Consultation paper

Incentivising and measuring export service performance

August 2022

AUSTRALIAN ENERGY REGULATOR

Inquiries about this publication should be addressed to:

Australian Energy Regulator
GPO Box 3131
Canberra ACT 2601
Tel: 1300 585 165

AER reference: 14143243

Amendment record

Version	Date	Pages
1	5 August 2022	72

Contents

1 Executive summary 4
1.1 Export service reforms subject to consultation 4
1.2 Issues for stakeholder consideration 4
2 Introduction 6
2.1 Scope of review process 6
2.2 Terminology 9
2.3 Project timeline 10
2.4 Request for submissions 11
3 Stocktake of available export service data 12
3.1 Criteria for assessing suitability of export service metrics 12
3.2 Consultation with DNSPs to date 13
3.3 Preliminary observations 14
4 Incentive review for export services 15
4.1 What is the incentive problem we are considering? 15
4.2 What are the underlying incentives? 16
4.3 Objectives of incentivising export services 18
4.4 Materiality of concern with incentives 19
4.5 Options for providing incentives 20
5 Export service performance reports 35
5.1 Defining and tracking service performance in an ideal world 36
5.2 Metrics to track export service performance in the short term 37
5.3 Feasibility of improving data 39
5.4 Steps for report development 41
6 Update to benchmarking reports 44
6.1 Why are we considering changes to the productivity benchmarking? 44
6.2 Options for changes to the productivity benchmarking 47
6.3 Calculating an OEF for base opex efficiency assessments 49
6.4 Preliminary consultation on model specification options 56
Attachment A: Stakeholder feedback template 62
Attachment B: Data stocktake and assessment against criteria 67

1 Executive summary

In August 2021, the Australian Energy Market Commission (AEMC) published its Access, pricing and incentive arrangements for distributed energy resources final determination (the Rule change). The Rule change amended the National Electricity Rules (NER) and National Energy Retail Rules and tasked the AER with delivery of a package of reform workstreams to strengthen customer protections and our regulatory oversight of distribution network service providers (DNSPs) provision of export services. These reforms will also provide stakeholders with useful information and insight about the quality of their export services.

1.1 Export service reforms subject to consultation

This joint consultation paper seeks stakeholder views on three interrelated reform workstreams. We seek engagement and feedback on:

- whether incentive arrangements for export services are fit for purpose. The AEMC found that incentive frameworks in the NER, if left unchanged, could incentivise DNSPs to reduce costs at the expense of export service quality. The Rule change requires the AER to undertake a review to consider arrangements (which may include a service target performance incentive scheme) to provide incentives for DNSPs to provide efficient levels of export services.
- the development of performance metrics to include in our first annual DNSP export service performance report. These reports will consider, among other things, the relative performance of each DNSP in providing export services, DNSPs use of static zero export limits and performance relative to export tariff offerings.
- how to best incorporate export services into our annual benchmarking report. The efficient provision of export services may see DNSPs invest in increases to export hosting capacity. These investment decisions are not currently recognised explicitly as an output in the economic benchmarking framework.

In considering our stakeholder engagement approach for each of these workstreams, we found that each would involve consultation on suitable export service performance metrics. While use cases are likely to differ, the same considerations and approaches to assessing the suitability of export service metrics apply to each workstream. As such, a collective consultation will allow us to identify appropriate export service metrics and address common data reporting challenges in a streamlined and consistent way.

This consultation paper broadly discusses the export service metrics identified to date. We also address the practical application of these export service metrics with respect to incentives arrangements, performance reporting and the benchmarking report within each workstream section of the paper.

1.2 Issues for stakeholder consideration

1.2.1 Incentive arrangements

In this review we will consider the underlying incentives faced by DNSPs in providing export services and how big an effect a lack of incentives could have for consumers. We'll also explore the practical feasibility of extending the STPIS to exports and relatedly, the

challenges of defining robust performance metrics for exports including the availability of reliable and consistent performance data due to low visibility of low voltage parts of the network. We will include in our consideration of incentives for export services an examination of non-financial or 'reputational' incentive options for improving export service performance.

We seek stakeholder responses to our preliminary thinking, concerns, and challenges with implementation of a financial incentive mechanism. We also ask whether a bespoke or allowance/margin type incentive mechanism or additionally, a guaranteed service level incentive option should be further explored. Finally, we ask for stakeholder feedback on whether reputational incentives are sufficient to address current concerns about DNSPs' export service performance.

1.2.2 Performance reporting

We will publish annual reports on the performance of each DNSP in providing export services. These reports aim to, among other things, provide transparency, accountability, and reputational incentives to DNSPs in providing export services to their customers.

This review seeks stakeholder views on what export service performance metrics our performance reports should capture, both in the short and longer-term acknowledging potential data challenges. We are also requesting insights and suggestions on our proposed approach to developing the inaugural export performance report.

1.2.3 Benchmarking

The current benchmarking models provide important sources of information for the efficiency of historical network expenditures (opex and capital expenditure (capex)). This helps us to understand why network productivity is increasing or decreasing and where we can best direct our expenditure reviews. However, the current models do not explicitly include export services as an output which is likely to underestimate the productivity of DNSPs.

This paper discusses options for how we could update the productivity benchmarking in our Annual Benchmarking Report (ABR) for DNSPs to account for export services. We are seeking stakeholder feedback on the extent to which existing benchmarking techniques account for export services and the range of possible options for adjusting the benchmarking framework to account for export services. We are also engaging on our proposed two-staged approach for considering options firstly on if and how we can calculate an export service's operating environment factor for use in the AER's opex efficiency assessments and then later consulting on broader options for changing benchmarking model specifications.

Next steps

We invite feedback from interested parties in response to the issues raised in this consultation paper by **2 September 2022**. This feedback will support the development of our draft report and our proposed approaches to incentive arrangements, performance reporting and benchmarking for export services.

We also intend to hold a workshop with stakeholders on the material covered in this paper on **22 August 2022**. Interested parties are invited to register their interest by email to aerinquiry@aer.gov.au.

2 Introduction

2.1 Scope of review process

On 12 August 2021, the Australian Energy Market Commission (AEMC) published its Access, pricing and incentive arrangements for distributed energy resources final determination (the Rule change). The determination changed the National Electricity Rules (NER) and National Energy Retail Rules with the aim to integrate more distributed energy resources (DER) such as small-scale solar, batteries and electric vehicles into the grid. The Rule change requires distribution network service providers (DNSPs) to plan for providing export services. It also strengthens customer protections and our regulatory oversight.

The scope of this review process is limited to the following workstreams:

- Review of incentive arrangements for export services – The AEMC found that incentive frameworks in the NER, if left unchanged, could incentivise DNSPs to reduce costs at the expense of export service quality. The Rule change requires the AER to undertake a review to consider arrangements (which may include a service target performance incentive scheme) to provide incentives for DNSPs to provide efficient levels of distribution services provided to retail customers for supply from embedded generating units into the distribution network.
- Developing performance metrics to include in the inaugural export service performance report – The AEMC considered enhanced transparency of export service performance would support more informed regulatory and policy decisions as well as more informed investment and operating decisions. To that end, the Rule requires us to prepare and publish annual reports on the performance of each DNSP in providing export services to customers over the previous year.
- Incorporating export services into the AER's annual benchmarking report - To the extent export services are not adequately captured in the productivity benchmarking, some DNSPs may receive relatively lower productivity scores than would be the case if export services were better reflected in the benchmarking models. This could impact how we assess the efficiency of their opex as part of the revenue determination process.

In considering our stakeholder consultation approach for each of these workstreams, we noted that each workstream would consult on suitable export service metrics. While the use cases for each workstream do diverge, the same basic principles of assessing the suitability of export service metrics (having regard to factors such as measurability and cost effectiveness) apply to each workstream. While Section 3 below broadly discusses the export service metrics identified to date, the practical application of these export service metrics with respect to incentives, performance reporting and benchmarking is contained in the relevant workstream section.

To the extent that performance reporting itself can serve as a reputational incentive on DNSPs to provide export services, the performance reporting workstream also overlaps with the incentives review (discussed further in Section 4). Although the potential for the annual benchmarking report to provide a further reputational incentive is limited, there remains overlap in considering suitable metrics for benchmarking purposes.

A joint consultation process also better aligns with our stakeholder engagement framework by building knowledge and capacity to help stakeholders to meaningfully engage. This approach should help to provide a more holistic consideration of the issues raised, which is likely to make the engagement more effective.

A combined approach should aid in identifying appropriate export service metrics and common data reporting challenges, whilst also removing redundancy and any regulatory or engagement burden. It is likely to also ensure we are aligned when evaluating export service performance levels. We note that the different use case application of specific data metrics means a differing level of accuracy of data will apply. For instance, when assessing the merits of export service metrics for the purposes of supporting a financial incentive scheme or incorporation into the benchmarking report, a higher level of scrutiny will be required given the applicable revenue implications. Conversely, publicly reporting on a DNSPs export service performance, where no revenue is at risk, can mean the use of less robust data metrics remains appropriate.

This consultation process addresses some parts of the AER's obligations under the Rule change. In addition to the matters under consultation, the Rule change also tasked us with:

- Reviewing relevant guidelines to incorporate export services – we have reviewed and consider no amendment is necessary to the:
  - Distribution Service Classification Guideline
  - Cost Allocation Guideline
  - Expenditure Forecast Assessment Guideline.
- Reviewing the Connection Charge Guideline – the AEMC determined that a DNSP will not be able to offer a static zero export limit to a small customer who is seeking to connect CER to the network, unless it is requested by the customer, or an exception listed in the AER's connection charge guidelines applies. Our review of this guideline exploring the appropriate exceptions to this restriction will commence broad consultation in August 2022.
- Publishing export tariff guidelines – the AEMC found that price signals are an effective potential tool to promote efficient use of and investment in export services. The aim of the Rule change was to smooth demand for consumption and export services using pricing along with other regulatory control measures (e.g. investment tests) to reward customers for actions that better use existing infrastructure or improve network operations, benefiting all customers. We published our Export Tariff Guidelines in May 2022.[1]
- Publishing the customer export curtailment value (CECV) methodology and associated values – The Rule change requires the AER to develop customer export curtailment CECVs. These values will help guide the efficient levels of network expenditure for providing export services and input into network planning, investment and incentive

[1] AER, *Export tariff guidelines*, May 2022.

arrangements for export services. We published our CECV methodology and associated values in June 2022.[2]

We also published our DER integration expenditure guidance note in June 2022.[3] Consultation on that guidance commenced before the AEMC's Rule change process but forms an important component of stakeholder guidance about how DNSPs provide efficient levels of export services on their networks.

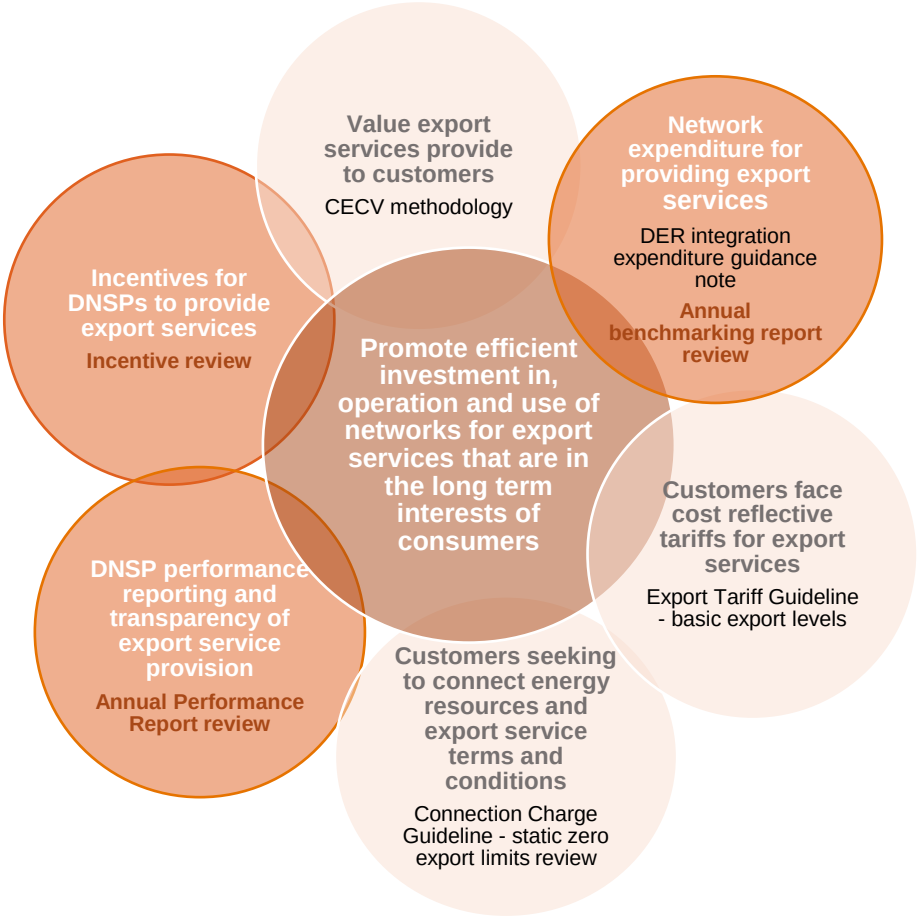
Figure 1 provides a graphical representation of these various Rule change-driven workstreams in the context of the distribution network regulatory framework, highlighting the projects that are the subject of this consultation paper.

