule change supports recommendations made in the AEMC's metering review and includes reforms that accelerate the deployment of smart meters, improve network access to power quality information and improve the consumer experience with smart meter installation and use. The rule change includes a two-year transitional period in which retailers are required to seek explicit informed consent from customers before changing their tariff structure following a smart meter upgrade.[15]

As of 2023–24 more than three-quarters of all export customers have smart meters. Some DNSPs note that lower than average reported proportions of export customers with smart meters in their networks may be due to high numbers of solar installations occurring before net-metering and smart meters were required. As the smart meter rollout continues, DNSPs will have greater visibility of export data, enabling more efficient network operations. This benefits all consumers. Figure 3.2 shows the proportions of export service customers with smart meters for each DNSP over the measured period. TasNetworks has had the largest growth in 2023–24, increasing by 16 percentage points. Energex also recorded a large increase in smart meters, growing by 11 percentage points, however it remains the DNSP with the lowest smart meter penetration.

[14] Net metering is when solar generated electricity is first used to meet any household consumption and/or battery storage that takes place at the time of generation, before exporting any excess electricity onto the network.

[15] AEMC, Accelerating smart meter deployment, Australian Energy Market Commission

Figure 3.2 Proportion of export service customers with smart meters – 2021–22 to 2023–24

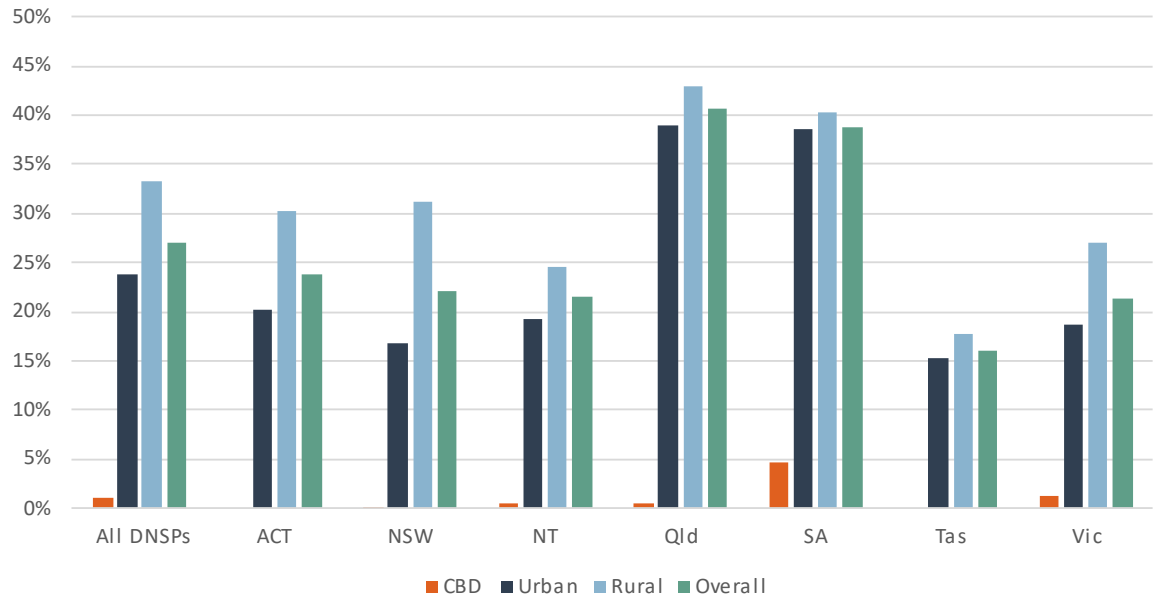


3.1.2 Customer numbers across feeder zones[16]

Data provided by DNSPs (as shown in Figure 3.3) shows that customers on rural feeders are the most likely to be users of export services across all states and territories, conversely central business district (CBD) customers are the least likely. The higher density of customers and the associated lower roof space available for solar installations per customer (for example, for customers in apartment buildings) drives lower use of export services in CBD areas.

16 A feeder means a power line, including underground cables, that is part of a distribution network. Depending on the DNSPs feeders classifications and the location of the network, DNSPs may report customers on CBD feeders, urban feeders, short rural feeders, long rural feeders or a combination of feeders.

Figure 3.3 Proportion of customers using export services by feeder classification – 2023–24



Note: DNSPs in the ACT and Tasmania do not classify any feeders as serving CBDs.

3.2 Export capacity

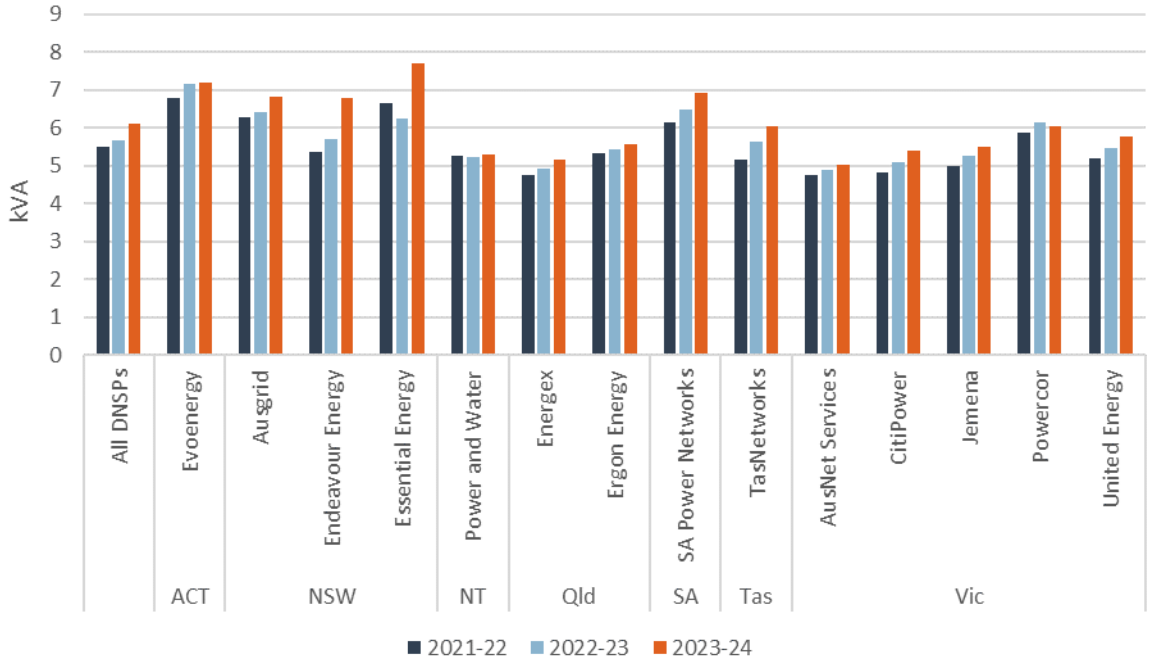
Average export capacity per export customer across all DNSPs increased to 6.1 kVA in 2023–24, up from 5.7 kVA in 2022–23 and 5.5 kVA in 2021–22.

Export capacity per customer is influenced by several factors, including:

- higher or lower export limits by DNSPs – this is discussed further in chapter 4
- reduction in the cost of PV systems over time, as lower installation costs encourage customers to install larger CER systems
- changes in electricity import or export tariffs, which may incentivise larger or smaller CER installation sizes.

Figure 3.4 shows the average export capacity per export customer for each DNSP in 2023–24. Essential Energy had the highest average export capacity per customer at 7.7 kVA, increasing from 6.3 kVA in 2022–23. AusNet Services' average increased slightly in 2023–24 but remains the lowest average export capacity at 5 kVA.

Figure 3.4 Average export capacity per export customer



3.3 Battery penetration

On-site batteries are currently the second most popular exporting technology at about 4% usage among export customers in 2023–24. In future reports we may include data on other emerging technologies, such as electric vehicle-to-grid capabilities.

In 2023–24, more than 16% of all new export customers with rooftop solar also had an accompanying small-scale battery installed, up from just over 11% in 2022–23.[17]

As shown in Figure 3.5, the proportion of customers with batteries has been increasing across all DNSPs. Evoenergy and SA Power Networks had the highest proportion of customers with batteries of all DNSPs in 2023–24 at 12% and 11% penetration respectively.