As Figure 1 demonstrates, there are synergies and inter-relationships between each of the workstreams being explored in the current consultation process but also the key interlinkages with each of the other workstreams outside the scope of this consultation. For example, consideration of a financial incentive for export services could use the CECV methodology and associated values as the basis for the value of any applicable financial incentive payment or penalty. Furthermore, the annual performance reports could report on a network's performance with respect to the number of customers that are subject to a static zero export limit.

[2] AER, *Final CECV methodology*, June 2022.

[3] AER, *DER integration expenditure guidance note*, June 2022.

Figure 1: Graphical representation of inter-relationships between work streams



2.2 Terminology

The Energy Security Board recently adopted the term ‘customer energy resources’, instead of ‘distributed’ energy resources, to better reflect the role, ownership and opportunities these devices represent for customers.[4] This adoption is in recognition of the thoughtful engagement from customer groups on the rapidly growing energy ecosystem. Where appropriate in this paper, and more generally, the AER will seek to update its use of 'DER' to customer energy resources.

We refer to customer energy resources as the devices and systems located on the customer’s side of the network connection ‘behind the meter’ (such as solar PV, batteries and electric vehicle) connected to the electricity distribution network that are capable of exporting electricity to the grid and/or capable of responding to price and remote-control signals to change export or consumption patterns. These can include both residential and commercial/industrial devices. The NER refers to these devices as embedded generating units.[5] Other network connected embedded generating units could include batteries installed

[4] Energy Consumers Australia (ECA) has been a strong advocate for a shift in language to better reflect this dynamic for consumers. See ECA, *The bECAuse Blog: Death to DER? Why we need to change the language we use for the energy transition*, 2 May 2022, accessed 25 July 2022.

[5] Chapter 10 defines embedded generating units as the plant used in the production of electricity connected within a distribution system and not having direct access to the transmission network.

on the network where these are not otherwise owned and operated by the DNSP. Neighbourhood batteries[6] are an example of these types of technology that will require and use DNSP export services. Most discussion to date about customer energy resources is in relation to exporting capabilities of these devices. Overtime the consumption load associated with some of these devices, (electric vehicles and potentially batteries), could become the subject of network investment, and this will be covered by the existing regulatory framework with respect to consumption services.

To be clear, this consultation process is focused on incentivising and measuring DNSP performance with respect to the provision of customer export services to export customers. The NER defines customer export as the supply to a distribution network of electricity generated by embedded generating units.[7] Further, for the purposes of this consultation, export customers include those that are subject to static zero export limits. We will work with DNSPs to narrow the scope of future information requests to ensure this focus on customer export services is implemented.

2.3 Project timeline

We acknowledge the relatively compressed timeframe for consultation given the breadth of issues addressed in this consultation process. Given the inclusion of the annual benchmarking report workstream, we are required to follow the distribution consultation procedures.[8] We recognise some stakeholders may have a narrower interest in particular workstream issues and we encourage all stakeholders to engage as best as possible, recognising this could entail focusing on specific areas of interest.

Table 1: Project timeline

Project step	Estimated date
Consultation paper published	5 August 2022
Stakeholder webinar	Mid-August 2022
Submissions to the consultation paper close	2 September 2022
Draft report published	7 October 2022
Stakeholder workshop	October
Submissions to the draft report close	18 November 2022
Publish final review report	16 December 2022

[6] See for example: https://www.yef.org.au/community-batteries/yarra-community-battery-trial/

[7] Excluding generation from registered participants.

[8] NER Rule 11.141.6(a).

2.4 Request for submissions

This consultation paper discusses the key issues on which we seek feedback. We have posed questions to guide stakeholders and assist with their feedback throughout the consultation paper. For convenience, we have included a summary list of these questions in **Attachment A**. We appreciate these questions are extensive and welcome submissions that focus on a sub-set of these questions or make broader points relevant to this consultation.

We request all submissions be in Microsoft Word or another machine-readable document format.

We invite stakeholder submissions on this consultation paper by **2 September 2022** and will consider all submissions received by that date.

Please email submissions to Sara Stark, Director, DER – Network Regulation, Australian Energy Regulator at sara.stark@aer.gov.au.

We prefer that all submissions are publicly available to facilitate an informed and transparent consultative process. Submissions will be treated as public documents unless otherwise requested. All non-confidential submissions will be placed on our website. Parties wishing to submit confidential information should:

- clearly identify the information that is the subject of the confidentiality claim
- provide a non-confidential version of the submission in a form suitable for publication.

3 Stocktake of available export service data

As noted in Section 2, each of the workstreams we are consulting on involves identifying suitable export service metrics. The use cases of particular export service metrics will vary for each workstream. However, the same broad principles of assessing the suitability of export service metrics (having regard to factors such as measurability and cost effectiveness) apply to each.

Further, the final AEMC final determination noted the likely need to gather relevant information from DNSPs to test the robustness of potential metrics before deciding how to measure export service performance.[9] As we determine how export service performance is best measured, we can identify current data limitations and work with DNSPs to build data capabilities for future use.

Suitable export service metrics should help us to:

- understand the current state of export service provision and existing service levels for various distribution networks
- understand the nature and extent of the issues associated with capacity limits, consumer complaints and overvoltage
- develop performance measures for export services that customers value
- ascertain if there is a need for an incentive scheme to provide fit-for-purpose incentives, and what form it would take.

3.1 Criteria for assessing suitability of export service metrics

In assessing the suitability of identified export service metrics for achieving the above purposes, we propose the following criteria:[10]

- Measurable: the required information is available to produce a reasonably accurate metric which is consistent over time and between DNSPs.
- Not significantly influenced by exogenous factors (outside the DNSPs' control): This criterion is especially pertinent to performance metrics used within a performance incentive scheme. In principle it also applies to measures of inputs, however DNSPs usually have limited control over outputs given their obligations to supply. This criterion does not apply to metrics for operating environment factors (OEFs), which are exogenous variables which can help to explain differences between benchmarking outcomes of DNSPs.

[9] AEMC, *Final determination – access, pricing, and incentive arrangements for DER*, August 2021, p. 48.

[10] This list builds on the criteria identified in AEMC, *Final determination – access, pricing, and incentive arrangements for DER*, August 2021, p. 49.

- Not gameable: DNSPs are not able to unduly manipulate the measure (e.g. by classifying how information is collected), and the measure does not provide incentives for inefficient service outcomes. The metric should yield efficient incentives.
- Cost effective: the costs to capture the metric should not outweigh the benefits of export service level improvement.
- Reflective of services provided to customers: measures DNSP activities which directly affect what the customer receives.

3.2 Consultation with DNSPs to date

In September 2021, we engaged with DNSPs and the Energy Networks Australia to develop an information request to collect data on export services. We also asked DNSPs to comment on the availability and suitability of proposed metrics based on alignment with the principles.[11] Our initial consultation indicated that while a range of metrics are available, these currently lack accuracy and robustness. Simple metrics such as customer numbers and capacity while readily available, are only useful when normalised or used with other export service metrics. Derived secondary metrics such as export volume curtailed are more meaningful metrics to indicate export service delivery but are difficult to measure consistently across DNSPs. Additionally, export service expenditure data was considered vital information for future regulatory determinations and was considered suitable and relevant.

This initial feedback helped us develop and issue a draft information request in March 2022. The responses from DNSPs on the draft request suggested challenges in submitting historic expenditure data and sought clarification on definitions, margin of errors in existing data and granularity of the data required. DNSPs questioned the need for feeder level data given its volume and burden to collect, and suggested we consider only network-level data.

We modified our final information request to clarify definitions, not request voltage and curtailment metrics, and to only request expenditure data that DNSPs could report or accurately estimate. However, we maintained the granularity of our request with respect to the feeder level data. Our intention was to seek raw granular data to maximise its potential usefulness given the breadth of use cases under consideration. Feeder level data can be segmented based on customers and network type to understand how service levels vary across DNSPs.

We issued the final information request to DNSPs in March 2022 and received data in early June 2022. Table 10 and Table 11 in Attachment B discuss the data we received from DNSPs and assess the suitability of each metric for measuring export service performance.

---

[11] As discussed in Section 2.2 above, the focus of this consultation process is on DNSPs provision of customer export services. In our discussions with DNSPs to date we have invariably applied references to DER rather than the more specific reference to export services. Because reference to services related to DER includes provision of a broader subset of services, we are now seeking to define the context of both the information we will request from DNSPs, and this consultation process itself, more narrowly. An example of this is reference to DER integration expenditure, which could encompass expenditure related to both export services but also consumption services related to meeting the load demands of electric vehicles. Accordingly, some of the definitions of the data and metrics noted throughout this paper will differ from those contained in the information requests previously sent to DNSPs.

Attachment B also summarises DNSP comments on each metric and provides example secondary metrics.

3.3 Preliminary observations

Most DNSPs have made reasonable efforts to provide us with the information we requested. We note that while most DNSPs have been providing export services for some time, it is still early days in positioning export services into the regulatory framework. We observed that datasets for export services are either disintegrated into various network applications or embedded into existing information related to consumption services. Following our preliminary review of the information provided, we observe that:

- granular feeder level data reveals differences in export service data capturing processes. We may need to separately work with DNSPs to unpack these differences and standardise the data format for ongoing data reporting.
- Victorian DNSPs have superior access to granular power quality data because of the high penetration of smart meters in the jurisdiction.
- export service expenditure makes up a small percentage of overall costs.
- we will need to engage further with DNSPs to establish clear definitions and common estimation tools to improve data accuracy and comparability.
- DNSPs require guidance on what level of estimation may be used to report export service data.
- historic export service expenditure data is challenging to capture as DNSPs previously recorded this type of expenditure as part of consumption services.
- DNSPs have recorded data useful for export service metrics data in segregated systems such as low voltage planning, financial cost centres and customer data billing systems. This data is therefore less interlinked than consumption datasets.
- limitations in customer connection agreement processes make it difficult for DNSPs to measure customer requested export capacity versus approved export capacity.
- the evolving nature of export services creates challenges in defining parameters around performance metrics.

4 Incentive review for export services

The incentive frameworks in the NER, if left unchanged, could incentivise DNSPs to reduce expenditure, through the application of incentive schemes such as the capital efficiency sharing scheme (CESS) and the efficiency benefit sharing scheme (EBSS), without providing effective incentives for DNSPs in relation to export service performance.

This section discusses incentives for DNSPs to provide export services through the lens of whether (1) incentives are limited, and (2) if so, what options may be effective in improving those incentives. Specifically, we discuss the following:

- the underlying incentive problem and its materiality
- the practical feasibility of extending the STPIS to exports
- challenges of defining robust performance metrics for exports
- whether performance data is sufficiently reliable and consistent to tie to financial incentives
- failing above (or complementing financial incentives), what non-financial incentive options could improve export service performance.

This section of the consultation paper seeks stakeholder views on the following:

- Whether DNSPs need to be further incentivised to provide export services.
- Responses to our preliminary thinking on the concerns and challenges with implementation of a financial incentive mechanism.
- Whether a bespoke or allowance/margin-type incentive mechanism should be further explored.
- Whether a guaranteed service levels incentive option is possible and/or desirable as both an incentive option and a consumer protection mechanism.
- Whether reputational incentives are sufficient to address current concerns about DNSPs' willingness to provide export services.

4.1 What is the incentive problem we are considering?

We need to consider how to integrate these new services into the incentive-based regulatory framework in a manner that best advances the National Electricity Objective. We should do this by providing DNSPs with incentives for optimal quantity, cost and quality of export services. Appropriate incentives can encourage DNSPs to invest in an efficient amount of export capacity and design export tariffs that encourage retailers, aggregators and consumers to purchase that capacity. In the absence of such incentives, there is a risk that revenue capped DNSPs may adopt the approach to investing in export capacity that involves the lowest cost and risk to them rather than the approach that maximises overall efficiency.

The current consultation process for the NSW/ACT/NT/Tas reset process has reached a final position that excluding exceptional cases, export services will be considered a standard

control service and therefore subject to a revenue cap.[12] This means our focus for incentivising export services will rely on a multifaceted approach of trying to find a balance among the various regulatory incentive mechanisms like the CESS/EBSS and the STPIS and reputational (non-financial) incentives.[13]

4.2 What are the underlying incentives?

Under the current regulatory framework, DNSPs have an incentive to increase their regulatory asset base and earn the return on capital associated with that growth. To balance this incentive, the revenue cap control mechanism provides some incentive to minimise costs over the regulatory period. Further, the CESS and EBSS smooth this incentive throughout the period and strengthens the incentive on DNSPs to find efficiencies in the delivery of distribution services and reduce expenditure. However, these schemes do not incentivise DNSPs to maintain or improve export service performance. While this STPIS incentivises import service performance, it does not include performance measures reflecting the relevant attributes of the export services. This means there could be an incentive for DNSPs to reduce costs at the expense of export service quality. If there are no incentive schemes with performance parameters for export services, there is a risk that DNSPs may decide to not incur or to defer the expenditure needed to deliver efficient levels of export service.