Battery penetration may be influenced by electricity price incentives (such as low feed-in tariff rates), national schemes like the Clean Energy Council's Home Battery Saver Program,[18] or differences in state/territory government policy incentives (for example, the ACT Government's Sustainable Household Scheme[19] and the NSW Peak Demand Reduction Scheme).[20]

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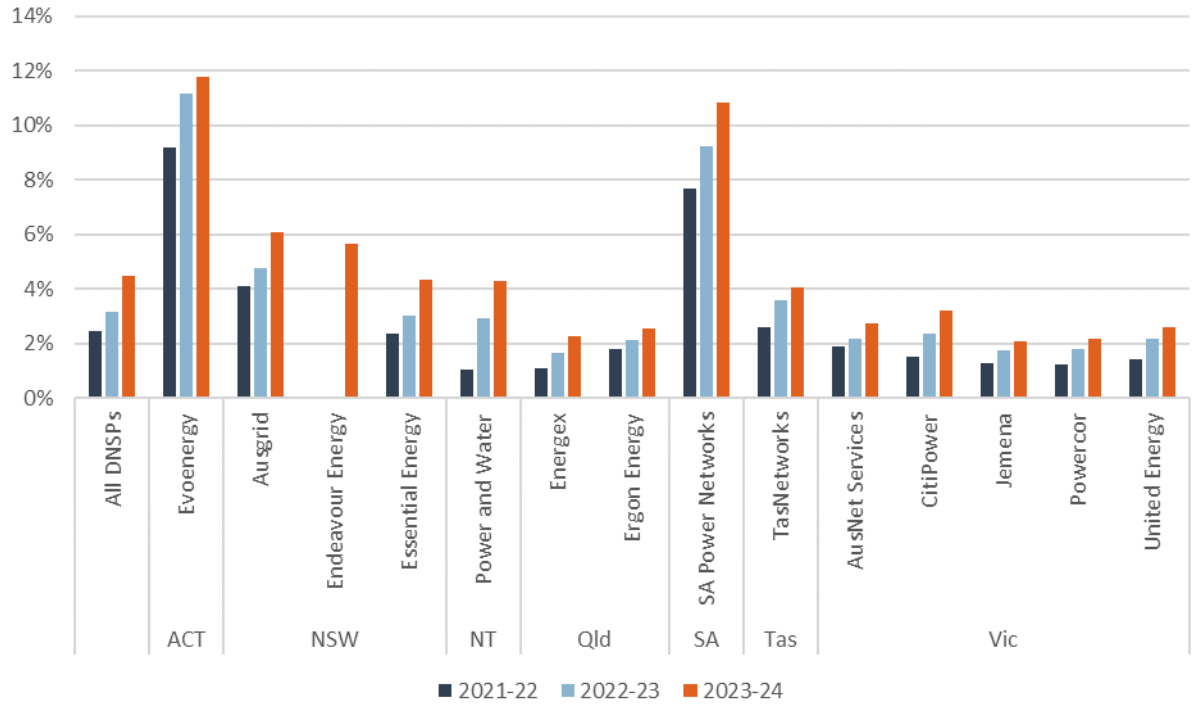
17 Following system upgrades enabling them to track battery connections, Endeavour Energy reported the number of export customers batteries for the first time in 2023-24. However, data could not be backdated to determine which year the battery was installed, as a result 16,811 export customers were reported with a battery in 2023–24. To avoid falsely inflating the percentage increase for 2023–24, Endeavour Energy were not included in this calculation.

18 Clean Energy Council, Home Battery Saver Program.

19 Everyday Climate Choices, Sustainable household scheme, ACT Government.

20 NSW Climate and Energy Action, Peak Demand Reduction Scheme, NSW Government.

Figure 3.5 Proportion of export customers with a battery



Note: Endeavour Energy began reporting customers with batteries in 2023–24.

3.4 Energy exported by customers with smart meters

Smart meters allow DNSPs to measure the amount of energy exported by customers. Exports from customers without smart meters generally cannot be directly measured by DNSPs.

Export volumes are influenced by several factors, including:

- An increased amount of installed solar PV capacity will increase the volume of energy exported.
- Increased smart meter penetration rates (Figure 3.2) ensure a higher proportion of exported energy is measured.
- Increased overall demand for electricity (for example, due to electrification of buildings and transportation) will reduce export volume as a proportion of total energy delivered.
- Increased self-consumption of PV electricity (for example, facilitated by batteries, smart devices or electric vehicles) will reduce the volume of energy exported.
- Periods of sunnier weather will result in increased exports as customers generate more electricity from their on-site solar, while years with less sunny weather will result in reduced exports.
- Years without extreme hot or cold weather may cause customers to self-consume less electricity for heating and cooling, resulting in them exporting more of their generated solar power to the network.

More than 14 million MWh of energy delivered in 2023–24 came from export customers with smart meters, representing 10% of all energy delivered, up from 8% in 2022–23. SA Power Networks had the largest increase with over 20% of all energy delivered on their network exported by customers with smart meters (Figure 3.6).

Figure 3.6 Export volume from customers with smart meters as a proportion of total energy delivered – 2021–22 to 2023–24

3.5 Export reward tariffs

Export customers use the distribution network to export their excess electricity to other customers. DNSPs are increasingly making investments and providing services to support the export capability of their customers. Historically, these investments have been funded through the tariffs on electricity imports that are paid for by all customers, including customers that do not export or have the option to export, such as some renters and apartment residents.

Following a rule change in 2021 designed to improve the integration of CER into the electricity grid, DNSPs may propose two-way tariffs (export reward tariffs) that match the two-way flow of electricity imported from the grid and electricity exported to the grid, such as from rooftop solar systems.[21]

Export reward tariffs are charges and payments/rewards that DNSPs are able to implement for the export services they provide. They allow for DNSPs' export investments to be funded by exporting customers on the network. These tariffs are designed to encourage exporting customers to self-consume or store their own solar electricity during the middle of the day

[21] AEMC, Access, pricing and incentive arrangements for distributed energy resources, Australian Energy Market Commission

when the costs to host excess solar on the network are high and to export to the network, or self-consume, during the evening consumption peak when generation on the network is lower and exports will benefit all customers.

Export reward tariffs include a charge component for using the network to export electricity into the grid during periods of maximum generation (for example, the middle of the day), and a component that rewards customers for exporting electricity into the grid when it is needed most (for example, during evening peak periods when generation is lower).

Export rewards are in addition to (that is, independent of) any feed-in tariff for the exported electricity that the customer receives from their retailer.

Currently customers who export solar electricity into the network can receive a feed in tariff paid to them by their retailer for the electricity they export.[22] Export reward tariffs are different to feed in tariffs as they are charged by DNSPs to retailers in relation to their customers' use of the network. The availability of export reward tariffs for retail customers will depend on the offerings made available by each retailer, as retail tariffs are not required to reflect the tariffs charged to them by the network. How retailers ultimately present or charge export reward tariffs to customers will be determined by each individual retailer.

Export reward tariffs are not yet available across all distribution networks. They were introduced by NSW DNSPs from 1 July 2024 after those DNSPs justified the need to introduce these tariffs in their networks. From 1 July 2025, NSW retailers can include export reward tariffs as part of their retail offers to customers. Distributors in South Australia and Queensland have proposed export reward tariffs, for which the AER will issue a final determination in April 2025. All DNSPs will be allowed to implement export tariffs by 2026;[23] however, actual implementation depends on the individual DNSP.

DNSPs can only propose new network tariffs (including export reward tariffs) as part of their tariff structure statements, which are submitted to the AER for approval at the start of each 5-year regulatory control period.

The introduction of export reward tariffs includes a 10-year transition period requiring DNSPs to include a basic export level under which a customer will not attract any charge for exporting. The basic export level is also proposed as part of a DNSP's proposed tariff structure statement. Each DNSP will determine the basic export level on its network as it prepares to introduce export reward tariffs.

The basic export level is the threshold (calculated by reference to capacity, energy or other measure permitted in a distribution determination) up to which a customer may export electricity during the export charging period for free.

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22 Some customers may also receive a feed in tariff paid to them by their state or territory government under legislated schemes for a set period. These schemes are closed to new customers but may continue to pay tariffs to existing customers for the duration of the set period.

23 AER, Export tariff guidelines, Australian Energy Regulator.

How DNSPs determine the basic export level

Each DNSP will establish the basic export level (BEL) for their network as they prepare to introduce export tariffs and rewards. Not all DNSPs have finalised the mechanism they will use for determining their BEL at this time.

DNSPs who have developed a BEL considered similar metrics to those they used to determine network hosting capacity (see chapter 4), with additional modelling and forecasting of power flows. This enables DNSPs to determine a BEL that best represents the maximum load per customer on their network before network investment or augmentation is required.

DNSPs in NSW were the first to introduce export tariffs and rewards and have finalised all information relating to their BELs. Details of the BELs of DNSPs that have developed them are shown in Table 3.2.

Table 3.2 Basic export levels

State/ territory	DNSP	Basic export levels
NSW	Ausgrid	6.85 kWh/day (2,500 kWh/annum) between 10am and 3pm
	Endeavour Energy	8 kWh/day (2,920 kWh per annum) between 10am and 2pm
	Essential Energy	7.5 kWh/day (2,737.5 kWh per annum) between 10am and 3pm
Qld	Energex	1.5 kW between 11am and 4pm daily for residential customers 1.5 kW between 11am and 1pm daily for business customers
	Ergon Energy	1.5 kW between 11am and 4pm daily for residential customers 1.5 kW between 11am and 1pm daily for business customers
SA	SA Power Networks	11 kWh/day for those with basic meters 9 kWh/day for those with smart meters, between 10am-4pm daily
Tas	TasNetworks	10 kW single phase and 30 kW for multi-phase

Note: The TasNetworks' BEL has not yet been submitted to or approved by the AER. It will be assessed by the AER (including with opportunity for stakeholder submissions) when it is submitted as part of an export reward tariff within a proposed tariff structure statement.

4 Export limits and curtailment

Export services are part of the core services provided by DNSPs. Electricity customers that invest in CER, such as rooftop solar PV, expect to be able to use the electricity they generate and export excess electricity to the grid. These exports provide benefits to all customers by increasing electricity supply competition. However, DNSPs impose export limitations to ensure that any energy exported is within the network's hosting capacity.

Network hosting capacity

Hosting capacity refers to the ability of a power system to accept energy generated by consumer energy resources without adversely impacting power quality, such that the network continues to operate within defined operational limits (without experiencing voltage or thermal violations). Hosting capacity varies by location and time due to changes in consumption and the level of consumer energy resource penetration.

Distribution networks have an intrinsic level of capacity to host a certain level of consumer energy resource exports within operational limits. This is because network assets constructed for consumption services have the capacity to support some reverse power flow without additional investment.