Forecasting risk gives a good practical example of how this imbalance might operate in practice. As with other standard control services, the provision of export services by DNSPs under the regulatory incentive framework sees all forecast risk sit with the consumer. That is, if a DNSP forecasts a greater than realised level of demand for export services, either the DNSP invests in additional export service capacity but remains under-utilised or the DNSP does not invest and receives the CESS payment associated with that underspend.[14] Conversely, should a DNSP under-forecast export service demand, export service demand will not be met. However, unlike consumption services and the unserved supply of energy, exporting customers will have their exports curtailed, potentially without noticing. This forecasting risk highlights the underlying incentives for DNSPs in providing export services.

DNSPs also have other incentives beyond maximising CESS/EBSS rewards that could discourage them from providing optimal quantity, cost and quality of export services including:

- Upstream asset stranding – Greater generation and use of distributed generation will reduce reliance on upstream assets (e.g. the DNSPs' high voltage assets or transmission assets). This could prevent DNSPs from actively fostering export services

[12] See for example: AER, *Ausgrid Determination 2024-29*, July 2022.

[13] The alternative to this is a price cap mechanism. Under this regulatory form of control, DNSPs are incentivised by a set price to drive the optimal levels of quality, cost and quantity of the service subject to the price cap. A price cap mechanism better balances the forecasting risk discussed below because prices are set according to the same level of forecast demand driving proposed expenditure forecasts.

[14] We are currently reviewing whether the regulatory incentives we apply to networks remain relevant and fit-for-purpose. This forms part of strategic objectives over 2020–25 to improve our approach to regulation by being more efficient and focusing on outcomes that matter most to consumers. See AER, *Review of incentive schemes for regulated networks*, accessed 25 July 2022.

or in the extreme, to frustrate their development, due to the opportunity cost of foregone network investment or fear of asset stranding.

- Customer grid defection – Where the costs of customer energy resources continue to fall on customers, defection from the grid to a self-sufficient standalone energy supply may become attractive to some of the DNSPs' current or prospective customers. If DNSPs consider this a material risk, they may be incentivised to expedite the pace of establishing arrangements for efficient export service provision and use, so that these customers remain connected and can benefit from sharing their excess energy. However, they may have an incentive to transition to export charges as slowly as possible so that these charges are not seen by some customers as another reason to defect from the grid.

Though the theory described above suggests DNSPs would have little to no incentive to provide export services, they have been providing such services for quite some time. It is understood that DNSPs provide these services primarily to maintain good customer relations.[15] In addition, there are also now some backstop consumer protection provisions provided by the AEMC rule change to direct DNSPs to provide a level of export service.

Static zero export limits

Under the final rules, a DNSP will not be able to offer a static zero export limit to a small customer who is seeking to connect customer energy resources to the network, unless it is requested by the customer, or an exception listed in the AER's connection charge guidelines applies. Prior to this rule change, the rules did not prevent customers from being allocated static zero export limits, even in situations where there was sufficient capacity available. While customers might be able to connect to the network, a static zero export limit means that a customer is prevented from accessing the network to export electricity at any time. The AEMC considered that the ability for a DNSP to offer static zero export limits to customers without any reason is inconsistent with the overall intent of the reforms. Clear rights for customers under the framework to connect to the distribution network for exports are likely to provide for improved access to export services.[16] As noted in Section 2, we will soon commence a public consultation process to help establish the circumstances under which DNSPs can apply static zero export limits.

Basic export level

There is also a consumer protection mechanism included as part of the rule change regarding the charging of export tariffs. The final rules require DNSPs to include a basic export level for each proposed export tariff. This allows a retail customer to export to the grid without charge up to a 'basic level'. Basic export levels must be available for a 10-year transition period to customers assigned to any export tariff. The basic export level should be set at a level where a DNSP can provide export services with minimal or no additional investment and taking into account the forecast demand of export services by exporting customers. This reflects the base level of export hosting capacity that all networks currently

[15] HoustonKemp, *Distributors' incentives to efficiently incur DER export expenditure*, July 2020, p.29.

[16] AEMC, *Final determination, Access, pricing and incentive arrangements for DER*, August 2021, p. iii.

provide, because network assets constructed to supply load have an inherent capacity to support some reverse power flow without any additional investment.

We have developed guidelines about methodologies for determining basic export levels, which are included in the Export Tariff Guideline.[17] DNSPs are required to include their basic export levels in their tariff structure statements, which we approve as part of the regulatory reset process.

Question 1

Do stakeholders consider further incentive measures are required to ensure DNSPs provide efficient levels of export services?

4.3 Objectives of incentivising export services

To assess the relative merits of approaches to enhancing incentives for DNSP provision of export services, we have developed some objectives or desired outcomes. Where possible, export service incentives should:

- be flexible to accommodate the differing starting points of DNSPs (data quality, network visibility, network constraints, etc), different jurisdictional programs and future technology changes.
- provide penalties and rewards (if applicable) that are commensurate to the problem being resolved.
- be compatible with other reforms and incentive schemes.
- maintain/improve export service levels for consumers.
- enhance information disclosure.
- address the issues and services that electricity end-users value, through targeted and prioritised spending.
- support efficient and informed customer investment in customer energy resources.
- provide benefits that exceed the administration and compliance costs involved with applying the incentives.

Question 2

Do stakeholders agree with these objectives for assessment of the merits of enhancing incentives for export services?

[17] AER, *Export tariff guidelines*, May 2022.

4.4 Materiality of concern with incentives

All regulation involves a trade-off of risks and benefits. Any incentive scheme that applies a financial reward or penalty necessarily causes a DNSP's allowed revenues to depart from its estimated efficient cost of supply. Regulators only adopt such schemes where they consider these departures are warranted by an expected net benefit to consumers in the long term. Before considering options for addressing incentives for export services, we must consider the materiality of the incentive concern.

Demand for export services is currently constrained in some locations across the NEM. Moreover, constraints are projected to increase with higher penetration of customer energy resources. This problem will be amplified if the uptake of batteries and electric vehicles is not actively managed so that consumption aligns with when passive rooftop solar generation is high. From the information we have available, even within networks of significant customer energy resources penetration, export constraints are limited. Recent studies suggest that tripping and curtailment was not significant for most energy users. On average, exporting customers were curtailed around 13 kWh of generation per year (less than 1% of their total generation).[18] Similarly, a recent UNSW research article concluded that:[19]

- most consumers in the sample do not suffer significant export curtailment, with approximately $3–12 per year per site on average in lost generation value; however
- the consumers which are significantly impacted can experience considerable financial penalty. The most impacted consumer is estimated to lose approximately $225–900 per year.

A HoustonKemp report commissioned by IPART NSW noted that Endeavour has calculated its own estimate of the financial effects that hosting capacity constraints have on an average exporting customer.[20] This high-level analysis indicates that the average customer export curtailment due to voltage is around 0.6 per cent with a likely financial impact of between $4–5 per average export customer each year.[21] While this estimate is preliminary, it is consistent with the findings from the UNSW analysis. The HoustonKemp report concluded that given lower levels of penetration and subsequently lower levels of export constraints in NSW compared with South Australia, an estimate near the lower bound of the UNSW estimate appeared reasonable.

In addition, we understand DNSPs, in consultation with their customers, are proposing increases in expenditure forecasts to support greater levels of export service on their networks. This investment is being included in reset proposals to alleviate some of the constraints identified above and therefore improving export service performance for

---

[18] Collaboration on Energy and Environmental Markets at UNSW, *Curtailment and Network Voltage Analysis Study Project Report*, August 2021.

[19] Heslop, S. et al. (UNSW), *Voltage Analysis of the LV Distribution Network in the Australian National Electricity Market*, May 2020, p 161. This estimate assumes that the sample of households and the 24 clear sky days used are representative.

[20] HoustonKemp, *Distributors' incentives to efficiently incur DER export expenditure*, July 2020, p.11.

[21] Endeavour's methodology used a sample of smart meter voltage compliance data and made the assumptions that the average solar customer has a 5kW system and lost revenue is based on a 70:30 split between feed in tariff and self-consumption. Endeavour recognises that this estimate is not conclusive and suggests that further work in this area would be helpful.

customers via funded expenditure. This further supports the view that the materiality of any residual incentive concern[22] is currently low.

Question 3

How significantly does the average low level (and value) of constraints currently experienced by most NEM exporting customers influence the need to enhance incentives for the provision of export services at this time?

4.5 Options for providing incentives

There are several options that could be implemented to incentivise DNSPs to provide export services, including:

- *A financial incentive mechanism (STPIS)* – The objective of an amendment to the STPIS would be to better align the commercial incentives of DNSPs with the interests of consumers and promote efficient delivery of export services. Through the interaction of an amended STPIS and the CESS/EBSS, DNSPs will be incentivised to reduce the cost of delivery of export services, will share the efficiency benefits with customers and will deliver a level of export service that better meets their customers' expectations.
- *Allowance/margin mechanisms* – DMIA or DMIS type incentive schemes that could provide DNSPs with specific funding arrangements for projects that are associated with improving export capacity. These projects would be assessed on a case-by-case basis.
- *Reputational incentives* – This would require the DNSPs to publish metrics on their export service performance. The DNSPs would not receive a financial reward/ penalty, but the publication of the metrics would improve transparency for stakeholders (particularly customers seeking to install export capacity and third-party non-network service providers). This approach could also facilitate comparability of DNSPs' performance.

These are not necessarily mutually exclusive options and some could work concurrently to incentivise DNSP export service performance. Similarly, given export services have only recently been established as a distribution service DNSPs are expected to provide, it could be the case that we transition through reliance on one form of incentive to another. For instance, the application of reputation incentives may be appropriate as DNSPs mature in their delivery of export services and historical data is established, but over time the use of financial incentives may become more appropriate.

4.5.1 Financial incentive mechanism (STPIS)

In general, the STPIS is designed to balance the incentive to reduce expenditure with the need to maintain or improve service quality. It achieves this by providing financial incentives to DNSPs to maintain and improve service performance to a level valued by customers. That is, while the regulatory regime encourages DNSPs to improve operating and capital

[22] Where export service performance is enhanced through 'funded' investment, that portion of improvement should be excluded from any export service performance mechanism.

efficiency, the STPIS is designed to ensure that this increase in efficiency is not at the expense of an inefficient deterioration in service performance for customers. In its final determination, the AEMC considered that the extension of an incentive scheme such as STPIS to exports is likely to promote the NEO and be in the long-term interest of consumers because it will promote efficient delivery of export services and noted there is also strong stakeholder support to extend the STPIS to exports.[23]

In respect of consumption services, the current STPIS provides incentives to DNSPs to improve on the existing service level where consumers are willing to pay for these improvements. The STPIS rewards DNSPs where they improve power supply reliability outcomes—such as a reduction of the average duration of power outages (known as SAIDI) and a reduction of the average frequency of power outages (known as SAIFI).[24] Likewise, the scheme penalises DNSPs where they allow power supply to decline below their reliability targets—which are based on the existing levels.

The STPIS currently consists of four components – the reliability of supply component, the quality of supply component, the customer service component (which are collectively referred to the 's-factor components'), and the guaranteed service level (GSL) component. The s-factor components reward (penalise) a DNSP by providing annual revenue increments (decrements) depending on the DNSP's performance against predetermined performance targets. The GSL scheme sets threshold levels of service for DNSPs to achieve and requires direct payment to customers who experience service levels below the threshold level.

The incentive rates provided through the reliability of supply component are calibrated with how willing customers are to pay for improved service. These rates are based on the value of the total annual energy transported by each DNSP measured by the value of consumer reliability, which indicates consumers' willingness to pay for improved levels of service. That is, the DNSP is able retain the value customers place on improvements in network reliability for a period of five years, which is designed to balance the expenditure incentives provided under the CESS and EBSS. Consequently, the incentive framework aligns DNSPs' financial incentives to deliver an optimal level of network reliability. That is, at a level of reliability where the incremental cost of improving reliability equals the value that customers place on the incremental improving reliability.

An amendment to the STPIS to include export services could, in theory, be included in one or several components of the STPIS. This could include a financial reward and/or penalty:

- to increase export capacity
- around a target level of headroom
- to ensure that export capacity is highly utilised
- responsiveness to customer complaints about export service quality
- related to a failure to meet a threshold level of export service.

---

[23] AEMC, *Final determination, Access, pricing and incentive arrangements for DER*, August 2021, p. 44.

[24] The SAIDI and SAIFI components combined form more than 90 percent of the total financial impact of the scheme.

While an amendment to the STPIS could promote efficient delivery of export services, any financial incentive mechanism requires accurate and robust metrics for setting the baseline performance and for measuring and valuing changes in performance. The next section discusses our preliminary thinking, including concerns and challenges with implementing a financial incentive mechanism.

Data metrics and availability

Key to any assessment of export service performance is defining an appropriate metric to measure that performance. The most direct and appropriate metric for assessing a DNSPs' provision of export services is how frequently and for how long the DNSP was unable to provide export services. The closest measure of this would be the frequency and duration of network export curtailment because of a network constraint (for example, voltage incursions that trigger a response by inverters to decrease or stop exports). However, there are challenges in deriving a reasonable estimate of network export curtailment as outlined in Box 1.