Curtailment is sometimes necessary to ensure that network power quality is not negatively impacted. However, inflexible curtailment can also unnecessarily restrict customer exports. Technologies that are in the process of being deployed, such as flexible export limits and inverters capable of voltage response, help to maintain power quality while not unnecessarily restricting exports.

For this report, export customer curtailment is defined as the reduction in a customer's exports due to a network constraint.[24] Curtailment can be quantified as the difference between the amount a customer's CER is allowed to export and the theoretical potential output of the installed CER if no network constraint was present.

DNSPs control or have influence over several forms of CER curtailment:

- **Export limits** – Export limits are imposed on customers by their DNSP when customers install rooftop solar PV. Export limits may be static or flexible and set the maximum level of export that a customer is allowed at any time.
- **Voltage-response curtailment** – Modern inverters are designed to limit customer generation in response to a high local distribution network voltage. This may prevent customers from both exporting electricity to the grid and self-consuming their own generated electricity.

[24] AEMO may also direct DNSPs under the emergency backstop mechanism to curtail CER output to support system reliability, such as in an extreme minimum demand scenario. This form of curtailment is not directly influenced by DNSPs, so it is not a focus of this report.

- **Network outages** – Like electricity imports, customer exports are constrained when there is a network outage. This type of curtailment is addressed in the Electricity and gas network performance report and is not a focus of this chapter.[25]

The total amount of energy curtailed per customer by a DNSP would be a valuable metric for measuring export service performance. However, in general, DNSPs do not currently calculate these estimates. Further, if these estimations were made, the methods would need to be sufficiently similar between DNSPs to be comparable. We are continuing to work with DNSPs to enable consistent estimation of overall CER curtailment to enable an energy curtailed per customer metric to be provided in future reports.

In lieu of direct estimates of curtailment, several indirect measures of curtailment can be used for assessing network export service performance. These are summarised in Table 4.1. These metrics and how they are trending over time are discussed in more detail in the remainder of this chapter.

[25] AER, Electricity and gas network performance report 2024, Australian Energy Regulator.

Table 4.1 DNSP export limit and curtailment overview – 2023–24

State/ territory	DNSP	Average residential non-zero export limit (kVA)	Duration of export access against the export limit	Customers on static-zero export limits	Customers receiving overvoltage
–	All DNSPs	5.7	99%	0.64%	20.4%
ACT	Evoenergy	5.6	99%	0.04%	12.2%
NSW	Ausgrid	-	-	0.00%	51.6%
	Endeavour Energy	6.5	100%	0.00%	43.2%
	Essential Energy	9.3	99%	0.93%	4.2%
NT	Power and Water	5.0	100%	3.20%	3.0%
Qld	Energex	5.0	-	0.49%	-
	Ergon Energy	5.0	-	1.17%	-
SA	SA Power Networks	5.9	99%	0.08%	26.3%
Tas	TasNetworks	5.6	100%	0.00%	2.1%
Vic	AusNet Services	4.7	96%	1.67%	11.4%
	CitiPower	5.0	99%	0.98%	0.7%
	Jemena	4.3	100%	0.05%	0.4%
	Powercor	5.0	99%	1.89%	1.8%
	United Energy	5.0	99%	0.19%	1.1%

Note: Data for "All DNSPs" are weighted averages based on total export customer numbers. A dash '–' signifies that a DNSP did not report the relevant metric. Ausgrid do not set export limits for customers and therefore do not measure the duration of export access against an export limit.

4.1 Static export limits

The export of excess energy generated from consumer energy resources within distribution networks has generally been managed through static export limits. By setting conservative static limits, DNSPs can keep generation within a network's hosting capacity and share that capacity across all customers.

Static export limits set the maximum level of export that a customer is allowed at any time. They do not guarantee a fixed or maximum level of export, because a customer's ability to export is still subject to local system constraints.

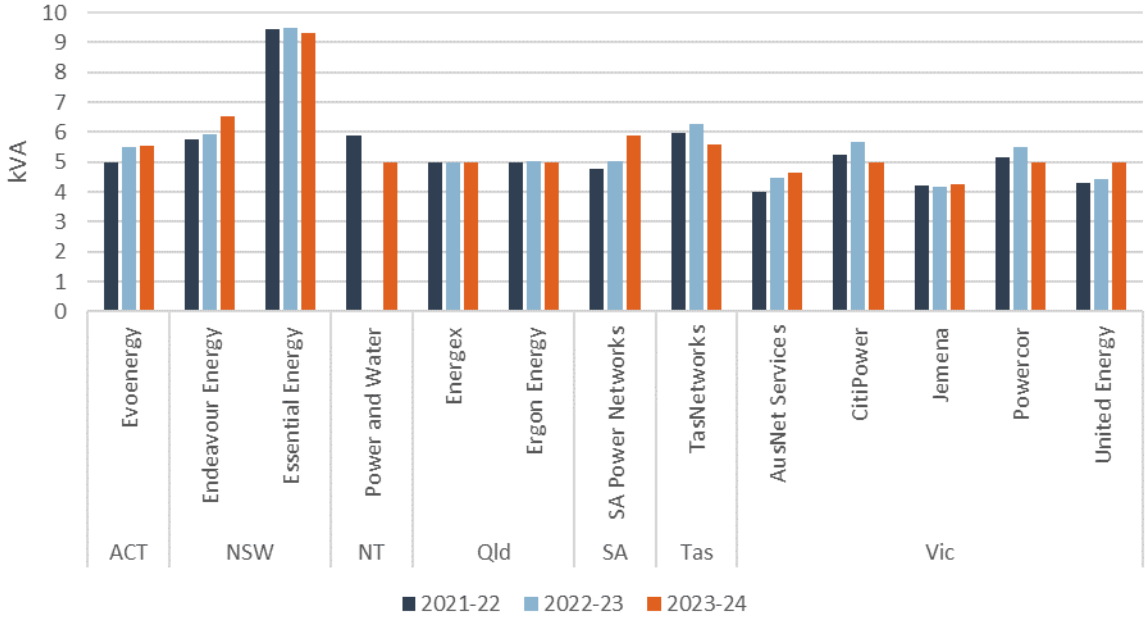
DNSPs generally set static limits at a level that is considered safe when the network is congested, reflecting periods when the network will not be able to accommodate additional exports. These conservative limits constrain consumers during times when there may still be capacity to export to the network.

Static limits do not guarantee a fixed or maximum level of export; rather, they provide a general indication of export capability. As more consumer energy resources are connected, consumers may face lower static export limits due to DNSPs seeking to avoid the risk of breaching operational limits.

Static limits are the primary source of export curtailment. The average size of a new small-scale rooftop solar installation in Australia is increasing and has passed 9 kW.[26] However, the standard export limit for a customer of most DNSPs has remained below this level. In some locations, DNSPs are applying limits that are lower than 5 kW or even zero to protect network assets and maintain power quality.

Figure 4.1 shows the average non-zero export limits for residential customers in 2023–24. While we also collect export limit data on non-residential customers, these limits are more bespoke than for residential customers, so are not readily comparable between different DNSPs.[27]

Figure 4.1 Average non-zero static export limit, residential customers – 2022 to 2024



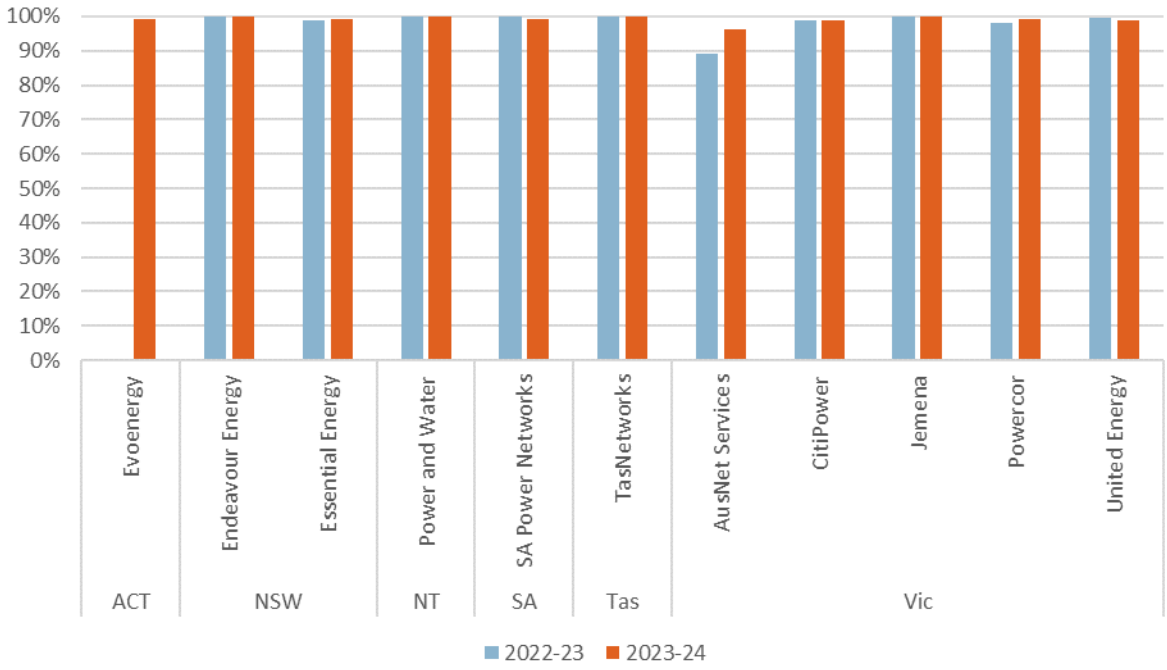
Notes: Ausgrid has not provided this metric as they report that they typically only apply a static export limit if requested by a customer. Ausgrid allow systems up to 10 kW per phase to connect automatically without any technical assessment provided that they comply with AS4777, noting that these systems are intended to automatically curtail when the network does not have capacity to accept export. Power and Water did not report an average non-zero export limit for 2022–23.
In 2020-21 Essential Energy only considered export customers that installed systems larger than allowed by their connection agreement to be on static non-zero export limits. Part-way through the 2022–23 financial year, Essential Energy changed its methodology so that any limit specified in a connection agreement is considered an static export limit, which aligns with typical practices of other DNSPs. This may lead to an overestimate of export limits for Essential Energy compared with other DNSPs in this figure.

26 Australian Photovoltaic Institute, Market Analyses, accessed 23 September 2024.

27 Average non-residential export limits can be accessed in the dataset that accompanies this report.

Figure 4.2 includes estimates from the DNSPs of how long their customers are able to export up to the limit (for example, they are not limited due to network voltage constraints). Most customers' exports are not constrained below their export limit most of the time.

Figure 4.2 Duration of full export access against the agreed export limit, Residential customers – 2023–24



Notes: Energex and Ergon Energy did not report this metric. Evoenergy commenced reporting on the metric in 2023–24. Ausgrid do not set export limits for customers and therefore do not measure the duration of export access against an export limit.

Standard residential export limits

Residential customers are typically provided with standard export limit offers for their connections. Network customers have a capacity allowance from networks for the electricity that they import, and some inherent export capacity is made possible from that connection. The standard limits vary between networks depending on how close those networks are to exceeding their inherent hosting capacity.

While the capacity of networks to provide export hosting capacity is often location-specific, DNSPs provide network-wide limits to inform customers of what export capacities they are likely to be allowed to connect quickly without further time-consuming or costly assessments.

The standard residential export limits applied by each DNSP are set out in Table 4.2. Some customers will be subject to local network constraints and will not be able to export up to the standard limits.

Table 4.2 Standard residential export limits

State/ territory	DNSP	Typical limit available for a single-phase residential connection	Details
ACT	Evoenergy	5 kVA	-
NSW	Ausgrid	10+ kVA	This is not an export limit, but a threshold above which assessment may be required before being approved
	Endeavour Energy	5 kVA urban, 3 kVA rural	–
	Essential Energy	5 kVA urban, 3kVA rural	–
NT	Power and Water	5 kVA	–
Qld	Energex	5 kVA	Only 2 kVA is available to customers on the single-wire earth return network
	Ergon Energy	5 kVA	Only 2 kVA is available to customers on the single-wire earth return network
SA	SA Power Networks	Flexible export limit: 10 kVA upper limit, 1.5 kVA lower limit	If customer is in a constrained area and chooses a static limit, a 1.5 kVA static limit is provided
Tas	TasNetworks	10 kVA	–
Vic	AusNet Services	0 kVA to 5 kVA	A site-dependent 0 kVA to 3 kVA flexible export limit is offered to constrained customers
	CitiPower	5 kVA	–
	Jemena	5 kVA	–
	Powercor	5 kVA	–
	United Energy	5 kVA	–

4.2 Static-zero export limits

Static-zero export limits are where a customer is constrained from exporting any electricity. Under our Connection charge guidelines for electricity customers,[28] DNSPs can only impose static-zero limits on customers in the following limited circumstances:

- the export from the generator will have a high probability of resulting in the DNSP not meeting a regulatory obligation to maintain the network within its technical limits (for example, voltage or power quality standards)
- the cost of augmenting the DNSP's assets to allow a reasonable export capacity outweighs the benefits arising from providing the additional export capacity.

A DNSP may also impose a static-zero export limit if it is expressly requested by a customer.

The increased adoption of flexible export limits provides an opportunity for DNSPs to offer alternative options to static-zero export limits. Flexible export limits make it possible for DNSPs to restrict customer exports at times where it may be necessary for network stability, while allowing exports to occur at other times.

As shown in Figure 4.3, the total proportion of export customers on static-zero export limits increased in 2023–24, with significant increases reported by Essential Energy and Power and Water. Powercor and United Energy changed their reporting methodology and provided revised figures for 2022-23 and 2021-22, which increased the overall proportion of customers on a static-zero export limit to 0.54% for 2022-23 (previously reported as 0.39% in the 2023 Export services network performance report).

This year, Essential Energy changed its approach to approving export customer connection applications to reduce the number of applications rejected due to incorrect application details. This occurs more often in locations requiring significant effort in relation to Voltage Rise Calculations,[29] such as caravan parks and retirement villages. By initially approving a static-zero export limit, Essential Energy aim to ensure customers can connect now and then reapply for an export limit in the future, after the necessary information is obtained. If Essential Energy were excluded due to this changed approach, the overall proportion of export customers on static-zero export limits would be 0.60% in 2023-24. With Essential Energy included, 0.64% of export customers were on static-zero export limits in 2023-24.

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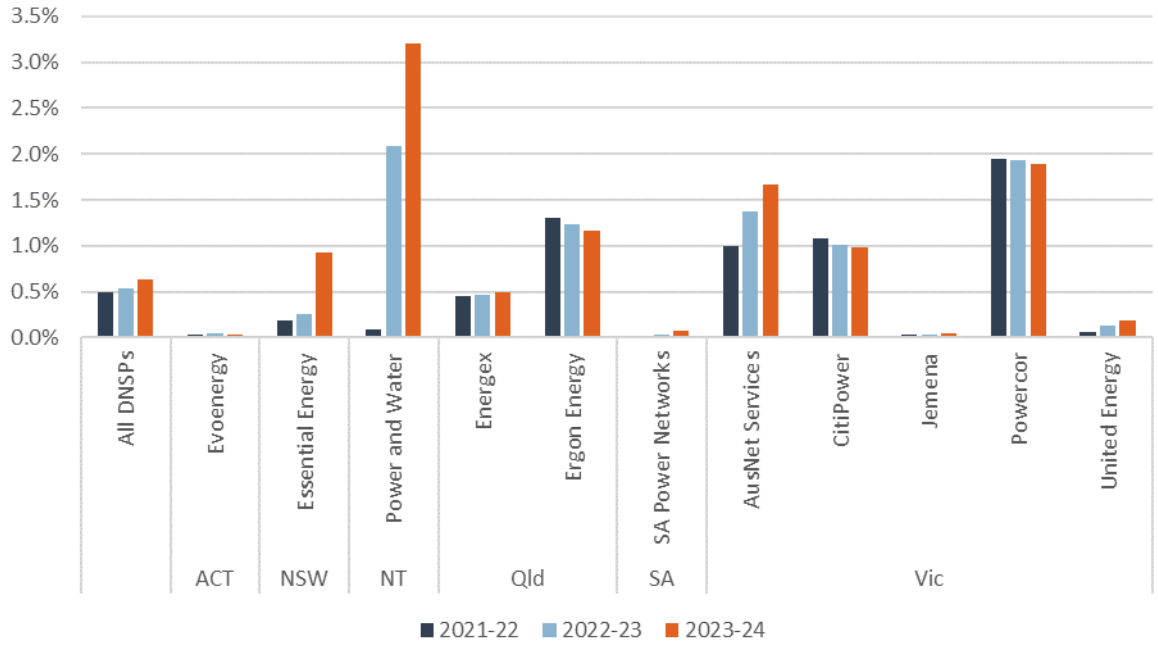
28 AER, Connection charge guidelines for electricity consumers – April 2023.

29 Voltage rise calculations are required to support a safe installation of rooftop solar PV. It ensures the electrical cables are sized appropriately between the solar PV installation and customer's switchboard, and to the connection to the network.

Figure 4.3 Proportion of export customers on a static-zero export limit



Note: Over the measured period Ausgrid and Endeavour Energy report having no static-zero export limit customers, while TasNetworks report having under 0.01% of its customers on static-zero export limits.

Application of export limits by DNSPs

DNSPs impose export limits to protect network equipment and to safeguard customer power quality. The reasons that limits are applied vary by location. Some sites require limits to reduce the risk of capacities being exceeded on network feeder cables or distribution transformers, while others have limits to reduce the risk of nearby customers being subject to over-voltage.

Unlike the other DNSPs, Ausgrid and Endeavour Energy currently have sufficient hosting capacity and do not require any customers be on static-zero export limits. SA Power Networks only has static-zero export limits on customers in constrained locations who have elected not to have a flexible limit.

The increased use of flexible export limits, advanced inverters and other technologies may mitigate the need for networks to apply increasingly stringent export limits to their customers as their hosting capacity changes in the future.

4.3 Flexible export limits

The introduction of flexible export limits provides customers the opportunity to export greater volumes of electricity into the network than a static export limit when congestion is low or there is demand for it.

Flexible export limits provide customers with a lower limit (minimum) and an upper limit (maximum) for the amount they may export. The customer's DNSP actively monitors and varies the customer's maximum allowable exports within the upper and lower limits in response to network demand and congestion.

Customers on a static export limit have a fixed maximum export limit, regardless of the size of the solar installation or available capacity on the network. Conversely, customers with a flexible limit may be set at a 10 kW limit most of the time and then be limited to 1.5 kW at times when there is network congestion. Customers with a static export limit of 5 kW can only export up to this amount, even if they have the capacity to export more. Customers located in networks that are already heavily congested may have a static export limit of 0 kW (that is, a static-zero export limit).

Flexible export limits benefit all DNSP customers because they allow DNSPs to defer the need for costly network investment by better utilising existing network hosting capacity. Efficiently hosting and coordinating consumer CER devices can result in a reduction in the wholesale energy component of all customers electricity bills, as well as providing owners of CER with greater value from their investment.