Box 1: Why is measuring network export curtailment challenging?

While network export curtailment is theoretically an ideal metric for understanding for export service performance, it faces several measurement difficulties

As illustrated in Figure 2, when there is a supply interruption, it is on the DNSP's side of the meter. The DNSP sees de-energisation rather than simply seeing that the consumer not using electricity. In contrast, when there is export curtailment, the DNSP may only see that the customer has stopped providing (or is providing less) to the grid. It is not necessarily straightforward to see if supply has reduced because (1) the consumer's household load has increased, (2) the battery has started charging, (3) energy production had declined (for example, due to cloud cover), or (4) there has been a technical error or curtailment triggered by one of the assets at the customer's side of the meter.

To measure export curtailment in the first instance, DNSPs would acquire inverter data, which is potentially challenging. Less modern inverters are not necessarily configured to capture this data. If the inverter captures the data, the data holder is not necessarily obvious. Depending on the individual customer's set-up, the data may be held by a solar retailer, aggregator (including virtual power plant operators) or inverter manufactures. DNSPs could also potentially use metering data to estimate curtailment, although doing so requires further estimation and would reduce measurement accuracy.

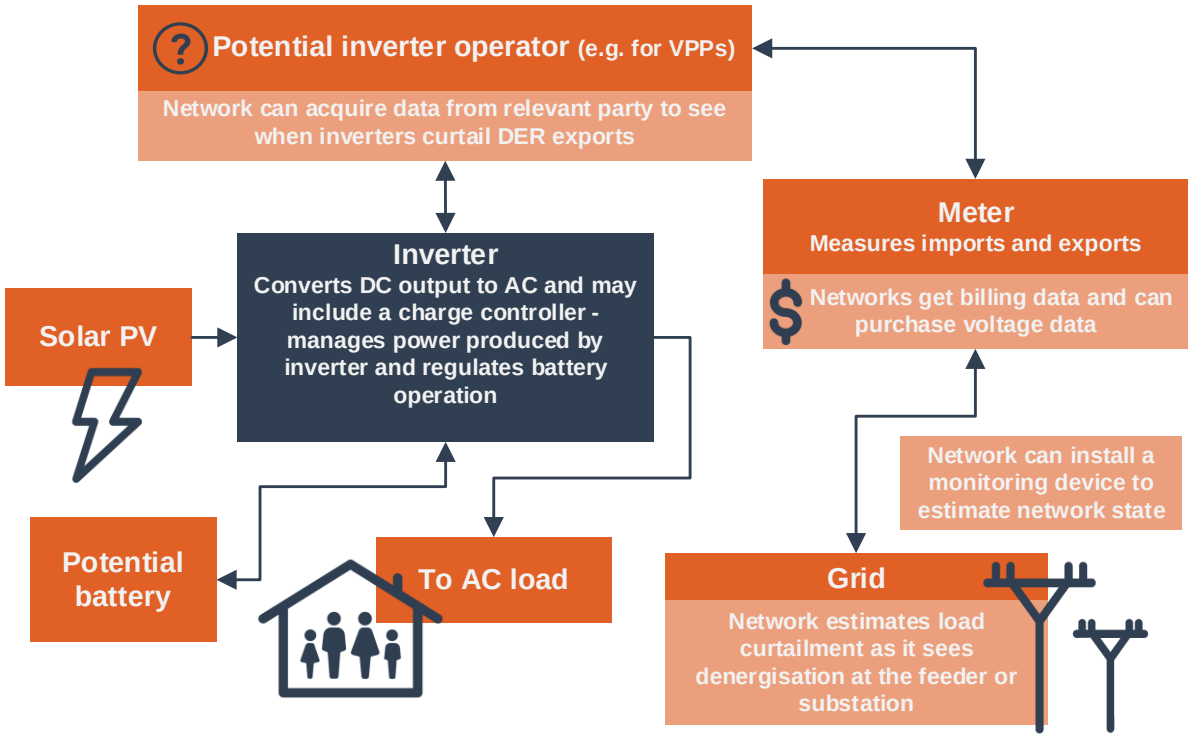
Regardless of its source, even if the DNSP had the best export curtailment data available to it, it would still face the following challenges:

- Export curtailment observed at the inverter level does not directly reflect forced export curtailment due to a constraint. Forced export curtailment is a hypothetical construct that measures what export levels would have been if not for constraint. It therefore requires observing the reduction in exports, estimating exports that could have occurred if not for the constraint (which requires estimating the household generation and demand). For example, if a household PV system was exporting its maximum 7kW capacity at the time of curtailment, it could estimate that the quantity of lost export was 7kW times the duration of the curtailment. However, this may not accurately represent the curtailment

because a non-network related curtailment event (cloud cover, self-consumption, etc) could have coincided with this period.

- It may not be clear that observed curtailment at the inverter level is due to a network constraint. For example, inverters may curtail exports if there are technical issues with assets at the customer's side of the meter, including incorrect inverter settings or limitations in the service customer installation. Also, since voltage levels at the customer's and DNSP's respective sides of the meter can differ, curtailment to manage voltage issues detected by the inverter does not necessarily mean there was a voltage-driven constraint at the DNSP's side of the meter.
- An export customer may not be curtailed because their static export led them to install an inverter with lower export capacity than they would have ideally installed. As such, an absence of observed operational curtailment may not suggest there was no network planning-based curtailment.

Figure 2: The challenge of measuring export curtailment – a stylised illustration



Assuming DNSPs overcame some of the material challenges discussed in Box 1 to derive a reasonable estimate of network export curtailment – it may remain challenging to identify if and what network constraint caused the curtailment. DNSPs in Victoria have different data quality access. Victorian DNSPs own and control the smart meters and data and therefore have the best low voltage network visibility in the NEM.

However, most other DNSPs have limited access to export curtailment data due to limited low voltage visibility on their networks. Instead, identification of network constraints is indirect and reactive, based primarily on customer complaints and network assumptions. This approach relies on engaged consumers who are aware of when their inverter trips or constrains to exports. These customers would be limited to those who proactively monitor

their exports, either via their inverter or billing data.[25] DNSPs are using samples of this data to help model available hosting capacity and to support broader expenditure proposals for investment to increase to hosting capacity. However, the costs of obtaining this data from either metering or Virtual Power Plant (VPP) service providers are prohibitive on the scale necessary to administer a STPIS incentive mechanism.[26]

For DNSPs that do have access to voltage data, there is the potential to consider using the management of network voltage as a proxy for an export service measure. This is because better management of the variations in network voltage can allow networks to host more exports. The Victorian Department of Environment, Land, Water and Planning (DELWP) is currently consulting on strategies to support effective voltage management on Victorian networks as they continue to integrate high levels of distributed energy resources into the electricity grid. The consultation paper notes that when voltage in the distribution network is not managed effectively, energy consumers can face a range of effects that include:[27]

- quality of supply issues (such as flickering lights)
- increased energy consumption
- increased energy emissions
- decreased ability for excess rooftop solar to be exported to the grid
- potential appliance damage.

DELWP points to the power quality component of the STPIS as a suggested opportunity to create an incentive mechanism for voltage to help realise the opportunities of improved voltage management.[28]

The broader concerns of network voltage and the power quality component of the STPIS are beyond the scope of this review. However, as a proxy for export service performance, DNSPs have noted that:

- voltage data at the inverter is not readily accessible to the DNSP.
- voltage data is a poor measure of export service performance and is a function of a range of factors that go into operating an electricity network.
- network voltage may or may not have a significant impact on customer exports.

Further, as noted by the AEMC, relying solely on voltage information could potentially create perverse incentives for DNSPs. Namely, financial incentives based on voltage management

---

[25] HoustonKemp, *Distributor's incentive to efficiently incur export services expenditure*, July 2020, p.14.

[26] Ibid. During consultation with NSW DNSPs, Endeavour noted that the commercially negotiated cost of data per NMI is indicatively $7–14 per year. This cost would mean that: customers are paying twice for providing this data (directly for the meter or through retail tariffs and through the cost of the data transfer); and > this cost may be prohibitive – given estimates of the benefits of relieving constraints, the net benefit may not be positive. Further, Essential note that voltage can be measured at only 0.3 per cent of connection points on Essential's LV network, even though they have approximately 120,000-150,000 smart meters within their network, as, they do not have commercial access to metering data.

[27] DELWP, *Voltage management in distribution networks consultation paper*, p. 26.

[28] DELWP, *Voltage management in distribution networks consultation paper*, p. 26.

could incentivise DNSPs to provide most customers seeking to export with an efficiently low static export limit to limit voltage on their networks.[29] That said, voltage management information could nevertheless be a valuable contextual metric to collect for performance reporting (see Table 5).

A further potential proxy measure of export service performance could be a measure of observable export volume as a proportion of generation capacity. This assumes there is a baseline level of exports associated with the level of installed capacity that could potentially be normalised and attempt to fill the information gap of estimated export curtailment. This measure is likely less reliable than voltage data as a proxy for curtailment and is more susceptible to exogenous factors, particularly as the energy transition progresses and behind the meter battery installation increases.

Disproportionate quality of service issues

Studies to date demonstrate that constraints are felt disproportionately by a small number of exporting customers and average quality of service measures within a STPIS mechanism are unlikely to target the improvements in the quality of export services where they are most needed.[30] This is particularly so given various network types throughout individual networks.

Interaction with 'funded' export service levels

Many DNSPs with lower levels of export capacity have recently proposed, or are intending to propose, significant uplifts in investment to improve export service provision as part of their regulatory reset processes. If a STPIS measure was implemented now (notwithstanding the issues concerning establishing an appropriate service level target for each DNSP) it could be difficult to control for the case that DNSPs are both funded for improvement in export service provision in expenditure allowances as well as financially rewarded through the STPIS.

Different levels of export service

Export services have been classified as standard control services in the forthcoming NSW/ACT/NT/Tas reset process.[31] This means that export services will encompass both a basic export level (representative of the intrinsic hosting capacity of the network) and export services above that basic export level (for which a charge may apply). In this context, there are two separate incentive tasks to address.

The first is to incentivise the provision of basic export levels. Because the basic export level represents the intrinsic hosting capacity of the network, the DNSP is not separately 'funded' to improve the provision of that portion of the export service. Therefore, it should be an easier task to ensure that DNSPs are not both funded for improvement in export service provision in expenditure allowances as well as financially rewarded through the STPIS.

The second task is to incentivise DNSPs to provide efficient export services above the basic export level in response to customer preferences for higher access. These export service

---

[29] AEMC, *Final determination, Access, pricing and incentive arrangements for DER,* August 2021, p. 49.

[30] See for example: Collaboration on Energy and Environmental Markets at UNSW, *Curtailment and Network Voltage Analysis Study Project Report*, August 2021.

[31] See for example: AER, *Ausgrid Determination 2024–29*, July 2022.

levels should be commensurate with that provided for as part of forecast expenditure. The AEMC referenced this when it noted:

> A DNSP's performance against its STPIS performance targets could be impacted by requirements on the DNSP to also offer minimum export connection capacity to customers. Hence, the STPIS may need to be designed to account for any impacts of minimum export capacity requirements on STPIS performance. Having dual export service performance requirements could lead to complexity of arrangements and a lack of clarity surrounding service level requirements and confusion for customers and DNSPs.

This would potentially mean that any STPIS mechanism would need to quarantine both the delivery and quality assessment of both the basic export level and export service delivery above the basic export level.

In addition, DNSPs have noted an intent to develop a suite of export service offerings over time, particularly as dynamic operating envelopes are adopted. This may mean that customers will be offered an export service that has varying degrees of access and 'firmness' to export that are likely to be linked to appropriate export tariffs. Establishing a common service quality metric reflective of the varying quality of service offerings will be highly complex. An example of this is DNSPs' future use of dynamic operating envelops (see Box 2 for further detail).

Box 2: Dynamic operating envelops

A dynamic operating envelope (DOE, sometimes referred to as flexible export limits) is a principled allocation of the available hosting capacity to individual or aggregate export capacity or connection points within a segment of an electricity distribution network in each time interval. DOEs vary import and export limits over time and location based on the available capacity of the local network or power system as a whole.

Most DNSPs are now considering strategies to implements DOEs to manage network hosting capacity constraints. Recent DOE trials demonstrate DOEs are a low-cost solution that enables much higher volumes of export services.

As part of the Energy Security Board's 'DER Implementation Plan', the AER is currently developing an issues paper for stakeholder feedback as part of a broader work program to provide policy direction and advice to the Energy Security Board in relation to the implementation of DOEs in the National Electricity Market. The AER is developing an issues paper for release in August 2022 for consultation, which will be followed by a directions paper towards the end of 2022 to outline what, if any, proposed changes should be considered to the frameworks around DOEs.

Value of improvements in export services

There is a further question about how to value changes in export service performance should the STPIS incorporate export services. While for consumption services, the incentive rates provided through the reliability of supply component are calibrated with how willing customers are to pay for improved service (measured by the VCR) this is not appropriate for export services. As a standard control service, improvements or decline in additional export

service performance must be valued in accordance with the value that increase/decrease in export services represents to all customers.