In 2022–23 flexible export limits were only available in small-scale trials through AusNet Services, Energex, Ergon Energy and SA Power Networks. These trials have been finalised and all 4 DNSPs now offer flexible export limits to at least some customers on their networks. Queensland DNSPs Energex[30] and Ergon[31] offer flexible export limits to all customers with compliant systems under their dynamic connections offering.[32] SA Power Networks is progressively rolling out flexible export limit availability across its network and will offer flexible export limit options to all customers by the end of 2023–24.[33] Victorian DNSP AusNet Services offers flexible export limits to customers who would otherwise be limited to no more than 1.5 kW fixed export per phase and will continue to develop and extend the offer to more customers in the future.[34]

Other DNSPs are developing their flexible export limits offerings, with Powercor commencing a flexible services trial in 2023–24 and Jemena indicating they are currently considering flexible export limits from 2026.[35]

The number of customers with flexible export limits is shown in Figure 4.4. SA Power Networks commenced rolling out optional flexible export limits across its entire network in 2023–24, resulting in the largest increase since 2022–23 and the largest number of customers with flexible export limits by a significant margin. Energex and Ergon have also made flexible export limits available across their entire network and have reported large

30 Energex, Dynamic Connections.

31 Ergon, Dynamic Connections.

32 Compliance requirements are in accordance with STN3510 Dynamic Standard for Small IES connections, which is set by Energex and Ergon Energy.

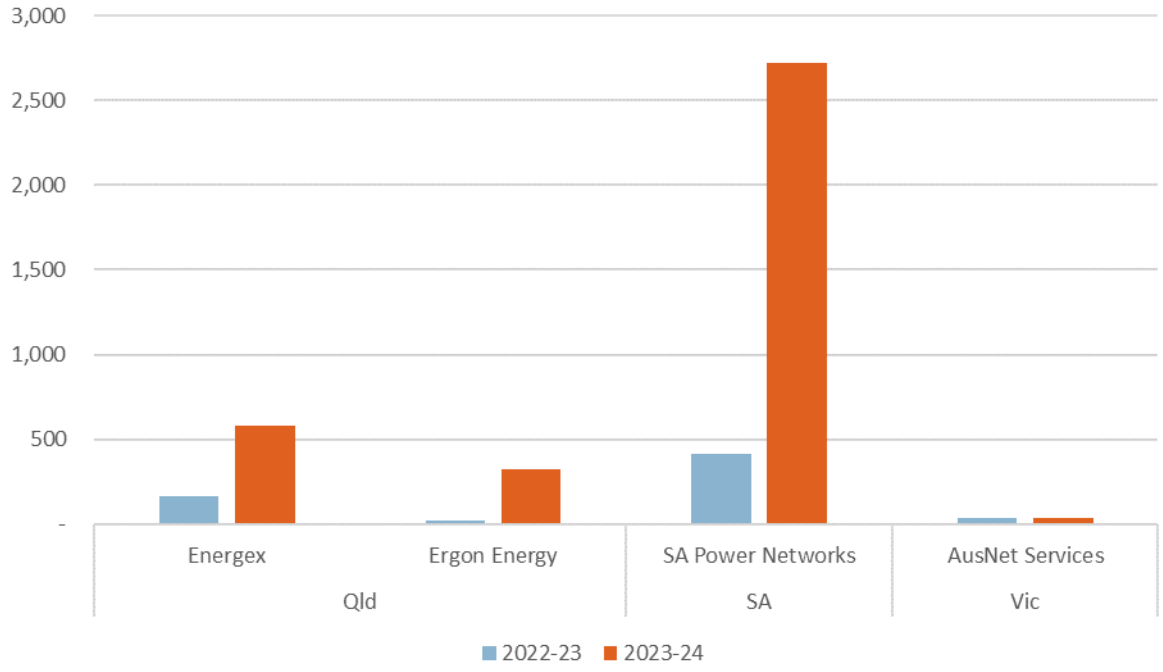
33 SA Power Networks, Flexible Exports.

34 AusNet Services, Flexible Exports.

35 Jemena, Future Networks.

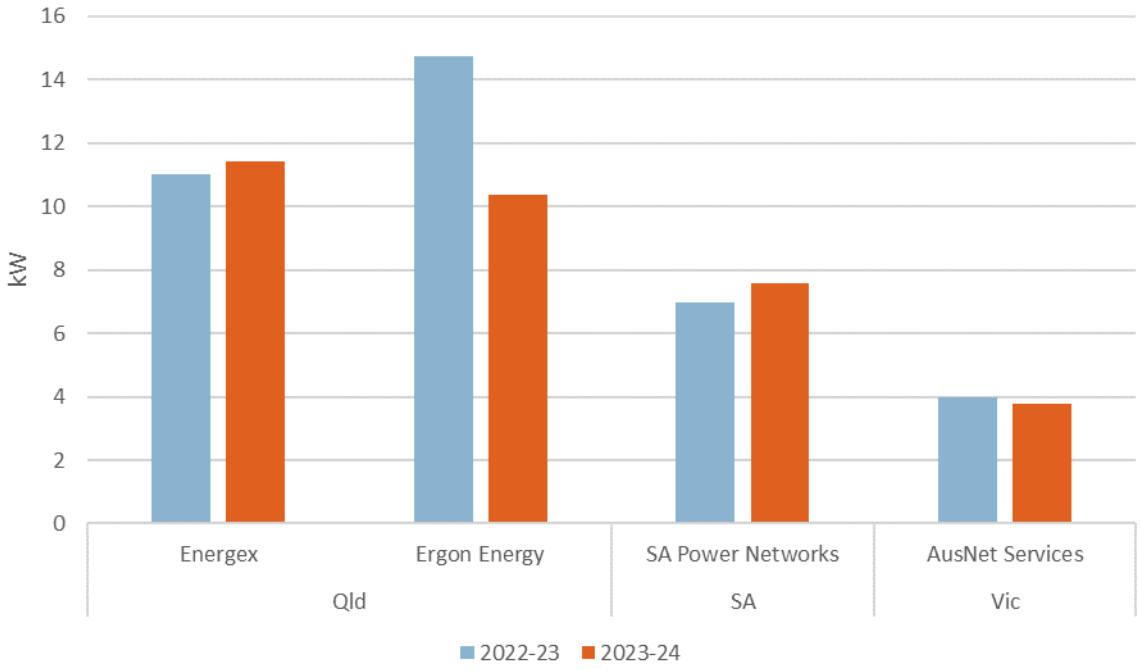
increases from 2022–23. AusNet Services has maintained the same number of customers from 2022–23.

Figure 4.4 Flexible export limit customer numbers



The upper limits of customers with flexible export limits are shown in Figure 4.5. Energex has seen a slight increase since 2022–23 to have the highest recorded average upper limit in 2023–24 of 11.4 kW. Ergon Energy had the highest upper limit in 2022–23 but experienced a large decrease in the average upper limit in 2023–24, reducing from 14.7 kW to 10.4 kW. Ergon Energy attributed the decreased average upper limit to an increase in customers with flexible export limits, which has reduced the overall average.

Figure 4.5 Average upper limit for customers with flexible export limits



Note: AusNet Services report upper limits on a per-phase basis. SA Power Networks changed its methodology in 2023–24, from a per-phase basis to a per-site basis. Ergon Energy and Energex report an aggregate of the upper limit of each phase for customers with more than one phase.

How DNSPs share information about export limits with customers

The majority of DNSPs share information about static export limits, flexible export limits and basic export levels with consumers via their website, with many hosting a dedicated page containing all relevant information for consumers and installers wishing to install rooftop solar. DNSPs generally also share this information with installers during the pre-approval process and publish this information each year within the Distribution Annual Planning Report.

Appendix A provides an overview of how each DNSP shares information with their customers.

4.3.1 Export limit guidance note

In October 2024 we published a guidance note on export limits that sets out our expectations relating to flexible and static export limits. The guidance note is a non-binding document aimed at providing guidance to DNSPs to support the efficient implementation of flexible export limits.[36]

The guidance note establishes interim guidance on key areas relating to the implementation and use of export limits, including:

- network hosting capacity assessment and capacity allocation,

[36] AER, Export limit guidance note, Australian Energy Regulator.

- revenue determinations,
- key considerations for designing and implementing flexible export limits, and
- reporting.

DNSPs should refer to the guidance note when seeking to apply and maintain export limits (flexible and static).

The AER will continue to monitor the progress of DNSPs implementation of flexible export limits to determine whether non-binding guidance has been effective in driving DNSP practices and behaviours and mitigating the risk of consumer harm.

Export service levels

DNSPs have noted that improved network and power quality data from the rollout of smart meters can be utilised to better manage power flows on the network and benefit consumers. Improved data should enable DNSPs to better forecast network power flows and more effectively utilise their network capabilities to offer improved export services by way of increased export capacity and reduced DNSP export curtailment.

As DNSPs consider how to effectively and efficiently service export customers in the future and ensure export access availability for all customers, they may implement other indicators to measure their performance and effectively plan for future CER integration and capacity needs. As part of a regulatory proposal, a DNSP must present information specifically relating to how CER integration is managed through the different elements of its proposal (that is, connection services, pricing, expenditure) and discuss how its proposal is appropriate to meet expected consumer outcomes.

In SA Power Networks current regulatory proposal for the 2025 to 2030 period, the CER integration business case proposes expenditure to maintain particular export service levels, being the proportion of daylight hours that a customer can export to the distribution network without experiencing curtailment.[37]

SA Power Networks seek to utilise export service levels as part of its CER integration strategy to ensure that export service levels are maintained and that customers do not experience a decline in the amount they are able to export due to increasing uptake of CER and demand for export services. It proposes to do this by introducing a proactive investment program to maintain a 95% export service level during daylight hours, for 95% of customers from 2025 to 2030. This program is targeted at small embedded generators operating under a basic connection only.

[37] This service level measure accounts only for the frequency that customers would experience an export limit below the upper limit of their connection (i.e. 10 kW). It does not account for the magnitude of the curtailment placed on their system, or the amount of energy that is lost as a result.

4.4 Export limit compliance

Network customers do not always comply with export limits. Customers may inadvertently export above their allowed export limit if their inverters have not been configured by the installer to comply with the limit imposed by a DNSP. DNSPs do not have a widely used method of verifying or enforcing export limits in cases where customers are non-compliant.

Table 4.3 shows the proportion of customers that different DNSPs estimate to be complying with the static export limits nominated in their connection agreements. These values were reported by only 5 DNSPs and have a high degree of uncertainty. These estimates highlight inherent measurement challenges in some of the data provided in this report. These reported estimates may change as estimation methods are improved or as the levels of monitoring or regulation are increased. Work to improve compliance with CER technical standards is ongoing at the AEMC and energy market bodies.[38]

Table 4.3 DNSP estimates of customer compliance with export limits – 2023–24

DNSP	Estimated compliance with static export limits
Endeavour Energy	11%
Essential Energy	78%
Evoenergy	96%
Power and Water	94%
SA Power Networks	67%

4.5 Overvoltage and inverter technology

Network overvoltage

In this report, network overvoltage is considered to occur when an export customer's network voltage reaches a point where their generating unit should reduce its real power output in response to increased voltage.[39] This is typically considered to occur when network voltage exceeds 253 V.[40]

Overvoltage causes increased customer curtailment as inverters reduce power output in response to high voltage levels. As shown in Figure 4.6, network overvoltages do not show a clear overall trend over the reported 3-year period. Most DNSPs show a decrease in overvoltage in 2023–24, with Evoenergy showing the largest reduction. United Energy had a small increase in customers experiencing overvoltage due to a severe weather event in February 2024. In 2022–23, SA Power Networks was requested by AEMO to curtail exports by deliberately causing overvoltage while an interconnection to Victoria was being repaired

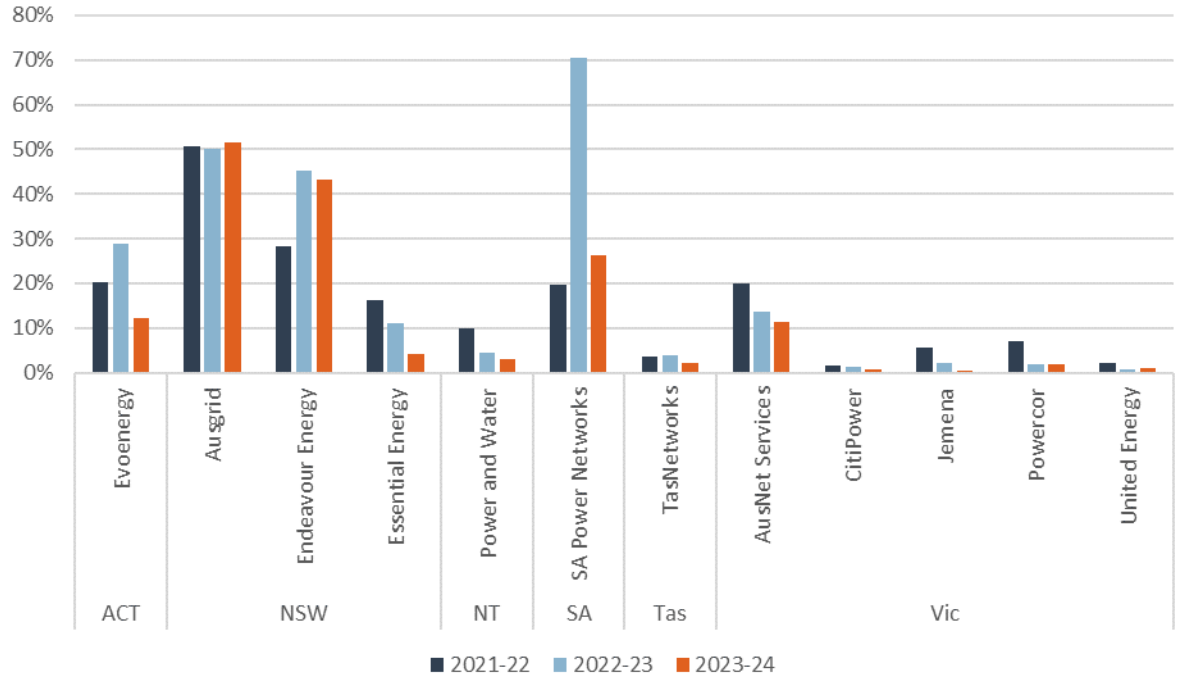
38 See "Customer installation compliance with inverter requirements" in section 4.5 of this report.

39 Some generating units may curtail at undervoltage conditions when reactive power response is enabled in inverters; however, we do not request networks to report at this voltage level.

40 The maximum steady-state voltage allowed by AS 61000.3.100-2011 and the voltage at which volt-watt curtailment occurs for inverters compliant with AS 4777.2(2020).

after storm damage. Not including this event, SA Power Networks noted that overvoltage occurred for 35% of customers in 2022–23 rather than the 70% value recorded.

Figure 4.6 Proportion of customers receiving overvoltage



Note: This chart shows the number of customers receiving overvoltage as a proportion of the total number of customers that have measured voltage levels. Energex and Ergon Energy do not currently have records of customers measured to receive overvoltage.

Since 2021, the National Electricity Rules require new inverters to comply with the standard AS 4777.2(2020). AS 4777.2(2020) is an update of the 2015 version of the standard, which requires inverters to be capable of a defined reduction of exports in response to overvoltage. The 2020 standard also requires inverters to be configured appropriately by installers so that overvoltage response occurs in practice. AS 4777.2(2020) requires inverters to respond in a defined way in response to voltage dips, improving system stability by minimising the sudden loss of CER during short duration low voltage events.

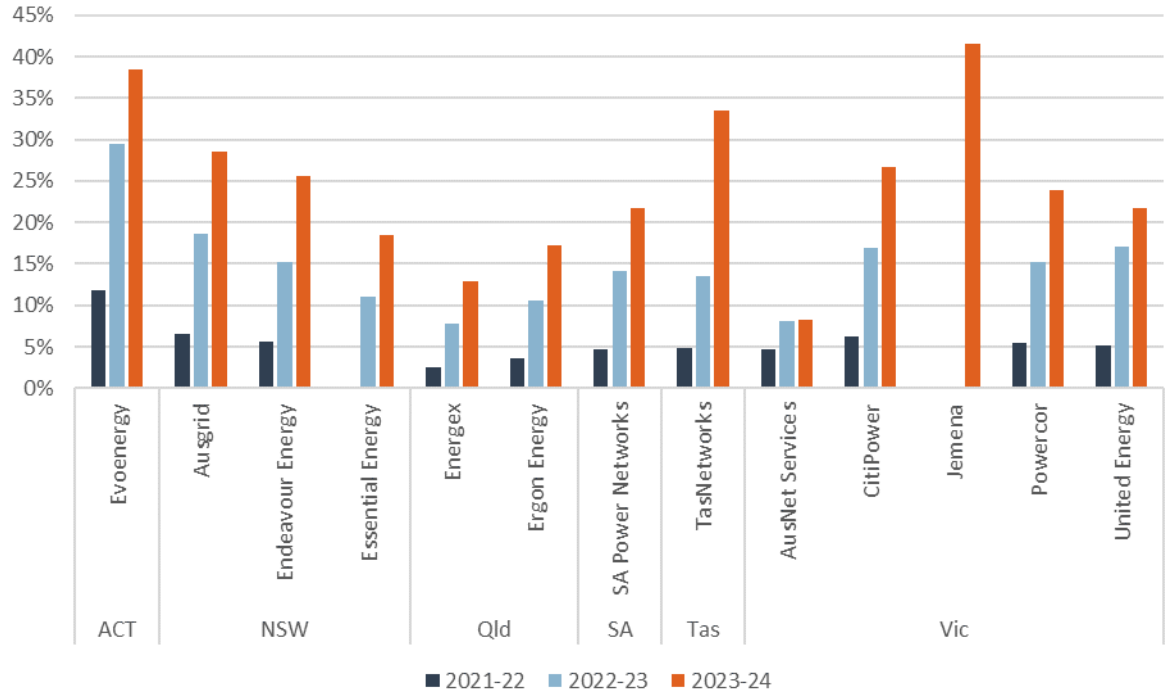
In August 2024, an amendment to AS4777.2 was published that addresses bidirectional charging and vehicle-to-grid (V2G) technology, including introducing new definitions to improve installation and compliance. The amendment will enable owners of V2G capable electric vehicles (EVs) to use the battery in their EV to power their home or export electricity to the grid for a profit.[41]

Figure 4.7 shows the proportion of export customers required to have AS 4777.2(2020) compliant inverters for each DNSP. The number of inverters required to be compliant with AS 4777.2(2020) has increased since the standard was mandated for new installations and continues to grow as customers replace or upgrade older installations. However, the majority

41 Standards Australia, AS4777.2 (Amd 2024).

of inverters for all DNSPs are not yet required to be compliant because they were installed before the standard was introduced.