The CECV represents the detriment to all customers from the curtailment of export services. Similarly, CECVs represent the benefit to all customers from the alleviation of curtailment which allows a greater level of export services. CECVs therefore offer an appropriate proxy for the valuation of improvements or decline in additional export service performance. We note that where a DNSP's required revenue allowance includes expenditure to improve its export service performance using the applicable CECVs to justify that expenditure, it is likely this will mean the effective valuation of improvements in additional export service performance will be zero. This is because the DNSP may have exhausted the CECV as part of the expenditure forecast and the STPIS mechanism will need to include control measure to avoid the duplication of 'funded' service performance.

If improvements in export service performance are explicitly funded through required revenue allowances, because the DNSP has sought to relieve forecast export constraints up to the applicable CECV, a non-symmetrical STPIS mechanism may be appropriate and a penalty only mechanism could be applied.[32] Table 2 below summarises our assessment of a financial incentive mechanism against our incentive objectives outlined in Section 4.3.

Table 2: Assessment of financial incentive mechanism against incentive objectives

Objective	Assessment	Comment
Flexible	Somewhat	The same STPIS mechanism would apply to all DNSPs and there would be a common approach to setting the elements of the mechanism, such as the incentive rate and how performance is measured. The baseline or target performance level could still be specific to each DNSP, as is the case for the STPIS.
Proportionate	Yes	Assuming it is possible to control for otherwise funded improvements in export service performance, the CECV could usefully reflect the proportionate benefit/determinant to consumers for improvements/reductions in export service performance.
Compatible	Yes	A STPIS for export services could operate in isolation, or in tandem with, other non-financial incentive options.
Improve performance	Yes	Assuming a highly targeted metric could be established (with appropriate data available), a STPIS incentive mechanism is likely to lead to improved DNSP performance with respect to export services.
Information disclosure	Yes	DNSPs would be required to provide service performance data to support a STPIS incentive scheme.
Targeted	No	A STPIS incentive would likely mean a broad approach to export service performance assessment and will not necessarily address the issues and services that consumers value most. For example, a more targeted incentive option could address issues of equity regarding the worst served export customers.

[32] CEPA, *Feasibility of export capacity obligations and incentives*, July 2020, p. 22. Note, this issue interacts with the concern about dual export service performance requirements such that a symmetrical STPIS mechanism could apply to the provision of export services up to the basic export level, but an asymmetrical STPIS mechanism would apply to export services above that basic export level.

Support customer investment	No	A STPIS incentive option in isolation would not provide sufficient transparency to customers to make informed investment/operation of customer energy resource investment.
Cost effectiveness	Yes	Limited additional administrative cost burden in administering an amended STPIS beyond the costs already associated with the scheme more broadly.

While a STPIS incentive mechanism meets most of the objectives of an appropriate incentive mechanism for export service performance, the data necessary to support the most applicable service performance metric – export service curtailment – is not readily available. Further, the data that is available to support tenuous proxy metrics of export service performance lacks accuracy and robustness.

Given these concerns, it may be appropriate to identify a selection of second-best metrics (for example, observable export volume as a proportion of generation capacity as noted above) and establish a paper trial to assess the veracity of each metric as an appropriate proxy measure of export service performance. The AER used a similar approach when first establishing the STPIS and it was suggested as a possibility by the AEMC in its final determination.[33]

Question 4

What level of accuracy and robustness of data metrics would stakeholders consider appropriate for a financial incentive mechanism to operate? For example, are stakeholders comfortable with the use of approximated/modelled inputs for the purpose of a STPIS export service performance measure given most DNSP face significant data visibility issues?

Do stakeholders agree that the CECV is the appropriate valuation of improvements or decline in export service performance? Should a non-symmetrical (penalty only) STPIS mechanism apply for export service levels about the basic export level?

Do stakeholders agree that there are significant concerns with implementing a STPIS mechanism for export services at this time? Are there any other issues we have not considered?

Should the AER explore establishing a paper trial to test the robustness of a selection of potential metrics? What metrics do stakeholders suggest should be included in a paper trial?

Guaranteed service level for export services

There is the possibility of narrowing an amendment to the STPIS to only including a GSL export service component rather than introducing export service metrics into the duration and frequency of outages STPIS component. The AEMC noted that our review of incentive

[33] AEMC, *Final determination, Access, pricing and incentive arrangements for DER*, August 2021, p. 48.

arrangements for export services should consider the need for GSL payments to export customers. Further, the AEMC cautioned that should the AER implement a national GSL scheme for exports it should not seek to fully compensate the customer for lost income due to lower levels of export service provided by the DNSP. The AEMC argued that this would constitute fully firm access rights for customers to export and lead to a level of access for export service that is higher than the level of access that customers receive for the essential consumption service. Firm access rights would also be inconsistent with the open access framework at the transmission level.[34]

We agree that any GSL scheme should not fully compensate for lost export value to customers as it would constitute a firm access right that is not consistent with the provision of efficient levels of export services. However, there may be scope for the consideration of whether a GSL could apply, for example, to the provision of basic export levels. DNSPs are required to include their basic export levels in their Tariff Structure Statements, which are approved by the AER and:

> our expectation is that a distributor offering an export service and tariff options must identify a basic export level that is available at all times. Although the threshold may be set to different levels at different times, it is the AER's expectation that a basic export level must always be greater than zero (where a static zero export limit is not applicable).[35]

A GSL attached to the basic export level could strengthen the consumer protections the basic export level establishes by further incentivising DNSPs to provide the quality of export service promised as part of the basic export level. This could be an interim first step in incentivising DNSPs to provide export services, until such time as base levels of export services are better established across networks.

We recognise that basic export levels may vary across networks, network types, over time and according to generation time periods. We also note that the same data issues identified above with respect to a broader STPIS measure could also apply to a GSL incentive option. For example, a measure of customer export curtailment may still be required. Assuming DNSPs could identify circumstances in which a customer fails to receive their basic export level, the associated GSL payments could be commensurate with the applicable jurisdictional CECV at that time.

Question 5

Should a GSL for export services be further explored?

If a GSL were to be implemented, do stakeholders agree a GSL would best relate to the basic export level and would the applicable jurisdictional CECV be the appropriate compensation for failing to meet the basic export level?

---

[34] AEMC, *Final determination, Access, pricing and incentive arrangements for DER*, August 2021, p. 53.

[35] AER, *Export Tariff Guideline*, May 2022, p. 17.

Bespoke incentive scheme for export services

The is also the potential for development of a bespoke incentive scheme specifically related to export service performance whereby DNSPs could propose a mechanistic incentive scheme as part of their revenue determination process. For example, this might allow DNSPs to propose an incentive payment that would be linked to measured increases in export capacity above a baseline level. If the proposed improvement was not delivered, the incentive payment would be reduced (or forgone entirely). Penalties might also apply for a deterioration in performance. In practice, this approach would still require the ability to establish robust performance measures and is likely to experience the same data metric and data availability issues as broader an amendment to the STPIS. However, a bespoke mechanism could help customers establish more unique performance metrics and give DNSPs the flexibility to agree to an incentive mechanism that is aligned with the specific priorities of their customers. For example, a DNSPs implementation of dynamic operating envelops could be considered an indication of a networks more advanced commitment and management of export services (and the subject of expenditure proposals). The number of customers accessing dynamic operating envelopes as a proportion of total exporting customers could be a useful metric of measuring a DNSP's success in providing higher levels of export service on their networks.

A bespoke approach would also rely on the ability to establish robust performance measures, as well as the value of customer exports, similar to an adjustment to the STPIS. However, for a bespoke mechanism, this may be somewhat more achievable because of the flexibility to create metrics capable of being furnished with appropriate data. The dynamic operating envelope example above demonstrates the simplicity a bespoke approach could provide.

Question 6

Should a bespoke export service incentive mechanism be explored further?

4.5.2 Allowance and margin mechanisms

These incentive options would operate in a similar manner to the current Demand Management Innovation Allowance and Demand Management Incentive Scheme in respect of consumption services. Under the AEMC rule change the AER is tasked with reviewing and where necessary or desirable amending the DMIA and DMIS.[36]

For an equivalent DMIA approach, DNSPs could propose to establish an allowance for expenditure to enhance export hosting capacity according to criteria (usually consumer supported). Throughout the regulatory period, DNSPs then submit compliance reports for such projects to be funded by the allowance. Any unused portion of the allowance is returned to consumers. This allows flexibility for DNSPs to implement export service-related projects that are highly responsive to consumers preferences. There may be difficulties in isolating the outputs of these specific projects with broader export service performance outputs if a

[36] Rule 11.141.2(b).

broader STPIS adjustment is also adopted. This would be dependent on the individual investment proposals.

Under an adapted DMIS approach, a DNSP would identify projects enhancing hosting capacity and commit to the deliverables of that project. The scheme would then allow the DNSP to identify an incentive margin (no greater than 50 per cent of costs) where the total project costs, plus the identified margin, are no greater than the project benefits. Table 3 below summarises our assessment of an allowance and/or margin mechanism against our incentive objectives outlined in Section 4.3.

Table 3: Assessment of allowance and/or margin mechanism against incentive objectives

Objective	Assessment	Comment
Flexible	Yes	This approach can be tailored for each DNSP's specific circumstances and is highly flexible to changing consumer preferences.
Proportionate	Somewhat	This approach may be appropriate if DNSPs are experiencing highly isolated levels of export service concerns. However, there are questions about the administrative costs associated with facilitating this type of incentive approach given the requirement for bespoke assessment of each potential project.
Compatible	Somewhat	Implementation of both this type of incentive alongside a STPIS adjustment could make it difficult to isolate the output measure.
Improve performance	Yes	This will motivate a DNSP to improve performance with respect the specific identified project output.
Information disclosure	Somewhat	DNSPs will be required to provide performance information with respect to the specific project which could be highly specific to a particular part of the DNSP's network.
Targeted	Yes	Highly targeted at specific export service concerns.
Support customer investment	Somewhat	Has the potential to address the concerns of a locational subset of customers but will not support customer investment network wide.
Cost effectiveness	No	Given the ad-hoc and selective nature of this type of an approach, the costs in establishing these sorts of mechanisms are unlikely to be outweighed by provide benefits to consumers.

While there are advantages to implementing these incentive options, they are likely to remain complementary to other incentive options and could experience similar data metric concerns as a STPIS adjustment approach.

Question 7

Should an allowance and/or margin incentive mechanism be explored further?

Do stakeholders think appropriate output measures could be used to assess a DNSPs performance given the flexibility of these approaches? Should consumers drive these types of proposals?

4.5.3 Reputational incentives

There is little information currently available for consumers to understand the performance of DNSPs in delivering export services. DNSPs are beginning to capture relevant export service data as this type of service becomes more pertinent to the operation of their networks. As noted above, DNSPs have been historically providing export services absent any explicit incentive to date due largely to ensure good customer relations. The high level of export service provision (demonstrated by currently small levels of export constraint) indicates it is likely that increasing the transparency of DNSPs export service performance information will lead to enhanced reputational incentives.

This incentive approach allows for the development of robust measures of performance without putting revenue at risk or inappropriately rewarding DNSPs. It would also allow for the assessment of trends over time and a comparison of the performance of DNSPs (with suitable controls). This option provides the additional advantage over a financial incentive of providing stakeholders with an insight into their DNSP's delivery of export services, particularly where DNSPs are proposing uplifts in investment in export service provision.

Following a recent review of DNSPs' incentive to efficiently incur export service expenditure, IPART amended its reporting requirements for DNSPs. From 1 July 2024, NSW DNSPs must publish numerous export related data metrics including, for instance, the network's top ten areas by postcode that have the highest level of customer energy resources by reference to volume of exports and number of connections.[37] This is consistent with a key recommendation of HoustonKemp's advice that an information disclosure incentive would help inform customers with customer energy resources (and those who may be contemplating in investing in these) as to the presence and location of export complaints (in the short term) and constraints (in the longer term) as more information becomes available on the hosting capacity of localised network.[38]

Broader service quality metrics for consideration could include:

- penetration of customer energy resources and export output within the distributor's network
- the impact that networks have on the ability to export (information about number of static export limits)
- data on customer complaints (as representative of customer's satisfaction with the export service provided). If this were locationally identifiable it could help inform third parties about the presence of locational network constraints.

This option could also address the disparity in DNSP access to export service data, whereby those DNSPs with access to higher levels of data could use this data to illustrate the use cases for broader export service performance. This could ensure customers see some of the value from investment in that data collection (particularly where it has been sourced from smart meter data) is returned.

---

[37] IPART, *Distribution reliability standards, Reporting manual*, section 3.4, p. 5.

[38] HoustonKemp, *Distributors' incentives to efficiently incur DER export expenditure*, July 2020, p. 50.

A reputational measure could become a transitionary incentive approach as greater levels of access to data occur over time or remain a complimentary incentive measure. Table 4 below summarises our assessment of a reputational incentive option against our incentive objectives outlined in Section 4.3.