Figure 4.7 Proportion of export customers required to have AS 4777 (2020) compliant inverters



Note: Power and Water did not report this metric. Jemena commenced reporting this metric in 2024.

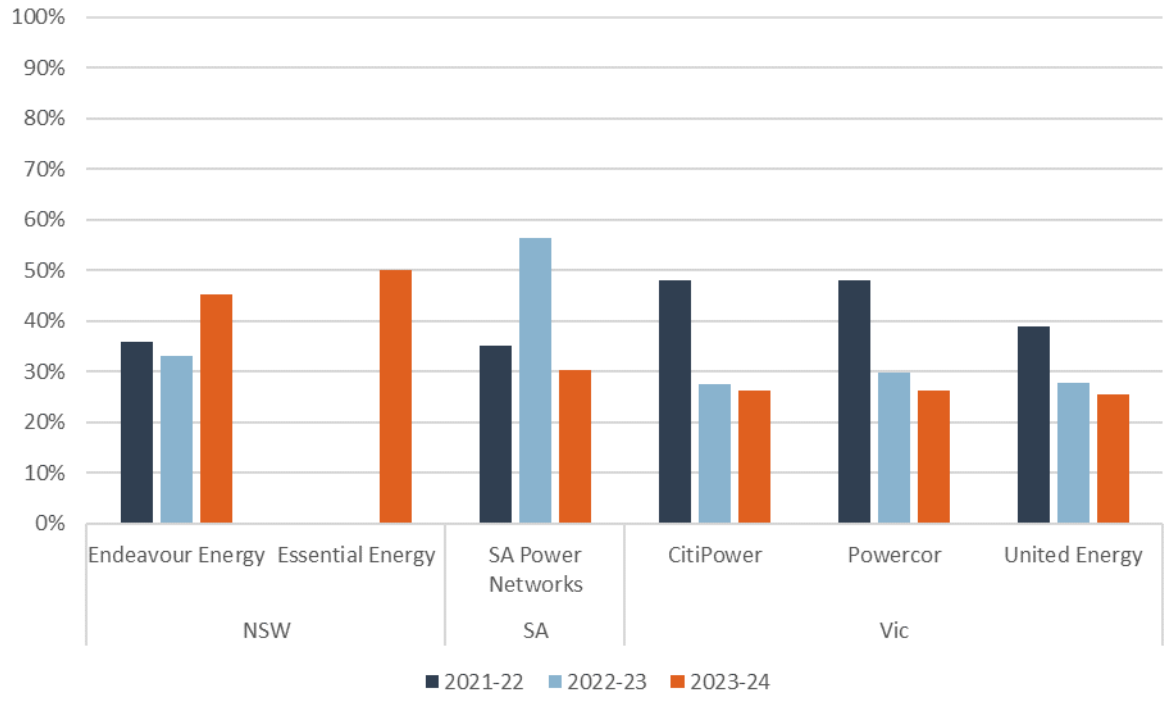
Customer installation compliance with inverter requirements

AS 4777.2(2020) requires CER installers to configure inverters to have appropriate settings applied at the time of installation. If the installer does not apply these settings, or the settings are changed by the customer after installation, the inverter won't respond to network voltage fluctuations as intended.

While there are generally no mechanisms to ensure that installers comply with AS 4777.2(2020), some networks have begun conducting surveys to estimate inverter compliance. These estimates are shown in Figure 4.8. As with compliance with static export limits (section 4.1), ensuring inverter compliance is an ongoing challenge. We consider technical compliance of CER to be a systemic challenge, rather than a problem that is specifically caused by or must be solved by consumers.

Following a recent review by the AEMC into consumer energy resource technical standards,[42] development of a national CER technical standards framework was recommended. As part of the National CER Roadmap released by the Energy and Climate Change Ministerial Council (ECMC) in 2024, a CER Taskforce, supported by Australian Renewable Energy Agency (ARENA) and the Distributed Energy Integration Program Steering Group, commenced work in 2024 to develop nationally consistent technical standards for CER device interoperability and flexibility, including V2G capabilities.[43]

Figure 4.8 Estimated non-compliance with AS 4777.2(2020)



Note: 2023-24 is the first year Essential Energy have reported this metric.

42 AEMC, Review into consumer energy resources technical standards, Australian Energy Market Commission.

43 ECMC, National CER Roadmap, Energy and Climate Change Ministerial Council, July 2024.

5 Time to provide an offer

DNSPs are responsible for assessing customer applications to connect CER to their networks, although they are generally not involved with the actual completion of the installation. Long wait times from when a customer applies for a connection to when the connection is offered by the DNSP results in a poorer connection experience for consumers and delays CER systems from coming online.

Table 5.1 provides a summary of the time taken for DNSPs to provide export connection offers to their customers. Power and Water Corporation takes the longest on average to provide export offers to customers by a significant margin (23 days for model standing offers and 164 days for other offers). The significantly longer time frames reported by Power and Water Corporation were attributed to delays in conducting network studies and with its reporting procedure, which does not account for customer delays when additional information is required.

On average, all other DNSPs provide export offers in accordance with their model standing offer within 3 days, except Essential Energy (5 days). Offers outside of model standing offers may involve bespoke arrangements between DNSPs and customers. Therefore, these are more difficult to compare between DNSPs than time taken to provide a standing model offer. Many DNSPs take longer than 20 days to provide an offer that is outside of their model standing offer (Energex, Ergon Energy, SA Power Networks and TasNetworks).

Table 5.1 Average time for DNSPs to provide a connection offer – 2023–24

State/ territory	DNSP	Time to provide a model standing offer (Days)	Time to provide a low voltage offer outside of the model standing offer (Days)
ACT	Evoenergy	2.2	10
NSW	Ausgrid	0-1	5
	Endeavour Energy	Auto approval	8
	Essential Energy	5.7	–
NT	Power and Water	23.7	164
QLD	Energex	0-1	30
	Ergon Energy	0-1	31
SA	SA Power Networks	Auto approval	52
TAS	TasNetworks	3.0	73
VIC	AusNet Services	1.0	15
	CitiPower	Auto approval	0
	Jemena	1.0	–
	Powercor	Auto approval	1
	United Energy	Auto approval	9

Note: A dash '–' signifies that a DNSP did not report the relevant metric.

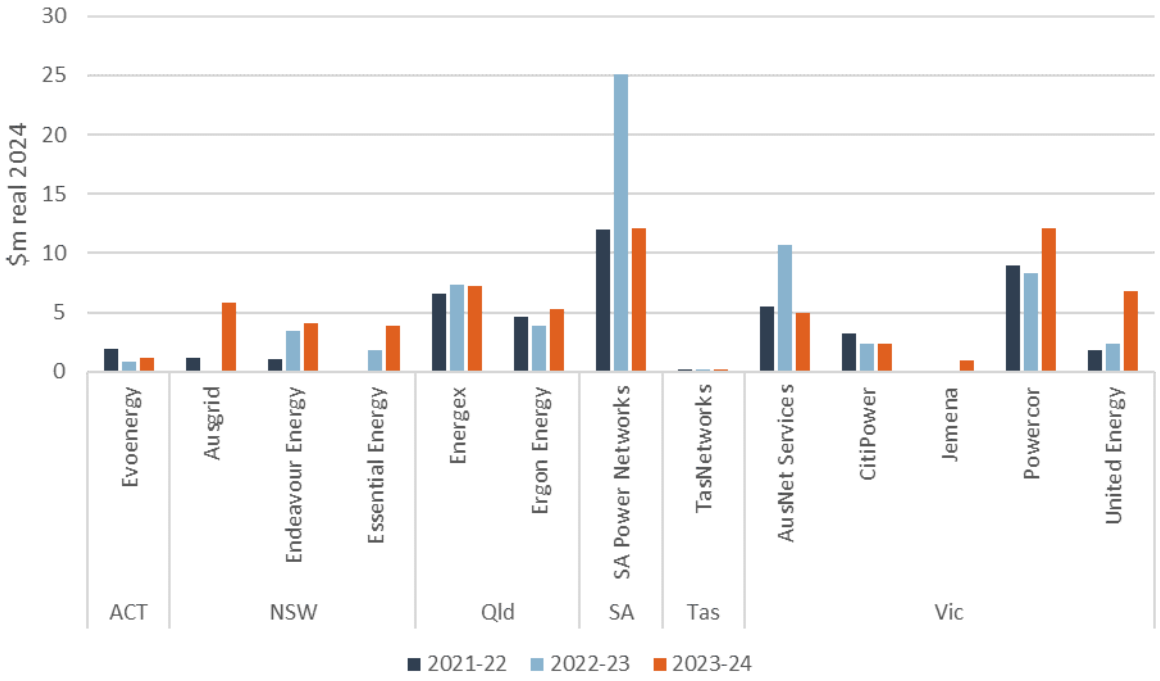
6 Expenditure

Expenditure on enabling export services is not a measure of export service performance. However, it does indicate current or emerging constraints relating to exports and DNSP activity to address or prevent export-related constraints. We may expect to see the following outcomes of a prudent DNSP providing export services:

- An efficient level of export curtailment, although there may be cases where it is prudent to prevent constraints before they emerge.
- Prudent expenditure on solutions to prevent or rectify emerging or actual constraints. Depending on the cost and nature of the solutions, we would expect to see a business case for this expenditure as part of the DNSP's DER integration plans and investment proposals, consistent with AER guidance.
- Evidence that implemented solutions yield their projected benefits (within a reasonable margin of error). For example, if a DNSP justifies expenditure on the basis that it would prevent or reduce export curtailment against a counterfactual, we would expect to see this benefit in the data. If export customers had been given static export limits to manage a constraint, and that constraint was then removed, the DNSP would endeavour to remove the legacy limit.