Table 4: Assessment of reputational incentive option against incentive objectives

Objective	Assessment	Comment
Flexible	Yes	Though consistency of data availability across DNSPs would provide for a better level of comparison, different data starting points for DNSPs is less of a concern for reputational incentive options.
Proportionate	Yes	Given the low materiality of current network export curtailment, a reputational incentive alone could be a sufficient response to concerns about DNPSs export service performance.
Compatible	Yes	A reputational incentive option could be used alone or in combination with other incentive approaches.
Improve performance	Somewhat	DNSPs are unlikely to be as responsive to a reputational incentive approach than compared to a financial incentive, however we note DNSPs have been providing export services to date in the absence of any financial incentive.
Information disclosure	Yes	DNSPs would be required to provide service performance data to support a reputational incentive option.
Targeted	Yes	A reputational incentive option could target those aspects of export service most valued by customers and because the approach could rely on a cross section of metrics broader contextual information could be targeted to ensure a more holistic assessment of performance is reported.
Support customer investment	Somewhat	A reputational incentive option could provide a greater level of transparency to customers to make informed investment/operation of customer energy resources investment.
Cost effectiveness	Yes	Limited additional regulatory costs for both DNSPs and the regulator. Much of the suggested data inputs will be required to support DNSP expenditure proposals and observational metrics can be incorporated into the currently published annual performance reports.

While a reputational incentive option may not provide a sufficiently strong incentive for DNSPs to improve export services performance (particularly if there are relatively high costs associated with doing so), a reputational incentive increases transparency for consumers in understanding how export services are provided on their network. In addition, the AER is now required to publish annual reports on the performance of each DNSP in providing export services. To the extent that reputational incentives could be delivered through publication of export service performance metrics, this annual reporting report is likely to serve that purpose. Our approach to establishing export service performance reports is discussed further below in Section 5.

Question 8

What sorts of reporting measures do stakeholders consider are likely to impose reputational incentives on DNSPs?

Do stakeholders consider reputational incentives are sufficient to address concerns about DNSPs provision of efficient export services?

5 Export service performance reports

We will publish annual reports on the performance of each DNSP in providing distribution services for embedded generators (such as residential solar) to export into the distribution network. The NER refer to these publications as 'DER network service provider performance reports' (which we refer to as 'export performance reports'). These reports will provide transparency for export service customers in understanding the services they are accessing and accountability for DNSPs in the quality of export service they are providing their customers. As discussed in Section 2, publicly reporting on a DNSP's export service performance, where no revenue is at risk (as in the case of a financial incentive mechanism) can mean the use of less robust data metrics remains appropriate. Further, as discussed in Section 4.5.3, these reports could also provide reputational incentives on DNSPs to provide efficient levels of export services.

Recognising that we must commence reporting on export service performance by end-2023, this section primarily focuses on what performance metrics would be both useful and feasible for monitoring purposes.[39] This report will include matters we consider appropriate, which may include information about:

- the relative performance of each DNSP in providing the distribution services
- the use of static zero export limits
- the impact of system limitations on availability or use of the distribution services
- performance relative to export tariff offerings.

This section of the consultation paper aims to elicit stakeholder views on the following:

- What export service performance metrics should we ideally capture, even if this is only feasible or practical to capture in the long-term?
- Bearing any current constraints to collecting ideal export performance metrics in mind, what export service performance metrics are useful and feasible to collect in the short term (that is, the 2021–22 or 2022–23 financial year)?
- What practical steps to collect data and develop metrics should DNSPs and the AER take to move towards reporting on what is ideal (or if not possible, the best possible proxy) in the longer-term?
- Do stakeholders have views or suggestions on our proposed approach to developing the inaugural export performance report?

[39] AEMC, *Rule determination: National Electricity and Energy Retail amendment (access, pricing and incentive arranges for distributed energy resources) Rule 2021*, 12 August 2021, p. 48, NER 6.27A.

5.1 Defining and tracking service performance in an ideal world

In our view, since network services are electricity transportation services, we would ideally measure performance for exports and imports in equivalent ways. We consider this consistent with the AEMC's decision to remove references in the NER that are specific to the direction of energy 'so the regulatory framework will give clear guidance that 'distribution services' relate not only to sending energy to consumers, but also to customers exporting the energy they generate'.[40]

5.1.1 Import service performance

Network service performance with respect to imports is implicitly defined as import service reliability – the more likely the network will allow consumers to import the electricity from the grid they want to, the more reliable it is. Performance metrics are essentially different measures of interruptions to supply per customer (frequency of momentary interruptions, frequency of sustained interruptions, total duration of sustained interruptions – each divided by the customer base).[41] We measure interruptions to supply both with exclusions (to remove events outside the DNSP's control for the purpose of incentive schemes)[42] and without exclusions (to understand what interruptions customers experience).

It is widely recognised that 100 per cent reliability is not ideal because, even if it was achievable, it would be prohibitively costly. As such, good performance is not viewed as full reliability, but as a good level of reliability that aligns with consumer preferences, which should take several factors into account, including affordability.

It is subjective to define what constitutes a reasonable level of reliability, particularly as preferences towards reliability vary between different consumers. However, this can be approximated. For instance, values of customer reliability help network planners to understand what customers are willing to pay to avoid certain outages.[43] Moreover, Guaranteed Service Levels attempt to specify what service levels import customers should reasonably expect without receiving an inconvenience payment.[44] The distribution reliability measure guideline also defines what constitutes a customer experiencing an inadequate level of service.[45]

5.1.2 Export service performance

In our view, measurements for export service performance that are equivalent to import service performance would ideally capture interruptions to exports per exporting customer.

---

[40] AEMC, *Rule determination: Access, pricing and incentive arranges for distributed energy resources) Rule 2021*, 12 August 2021, para 9, p. ii.

[41] See AER, *Distribution reliability measures guideline*, November 2018, p. 6 for these measures.

[42] See AER, *Distribution reliability measures guideline*, November 2018, p. 8 for these exclusions.

[43] AER, *Values of customer reliability*, accessed 14 July 2022.

[44] Guaranteed service levels are jurisdictional schemes that require DNSPs to pay consumers if specific levels of service are not met. For example, see Essential Services Commission, *Final decision: Review of the Victorian distributors' guaranteed service level payment scheme*, December 2015.

[45] Defined in AER, *Distribution reliability measures guideline*, November 2018, p. 8 as a customer experiencing greater than four times the network average for unplanned system average interruption duration index (SAIDI) on a three-year rolling average basis compared with a network average customer.

While we consider network export curtailment per exporting customer due to a network constraint would be the ideal metric in theory, some key challenges undermine its feasibility in the short term. Specifically, as discussed under Section 4.5.1, this metric faces several measurement challenges that render it not currently measurable or cost effective to measure.

If we were to overcome these challenges (or at least have a reasonable degree of confidence in modelled data) and measure a DNSP's export service performance to tie to an incentive scheme, we would want to develop 'normalised' measures that exclude interruptions outside the DNSP's control.[46] Consistent with our current network performance reporting, we would want to report both service performance within the DNSP's control and the service performance that customers experience.[47] Exclusions that apply to imports may have an equivalent exclusion for export reliability measures. We would consult with stakeholders in detail on this if we were to develop such measures in the future. However, in the meantime, we are seeking more high-level input.

Question 9

What export service performance metrics should we ideally capture, even if this is only feasible or practical in the long-term?

a. Do stakeholders agree that the ideal measurement of export service performance would use equivalent measures to those used to measure import service performance – and that this would entail measuring interruptions to exports (or network export curtailment) per exporting customer?

b. Do stakeholders agree with our view that it would not be feasible to report involuntary export curtailment per exporting customer in the short term (that is, for the inaugural export performance report due by end-2023)? That is, do you agree with our understanding that this metric is not currently measurable, or cost effective to measure?

5.2 Metrics to track export service performance in the short term

As discussed in Section 3.2, we consulted with DNSPs at the end of 2021 and issued an information request to them in early 2022 to understand what export service-related data they currently hold. A summary of current data holdings and limitations to that data is provided in Attachment B.

The data we collected covers the 2020–21 financial year. While export performance reports must cover a 12-month period,[48] we expect each report would compare that 12-month period

[46] See AER, *Distribution reliability measures guideline*, November 2018, p. 8 to see excluded events for the purpose of normalising reliability measured for the STPIS.

[47] For example, see figure 3-8 of AER, *Electricity network performance report*, September 2021, p. 19.

[48] AEMC, *Rule determination: National Electricity and Energy Retail amendment (access, pricing and incentive arranges for distributed energy resources) Rule 2021*, 12 August 2021, p. 48, NER 6.27A.

against a longer time series to analyse changes over time. However, our understanding from DNSPs is that acceptably reliable export services-relevant data only became available in recent years, and we would therefore need to initially balance the value of having a longer time series against the value of performing comparative analysis with higher-quality data. Our initial position is that 2020–21 would be a reasonable base year for most data relating to export service performance, with the potential to draw on a longer time series for some contextual metrics (for example, exporting customer numbers).

When evaluating what would constitute a good performance metric for export services, we apply five criteria (see Section 3.1). These include whether the metric would: (1) be measurable, (2) not be materially influenced by exogenous factors, (3) not lead to perverse incentives or perverse service outcomes, (4) be cost effective to measure, and (5) reflect services provided to customers.

Having had regard to these criteria, alongside what data is currently available or obtainable (see Section 3 and Attachment B), we are inclined to focus on the metrics in Table 5.

Table 5: Potential short-term performance reporting metrics

Metric	Reason for inclusion
	Performance metrics
Approved to requested to export capacity ratio (%) **Complemented by export customers provided with export limit below requested ('s, %)**	Calculated as approved export capacity (kVA) divided by customer requested export capacity (kVA)– and both these measures are available. This metric would only proxy curtailment if customer requested capacity reflects what they would have used. However, it provides a proxy for servicing exporting customer preferences, and would highlight if there are clear differences between locations (feeders) and customer types. Customer numbers can highlight where outliers may bias results. For example, it may highlight if the approved to requested capacity is low on a feeder because one customer requested excessively high export capacity.
Approved export capacity to installed capacity (kVA as a difference, % as a ratio)	Assessing allowable export capacity against installed capacity tracks network availability to support exports.
(%) of export customers with (a) static zero export limits, (b) non-zero static export limits, (c) dynamic/flexible export limits	Data is currently available and metrics both track performance and provide contextual information. For instance, this will help us to track and delve deeper into: • Is a high incidence of static export limits correlated with network constraints? If it is not, why are limits being imposed? If it is, are there plans to address the constraint (if doing so is economic)? • When actions occur to remediate network constraints, do static export limits continue? • Are dynamic/flexible export limits being used when they represent a feasible and logical solution to manage network constraints?
	Contextual metrics
Customer number metrics: number of export customers at end of period ('s)	Useful as an input for developing other measures and for providing contextual information such as establishing a baseline and understanding customer energy resources impact and penetration. Also, relatively easy and cost effective to measure, particular as data is already provided through AEMO's DER register.

Capacity metrics: installed capacity (kVA)	Useful as an input for developing other measures and for providing contextual information such as establishing a baseline and observing the potential to store generated energy. Also, relatively easy and cost effective to measure, particular as data is already provided through AEMO's DER register.
Customers with compliant inverters of the total export customer population on the network (%)	Calculated as customers with AS4777.2 compliant inverters divided by export customers– and both these measures are available. Compliant inverters are required for flexible export limits, so this metric helps us to monitor network readiness for flexible export limits (or dynamic operating envelopes)
Battery and generation installed storage capacity (kVAh)	Storage capacity is available and useful for understanding the extent export customers can self-consume. This will be a valuable parameter to account for if curtailment due to network constraints is estimated in the future.
Customers receiving overvoltage ('s)	This is a performance indicator for more general network services rather than being specific to exports. However, it is a contextual metric to better understand export service performance. If customer energy resource penetration and overvoltage are both high at a particular feeder, this may signal that voltage issues due to high levels of export should be better managed.
Estimated expenditure for the primary purpose of CER integration by reason: (a) Export-related overvoltage complaint management, other opex, ICT capex, network monitoring capex, other capex	This metric would be qualified given its current subjectivity in measurement and until more consistent data becomes available. It will likely be useful for understanding what actions individual DNSPs are doing over time rather than making comparative judgements between different DNSPs. It is valuable to start collecting as it will provide useful contextual information over a longer time series when considered alongside where export capacity has been limited and where overvoltage issues have occurred. It will also be needed to inform changes to the ABR and in export service-related expenditure proposals lodged with the AER.

Question 10

Do stakeholders agree that financial year 2020–21 is a reasonable base year to start reporting data for most export service performance metrics? If not, what would you recommend and why?

Considering current constraints to collecting export service performance metrics, what metrics are useful and feasible to collect for the inaugural export performance report (to be published by end-2023)? Do you agree with using the potential metrics summarised in Table 5, and are there particular factors we should consider in tracking those metrics? Relatedly, Attachment B summarises our understanding of current data holdings and limitations, and the potential usefulness of each metric. Please provide comments if you have any views on Attachment B.

5.3 Feasibility of improving data

Section 5.1 discusses what performance metric we would ideally measure, and Section 5.2 discusses what metrics we consider possible to include in the inaugural export performance report. While it may not be technically or economically feasible to measure what is ideal, there is scope to continuously improve what we report over time.

On this basis, Table 6 summarises some of the limitations we have identified, how these affect the quality of export service performance metrics, and whether there are feasible ways to overcome those limitations over time.

Table 6: Impact and scope to solve data issues for export service performance reporting

Limitation	Impact	Feasible solution?
Limited access to smart meter data outside of Victoria.	Limits DNSPs' ability to get observed voltage data at the connection point.	Problem will diminish as more customers get smart meters Networks can also attach voltage monitoring devices to estimate voltage devices, although this is costly.
Export curtailment is not directly visible to networks as customer generation occurs at the customer's side of the meter.	Export curtailment metrics are not directly measurable by the network.	DNSPs can purchase inverter data from the relevant party: inverter data can be held by a solar retailer, aggregator (including virtual power plant operators), or inverter manufactures.
A range of interacting variables affect customer generation.	Complicates measuring forced export curtailment, which would be modelled using curtailment data at the inverter level. Among other things, this would require modelling customer generation.	If key metrics are modelled, the AER should specify common modelling assumptions to measures are comparable and transparent.
DNSPs use different approaches to estimate export service performance.	Undermines the ability to compare performance between different DNSPs.	When requesting data, the AER would need tightly specify how metrics should be estimated.
Various connection agreement processes mean it is difficult to measure customer requested export capacity vs approved export capacity.	Results in estimates or sample data underpinning the metric, approved to requested export capacity (%)	There may be scope to improve connection agreement data, particularly as the AER approves DNSP's connection policies (NER clause 6.12.1).
Historic expenditure data on export services not universally separately identified.	Historical expenditure data on export services of limited use for comparison processes	While categorising expenditure by its primary purpose is somewhat subjective, this can improve over time with specific AER guidance and as DNSPs provide higher volumes of export services.
Accuracy of data on export customer complaints and overvoltage complaints.	Limited reliance on current complaint data, which potentially limits the usefulness of this measure to identify problems and emerging trends rather than comparing performance.	While legacy data issues will likely remain, the AER could specify how complain data should be collected and defined going forward. Due to costs, voltage data is currently collected on a sample basis. However, if voltage monitoring was directed towards the location of complaints, it could also provide a robustness check on the complaint data.
Customer behaviour influences delivery of export service (e.g. service delivery is affected by customer preferences to install customer energy resources and to use it to export versus self-consume).	Many performance measures are prone to reflect customer behaviour rather than network performance. Given forced export curtailment would need to be modelled, assumptions would need to be made about customer behaviour.	These limitations are likely to exist, highlighting the importance for us to interpret performance metrics with caution and triangulate our findings with other evidence where possible. If key metrics are modelled, the AER should specify common modelling assumptions and approaches so that

		measures are comparable and transparent.

Question 11

Do stakeholders agree with the data imitations, impacts and potential solutions summarised in Table 6? Advise if there are other key limitations we have overlooked or if there are further solutions to explore.

Several of the potential solutions in Table 6 refer to the need for the AER to tightly specify how data should be collected or estimated to ensure comparability. What should the AER consider or be aware of in pursing such an approach?

5.4 Steps for report development

We propose two phases for developing the inaugural export performance report:

1. Define and collect export service performance metrics, as part of this joint consultation – Table 3.
2. Prepare the inaugural export performance report as part of 2023 electricity network performance report, potentially as a version update – Table 8.

Table 3: Phase 1 project steps and timeframes

Phase 1 step	Estimated timeframe
Collect input on best practice and base level metrics for export service performance.	July–August 2022 (submissions to this consultation paper)
Collect input on proposed data to collect for performance reporting in 2022. This will balance the need to overcome practical challenges with the need to report meaningful and useful performance metrics.	September–November 2022 (submissions to draft report as part of this current review)
Issue information request to DNSPs to collect 2021–22 data to use in the inaugural export performance report.	November–December 2022
Final report will summarise outcome of the review in response to stakeholder submissions and will highlight next steps (including whether Option 1 or Option 2 will be followed under Phase 2 – as per Table 8 below).	December 2022

In forming the view that the export performance report should form part of our electricity network performance reports, we considered the following:

- The AEMC provided us discretion to publish the export performance report as a standalone report, or together with existing performance reports – such as the Electricity Network Performance Report of the Annual Benchmarking Reporting.[49]
- Developing the export performance report alongside an existing report would help us to:
  - leverage off an existing report development process. This would increase efficiency and streamline what would otherwise be multiple consultation processes with a similar group of stakeholders
  - more effectively consider any relevant interlinkages between the reports
  - manage the AER's reporting suite so our content is more streamlined and clearer to navigate
- Network performance reports are more suitable for housing export performance reports than the annual benchmarking reports. While annual benchmarking reports have the specific purpose of describing the relative efficiency of NSPs in providing regulated services,[50] network performance reports look at NSP performance under the regulatory regime more broadly. Among other performance indicators, they look at import service performance (or reliability), which would be beneficial to consider alongside export service performance. They also look at measures that are relevant to consider alongside export services, such as how network utilisation is changing over time.

Table 8: Phase 2 project steps – Develop inaugural export performance report

Estimated timeframe	Option 1: Early release as part of 2023 electricity network performance report	Option 2: Release as version update of the 2023 electricity network performance report
February 2023	If data collected in the information request issued at the end of phase 1 allows us to develop at least base level performance metrics for the 2021–22 regulatory year, announce that the export performance report will be developed as a chapter in the 2023 electricity network performance report. We will remind key stakeholders of the outputs from phase 1 when consulting on priorities and objectives for the 2023 electricity network performance report (as per NER clause 8.7.4(a)) and seek any additional input at that stage.	If data collected in the information request issued at the end of phase 1 is insufficient to develop at least base level performance metrics for the 2021–22 regulatory year, announce that the export performance report will be developed as a version update to the 2023 electricity network performance report. We will remind key stakeholders of the outputs from phase one, and how we will collect data on base level performance metrics for 2022–23. This step will meet the consultation requirements under NER clause 8.7.4(a) for the 2023 electricity network performance report, including the planned update to accommodate the export performance report.
April 2023		Issue an information request to collect data for at least base level export service performance metrics for the 2022–23 regulatory year. Issuing this request early will allow DNSPs time to put data collection systems in place. Responses will be due in September 2023.
May–June 2023	Consult with key stakeholders on the draft electricity network performance report, as per the consultation procedures for preparing NSP performance reports under NER clause 8.7.4. As part of this consultation, NSPs to which the report relates will be allowed at least 30	Consult with key stakeholders on the draft electricity network performance report, which will include export service performance as a focus area chapter. This chapter will provide the shell for the export performance report,

[49] AEMC, *Rule determination: Access, pricing and incentive arrangements for distributed energy resources*, 12 August 2021, paragraph 44, p. vii.

[50] As per NER Rules 6.27 and 6A.31.

	business days before the report is published to submit information and make submissions relevant to the subject matter.	although it will not incorporate the full dataset until the planned version update.
Late July 2023	Publish the inaugural export performance report as a chapter within the 2023 electricity network performance report	Publish the 2023 electricity network performance report with export performance as a focus area chapter.
October–November 2023		Use 2022–23 regulatory year data collected in September to develop performance metrics that underpin the export performance report. Consult on the data model and the draft report as per the consultation procedures for preparing NSP performance reports under NER clause 8.7.4.
December 2023		Publish the inaugural export performance report as a chapter within version 2.0 of the 2023 electricity network performance report

Question 12

Do stakeholders have input on our proposed approach to develop the inaugural export performance report as part of the 2023 electricity network performance report?

Please provide any views on the proposed project steps and timelines, including suggestions to improve the approach? If option one (early release of the export performance report based on 2021–22 data) is feasible, do you prefer this over option two (December 2023 release of the export performance report based on 2022–23 data)?

6 Update to benchmarking reports

There is a question as to how well the current productivity benchmarking accounts for export services and the impact this is having on the productivity results reported in the AER's annual benchmarking report (ABR). To the extent export services are not explicitly or adequately captured in the productivity benchmarking, some DNSPs may receive lower productivity scores than would be the case if export services were better reflected in the benchmarking models. This could lead to perverse reputational incentives for DNSPs around providing export services and could affect how we assess the efficiency of their opex as part of the revenue determination process.

This section considers if changes to the productivity benchmarking are needed, and if so, the best way to update benchmarking techniques to account for export services. In this section, we consider:

- the performance of the current benchmarking models in accounting for export services, and whether there is a case for making changes
- how export services could be better captured
- what export service data is available and whether the best available information is sufficiently reliable and consistent to be used for benchmarking, including to inform
  - in the short term, options for possibly developing an export services OEF
  - in the longer-term, options for changes to the benchmarking model specifications.

This section of the consultation paper seeks stakeholder views on the following:

- The extent to which existing benchmarking techniques account for, and / or do not account for export services at whole of model level, and more specifically at the individual input and output level.
- The range of options we will consider for adjusting the benchmarking framework to account for export services and the data available to implement these options.
- Our proposed two-staged approach for considering options. This includes first consulting on if and how we can calculate an export services OEF for use in the AER's opex efficiency assessment. Then consulting on broader options for changing benchmarking model specifications in 2023–24.

6.1 Why are we considering changes to the productivity benchmarking?

The following section sets out the current way we measure the productivity of the electricity distribution sector via several benchmarking techniques and whether / how this may be impacted by the increasing use of export services.

We use several types of 'top-down' benchmarking techniques to measure the productivity of the distribution sector as set out in Box 3. These techniques rely on data sets that currently cover the period 2006-2021, with new data added each year.

Box 3: The current benchmarking techniques

Productivity Index Number (PIN) models. These techniques use a mathematical index to measure outputs relative to inputs, enabling comparison of productivity levels and trends over time.

Total Factor Productivity (TFP) relates total inputs to total outputs and provides a measure of overall productivity growth for a single entity (a network or the whole industry). It allows total productivity growth rates to be compared across networks but does not allow productivity levels to be compared across networks.

Multi-lateral Total Factor Productivity (MTFP) relates total inputs (operating expenditure (opex) and capital) to total outputs and can provide a measure of overall network efficiency. It allows total productivity levels to be compared between networks and over time.

Multi-lateral Partial Factor Productivity (MPFP) is a partial efficiency measure, which uses the same output specification as MTFP but separately examines the productivity of opex and capital inputs against total output.

Econometric opex cost function models. These model the relationship between opex (as the input) and outputs to measure opex efficiency. The ABR presents opex productivity scores from two types of econometric opex models — Least Squares Econometrics (LSE) and Stochastic Frontier Analysis (SFA) – using two types of functional form for each model – Cobb-Douglas and Translog.

The econometric models include three outputs whereas the productivity index models include five outputs (the three outputs in the econometric models plus energy delivered and reliability). Box 5 in Section 6.4 below lists all inputs and outputs used in the ABR models.

Partial Productivity Indicators (PPIs). PPIs are a simpler form of benchmarking that relate one input to one output. This contrasts the above techniques that relate one or all inputs to total outputs. PPIs measure the average amount of an input (such as total cost or opex category costs) used to produce one unit of a given output (such as total customer numbers, megawatts of maximum electricity demand or kilometres of circuit length). PPIs do not take into account the interrelationships between outputs (or inputs) and can be informative when used in conjunction with other benchmarking techniques.

Operating Environmental Factors (OEFs). OEFs are factors beyond a DNSP's control that can affect its costs and productivity benchmarking performance. The PIN and econometric models include allowance for some OEFS (e.g. customer density, maximum demand density). The econometric models also account for the degree of network undergrounding. We also consider quantitatively some OEFs that are not captured by our opex econometric benchmarking models. If an OEF is outside a DNSP's control, material and not accounted for elsewhere in the models,[51] it is incorporated 'ex-post' it into our process for assessing, and if

[51] Criteria for identifying OEFs is in AER, *Annual benchmarking report: Electricity DNSPs*, November 2021, p. 46.

necessary, adjusting, the efficiency of a DNSP's base opex.[52] This process is described in detail in Box 4 below.

We use the results from these benchmarking models to assess distribution network efficiency as part of revenue determination decisions. The results give us an important source of information on the efficiency of historical network expenditures (opex and capital expenditure (capex)) and the appropriateness of using them in forecasts. We use benchmarking to understand the drivers of trends in network efficiency over time and changes in these trends. This can help us understand why network productivity is increasing or decreasing and where best to target our expenditure reviews. We use the results from the econometric opex cost function models specifically to assess, and where necessary, adjust the efficiency of a network's opex.

The results from these benchmarking techniques serve a variety of other purposes. The results provide network owners and investors with useful information on the relative efficiency of the electricity networks they own and invest in. They provide government policy makers (who set regulatory standards and obligations for networks) information about the impacts of regulation on network costs, productivity and ultimately electricity prices. The ABR results also provide consumers with accessible information about the relative efficiency of the electricity networks they rely on, while the breakdown of inputs and outputs driving network productivity allow consumers to better understand what factors are driving network efficiency and charges that contribute to their energy bill.

Stakeholders, in submission to previous ABRs, have raised issues about the impact that export services are having, or are likely to have, on DNSPs' comparative benchmark performance.[53] In particular, it has been noted that the rise of export service demand has:

- raised questions about whether the energy throughput and maximum demand measures remain appropriate outputs to include
- raised questions about whether an additional output is required to recognise distributed energy
- led to additional costs being incurred, which also needs to be considered in the benchmarking analysis.