Figure 6.1 and Figure 6.2 illustrate the capital and operational expenditure DNSPs incurred in providing export services. This expenditure has been modest to date (around 1% of DNSPs' total capital and operational expenditure on average). SA Power Networks reported the highest capital expenditure over the period (including a large spend for ICT systems), while Energex reported the highest operating expenditure (with a large spend attributed to overvoltage complaints management). United Energy also had a significant increase in capex this year due to the development of its low voltage distributed energy resources management system required to meet the Victorian emergency backstop mechanism.

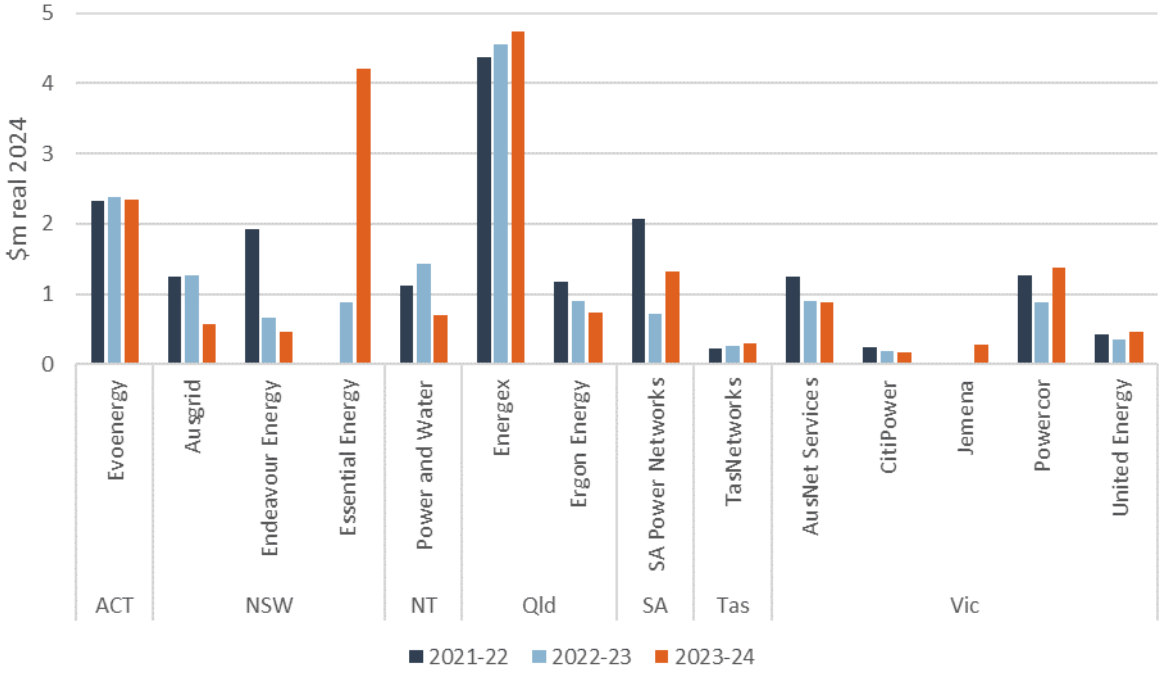
Figure 6.1 Capital expenditure incurred to provide export services



Note: Power and Water did not report capital expenditure to provide export services over the measured period.

Essential Energy reported a large increase in operating expenditure in 2023–24, attributed to a large spend on other operating expenditure, including smart meter data procurement and network monitoring, hosting capacity studies, software as a service and dynamic connection agreement innovation works

Figure 6.2 Operating expenditure incurred to provide export services



7 Looking ahead

7.1 National CER Roadmap

This year the Energy and Climate Change Ministerial Council (ECMC) endorsed the National Consumer Energy Resources (CER) Roadmap, which details a national implementation plan to deliver equity in the transition to renewable energy and a coordinated vision for household solar, batteries and other forms of CER.[44]

The CER Roadmap sets national reform priorities to build national consistency and support a harmonised approach to unleash the full potential of CER. The projects outlined in the roadmap focus on different aspects of CER integration, including achieving more equitable access to the benefits of CER, nationally consistent CER technical standards, secure CER device communications, developing a framework for the role of distribution system operator (DSO) and establishing a CER Data Exchange.

We will monitor how the outcomes of these projects are reflected in the performance of DNSPs in providing export services.

7.1.1 Redefining roles for market and power system operations

The distribution system operator (DSO) work plan is being led by the CER Taskforce and AEMC. Depending on the DSO model implemented, this may include functions such as implementing advanced, scenario-based modelling of CER and electric vehicle (EV) uptake and operation, bidirectional power flows and distribution system operations. The first stage of this project is due for completion in late 2025, and will define the roles and responsibilities of distribution-level market operation and drive alignment of incentives between market participants for CER integration.[45] This may require amending the NER, National Electricity Law and regulatory instruments such as AER guidelines in consultation with stakeholders.

7.1.2 Data sharing arrangements to inform planning and enable future markets

The CER Data Exchange project aims to improve data accessibility and transparency, reduce the costs of data access, enable greater CER coordination and support innovation and customer choice. The project will be delivered through the implementation of a digital platform designed to streamline the exchange of CER information between stakeholders. CER operational data, including that of EVs and EV supply equipment, will be captured for use to better manage local networks and the energy system as a whole.[46]

7.2 Future performance reports

From 2025 information collected from DNSPs will be standardised through the AER's regulatory information orders (RIOs).[47] In addition to standardising the core measures

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44 ECMC, National CER Roadmap, Energy and Climate Change Ministerial Council.

45 ECMC, National CER Roadmap, Energy and Climate Change Ministerial Council, p. 21.

46 ECMC, National CER Roadmap, Energy and Climate Change Ministerial Council, p. 20.

47 AER, Networks information requirements review, Australian Energy Regulator.

collected from networks, the RIOs require DNSPs to provide additional auditing and assurance compared to the information requests that were used to collect data for the 2022–23 and 2023–24 reports.

We will investigate new inclusions in next year's Export services network performance report, including data on electric vehicle chargers, community scale batteries and bidirectional network utilisation, subject to availability of data. We will continue to develop and refine our annual export services performance reports and metrics in consultation with key stakeholders, including DNSPs, state and territory jurisdictions and consumers.

Glossary

Term	Definition
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
CER	Consumer energy resources
Curtailment	Any reduction on the capacity of an inverter to generate power. This could be caused by the inverter tripping in response to voltage disturbances or formally imposed through network static or dynamic export limits.
Connection agreement	An agreement between a DNSP and a customer by which the customer is connected to the distribution network and receives distribution services.
DER	Distributed energy resources
DNSP	Distribution network service provider
Energy delivered	The total amount of energy transported through a distribution network.
Export	Electrical energy that flows from a customer's premises to a distribution network via the connection point.
Export access against the agreed limit	The annual percentage of time that customers have the unconstrained ability to export to the distribution network up to the maximum export limit set in their connection agreement.
Export capacity	The maximum amount of electricity a customer's system is capable of exporting to the distribution network in accordance with the connection agreement.
Flexible export limit	The maximum level of export that a customer is allowed by a DNSP which can be varied based off network conditions.
Hosting capacity	The ability of a power system to accept energy generated by consumer energy resources without adversely impacting power quality such that the network continues to operate within defined operational limits.
kVA	Kilovolt-ampere
kW	Kilowatt
Model standing offer	A document approved by the AER as a model standing offer to provide basic connection services in accordance with Chapter 5A of the NER.
NEM	National Electricity Market
NER	National Electricity Rules
Static export limit	A fixed maximum level of export a customer is permitted by their DNSP.

Term	Definition
Static-zero export limit	A static export limit of zero, preventing a customer from exporting any electricity to a distribution network.
Overvoltage	The network voltage reaching a point where a customer's generating unit reduces its real power output in response to increased voltage.

Appendix A – How DNSPs share export limit information

	DNSP	Location of export limit information
ACT	Evoenergy	https://www.evoenergy.com.au/Connections/Embedded-generation
NSW	Ausgrid	https://www.ausgrid.com.au/Connections/Solar-and-batteries/Information-for-solar-installers and further on application.
	Endeavour Energy	https://www.endeavourenergy.com.au/connections/connect-a-solar-system
	Essential Energy	https://www.essentialenergy.com.au/at-home/micro-embedded-generation and in the connection offer.
NT	Power and Water	https://www.powerwater.com.au/customers/power/solar-power-systems/pv-class-requirements
QLD	Energex	https://www.energex.com.au/our-services/connections/residential-and-commercial-connections/solar-connections-and-other-technologies
	Ergon Energy	https://www.ergon.com.au/network/our-services/connections/residential-and-commercial-connections/solar-connections-and-other-technologies
SA	SA Power Networks	Section 4.1 of the Technical Standards https://www.sapowernetworks.com.au/data/311031/ts129-small-eg-connections-technical-requirements-capacity-not-exceeding-30kva/
TAS	TasNetworks	https://www.tasnetworks.com.au/embedded-generation Information also available on request and during the connection process
VIC	AusNet Services	Information shared via installers during pre-approval.
	CitiPower	Information shared during solar pre-approval, and included in RINs, DAPRs, and materials are being developed for future.
	Jemena	Information available on request and included in DAPRs.
	Powercor	Information shared during solar pre-approval, and included in RINs, DAPRs. Further materials are being developed for future.
	United Energy	Information shared during solar pre-approval, and included in RINs, DAPRs. Further materials are being developed for future.

Note: RINs refers to regulatory information notices. DAPR refers to the Distribution annual planning report.