Under the current benchmarking, the amount of energy delivered to customers over the distribution network is measured at the customer meter. It does not measure energy

[52] We currently use a number of ex-post OEFs when using the opex econometric cost function analysis to test the efficiency of base opex. These include OEFS for operating and maintaining sub-transmission assets, vegetation management, taxes and levies, termite exposure, cyclones, and backyard reticulation of Evoenergy. See Sapere research group & Merz Consulting, *Independent review of OEFs used to adjust efficient opex for economic benchmarking*, August 2018.

[53] See AER, Annual benchmarking reports 2020, accessed 25 July 2022 for the following documents: AER, 2020 Annual Benchmarking Report: Electricity DNSPs, November 2020, pp. 55–57; Endeavour Energy, Submission on the AER's 2020 draft benchmarking report, 10 November 2020, p. 5; SA Power Networks, Submission on the AER's 2020 draft benchmarking report, 10 November 2020, pp. 1–2; Energy Queensland, Submission on the AER's 2020 draft benchmarking report, 10 November 2020, p. 3; Consumer Challenge Panel (CCP), Submission on the AER's 2020 draft benchmarking report, 10 November 2020, p. 6; Public Interest Advocacy Centre, Submission on the AER's 2020 draft benchmarking report, 19 November 2020, pp. 1–2.

delivered into the distribution network via export services. To the extent these two-way flows increase on a DNSP's network, our current output specification would not recognise these as additional outputs. Further, a DNSP may be required to incur higher opex and/or capital to manage the safety and reliability of its network. In this situation there could be a material increase in inputs (assuming all capital inputs are captured) without a corresponding increase in the current output measures, resulting in a relatively lower productivity score for the affected network than would be the case if the provision of export services were better reflected in the model specifications.

To date, export service-related expenditure appears to have been only a small proportion of total opex and total recent capex (and so is likely a very small proportion of the total capital stock) and so any potential disadvantage experienced by a DNSP under the current benchmarking techniques is unlikely to have been material. However, as installed export capacity, and the task of providing export services increases, the productivity of the sector may not be adequately measured, and the size of potential relative disadvantages may increase.

We acknowledge that work is required to better understand and assess the impacts of export services on the benchmarking models. To the extent they are material, it may be appropriate to recognise their impact, including possibly through changes to the specification of the inputs and outputs used in the benchmarking models to appropriately account for the relationship between changes in inputs and growth in distributed energy.

We seek stakeholder views about the impact of export services on our productivity measurement. Subsequent sections explore possible fit for purpose responses and Section 6.4 specifically seeks stakeholder's preliminary views on options for updating the model specifications.

Question 13

To what extent do the existing benchmarking techniques in Box 4 account for and / or do not account for export services?

How does this impact the productivity results generated by these techniques, and are these impacts currently material?

How do you see these issues changing over time as the level of installed export capacity increases and technology changes?

6.2 Options for changes to the productivity benchmarking

At a high level we consider the following are possible options for adjusting the benchmarking techniques to account for export services:

- Reviewing the benchmarking model specifications (i.e. the inputs and outputs used in the PIN and econometric models) to determine the extent to which the current models do and do not account for export services, the impact of this on the productivity results, and if and how export services could be better captured in the models.

- Developing export service cost category PPIs that would relate export service-related costs as an input to relevant outputs (e.g. export-services related opex against the number of customers using export services as a percentage of all customers, or against export service energy as a percent of total energy throughput, or against average connected export service installed capacity (kW) per customer).[54]
- Calculating an OEF for export services that reflects different operating environments including different levels of export service penetration on opex, and using that to adjust the opex econometric model efficiency scores used to assess the efficiency of a network's base opex (and if necessary, adjust its base opex).

Question 14

Do you agree that the options identified above are possible options for adjusting the benchmarking framework to account for export services? Are there any other options?

Our proposed two-staged approach

We are proposing to consult on options for changes to the productivity benchmarking using a targeted, iterative, two-staged approach.

Stage 1, which would be completed by December 2022 in parallel with the incentive and performance reporting work (discussed in Sections 4 and 5 respectively of this paper), would aim to:

- if possible, develop guidance on how an OEF for export services can be calculated using the best currently available information. To the extent export services OEFs are material, they could be applied as part of our assessment of the efficiency of base opex. This would ensure that DNSPs that face higher operational costs to meet demand for export services will not be disadvantaged when their opex is assessed using the current benchmarking techniques.
- determine how and to what extent the existing ABR models do or do not account for export services and the materiality of this on the productivity results. We will also seek preliminary views on options for updating the model specifications and the main development and implementation issues, including data availability, that would need to be resolved to implement these options.

Stage 2, to be initiated in 2023-24, would consult further on the model specification options, new potential PPIs that could be used in conjunction with updated models, and the development and implementation issues identified in stage 1. Stage 2 would also be informed by the outcomes on data and metric availability from the incentive review and performance reporting work described in sections 4 and 5 of this paper. This stage would aim to provide final guidance on if and how the ABR models can be updated to account for export services.

[54] The full list of the export service metrics the AER consulted on in 2021 can be found in Attachment B of this paper. Not all of these metrics are relevant candidate metrics for calculating PPIs.

We consider that this iterative and targeted approach will allow us to more effectively consult on the options for updating the productivity benchmarking. The approach has been informed by early stakeholder feedback on the type of export service-related data and metrics currently availability. It will allow us to prioritise in the shorter-term ways of practically adjusting the econometric opex benchmarking results (which we use in resets) to reflect differences in export service penetration between networks, while also working to consider and implement more complex and possibly data intensive changes to the benchmarking models over the longer term.

Question 15

What are your views on the proposed staged approach? What if any changes would you suggest?

6.3 Calculating an OEF for base opex efficiency assessments

Based on the staged approach set out in Section 6.2, this section examines how we may possibly develop guidance on an OEF for export services. Section 6.4 then examines the extent to which the current benchmarking models account for or do not account for export services, and possible options for updating the model specifications to address this.

The AER's standard approach for calculating an OEF to adjust the econometric opex cost function benchmarking results used as part of a base opex assessment includes:

- identifying the level of ***incremental efficient opex costs*** incurred by the DNSP because of the OEF.
- calculating an average annual incremental efficient opex for the benchmarking period.
- calculating these opex costs as a proportion of total average annual efficient opex.
- comparing the DNSP's proportion with the customer-weighted average proportion of the comparator 'efficient' DNSPs.[55]
- calculating the difference in proportions as the OEF adjustment (%). Where the difference is positive, indicating a relative cost disadvantage for the DNSP, this results in a positive OEF adjustment. Where the difference is negative, indicating a relative cost advantage for that DNSP, this results in a negative OEF adjustment.[56]

[55] The comparator group consists of DNSPs that have an econometric efficiency score at or above the 0.75 comparator point. See AER, *Annual benchmarking report: Electricity DNSPs*, November 2021, p. 51.

[56] For a fuller description of how we calculate and apply OEFs in our revenue determinations, see AER, *Annual benchmarking report: Electricity DNSPs*, November 2021, Chapter 7.

Box 4 describes in detail how we use the OEF as part of our base opex efficiency assessment.

Box 4: How we use opex efficiency scores in our revenue determinations to assess relative efficiency of actual opex in a specific year

The ABR econometric models produce average opex efficiency scores for the period over which the models are estimated (e.g., the 2006–20 period and the 2012–20 period in the 2021 ABR). Where there are rapid increases or decreases in opex, it may take some time before the period average efficiency scores reflect these changes. This means that in some circumstances the efficiency scores will not reflect a DNSP's relative efficiency in the most recent year.

To use the econometric results to assess the efficiency of opex in a specific year, particularly in the context of our revenue determination processes, we estimate the efficient opex of a benchmark efficient service provider operating in the target DNSP's circumstances.

We do this by first averaging the DNSP's actual opex (deflated by the opex price index) and calculating its efficiency score over the relevant period. We then compare the DNSP's opex efficiency score against a benchmark comparison score.

Where an OEF meets the AER's criteria for use in our base opex assessment process (Box 3), we apply the OEF adjustment by adjusting the 0.75 benchmark comparison point (upwards for negative OEFs, downwards for positive OEFs). This adjusted comparison point is then compared to the business's efficiency score (from the econometrics benchmarking models), allowing us to account for potential cost differences due to material OEFs between the business and the benchmark comparison businesses when we assess, and if necessary, adjust the business' base opex.

Where the DNSP's efficiency score is below the adjusted benchmark score, we adjust the DNSP's average opex by the difference between the two efficiency scores. This results in an estimate of average opex that is not materially inefficient. We then roll forward this period-average opex to a specific base year using a rate of change that reflects changes in outputs, OEFs and technology between the average year and the specific year. We then compare the DNSP's actual opex in the base year to the rolled forward efficient opex benchmark.

Examples of how we have applied this approach in practice are in the AER's opex final decisions for Jemena[57] and AusNet[58] for the 2021–26 regulatory control period, including the application of material OEFs that we have been able to quantify.

We have used a number of fit for purpose approaches to derive the incremental efficient opex costs used to develop other OEFs. For example, the vegetation management OEF is calculated by quantifying the cost impact of vegetation management regulations introduced in Victoria after the 2009 Black Saturday bushfires. The increased opex expected to be

[57] AER, *Final decision: Jemena distribution determination 2021–26 Attachment 6 – Operating expenditure*, April 2021.

[58] AER, *Final decision - AusNet Services distribution determination 2021–26 - Attachment 6 - Operating expenditure*, April 2021.

incurred as a result of new regulations is used as a proxy for the differences in costs of managing bushfire risks in Victoria compared to other states.

For export services, one approach is to rely on historical cost data and test the efficiency of these costs. Options for doing this are outlined below in Section 6.3.1. Alternatively, we could consider estimating efficient opex costs incurred in providing export services. Section 6.3.2 outlines possible approaches for doing this.

In choosing between these approaches, we will consider the available information to determine if developing an OEF is possible, and if so the approach that is feasible, timely and provides the best available derivation of incremental efficient export services-related opex.

6.3.1 Deriving incremental efficient export services-related opex from actual cost data

Deriving incremental export services related-opex

One approach to calculating incremental export services-related opex would be to rely on revealed cost data reported by DNSPs using a consistent measurement and cost attribution approach. Where consistent historical data is not readily available, other options include disaggregating these costs from existing historical opex cost categories or collecting new data using an agreed set of consistent cost attribution guidance.

DNSPs currently collect and report various consistent categories of opex in Category Analysis (CA) Regulatory Information Notices (RINs), including opex for maintenance, vegetation management, emergency response, non-network, network overheads, and corporate overheads. DNSPs also collect and report various categories of opex in Economic Benchmarking RINs, although these cost categories are largely not consistent across DNSPs. Export services is not currently a separate opex cost category under existing CA or Economic Benchmarking RINs, so while these costs are likely a part of total opex and likely make up a proportion of the CA and Economic Benchmarking RINs cost categories the data is unlikely to be recorded separately.

DNSPs do, however, monitor and account for export service-related issues in their internal network operations, management, and planning, as well as in expenditure proposals lodged with the AER.

DNSPs already monitor and manage their network operations and performance in relation to installed export capacity, energy exports and areas of constraints to enable them to provide hosting services for their customers while maintaining the safety and reliability of their networks. Initial feedback from DNSPs, and currently available data, indicates that annual DNSP operational and capital costs needed to meet current levels of export service demand have been relatively small in comparison to overall expenditures, though to date this has not been explicitly quantified.[59]

As installed export capacity rises, DNSPs will need to continue to forecast and undertake network planning to decide how best to manage demand for export services, including the

[59] Based on DNSP data provided as a part of consultation with DNSPs to date as set out in section 3.2.

types of network investment and opex required. Recent discussions with DNSPs have suggested substantial increases in expenditures related to the provision of export services are forecast over the coming years.

A number of recent DNSP expenditure proposals have included export service-specific opex and capex:

- SA Power Networks proposed expenditures as part of its export services management program to develop new operational systems and business processes to manage the integration of solar, battery storage and virtual power plants into its network. The low voltage management program was predominantly capex totalling $31.8 million ($June2020) but included $3.8 million ($June2020) opex over the 2020–25 regulatory control period.[60]
- TasNetworks proposed a $1 million ($2018–19) per annum step change to its base opex to meet compliance obligations relating to voltage on the network resulting from increased demand for export services.[61]
- CitiPower, Powercor and United Energy proposed opex step changes totalling $1.3 million, $6.2 million and $4.2 million ($2020–21) respectively, to remove voltage constraints on their networks and enable more customers to export solar. The networks stated that the opex would remove constraints caused by the step up in solar installations resulting from the Victorian Government's Solar Homes subsidy program. CitiPower, Powercor and United Energy also proposed $31.5 million, $60.7 million and $42.4 million ($2020–21), respectively of capex related to their solar enablement programmes.[62]

The AER has also signalled through its recently published *DER integration expenditure guidance note* that new investment to provide export services DNSPs propose should be justified with data and rationales that include:

- clearly identifying the export services being addressed, including an explanation of the network's approach to export-related planning and investment against alternative options
- identification of solution(s)
- an assessment of the costs and benefits of the preferred solution(s).[63]

As discussed in Section 3.2, we consulted with DNSPs at the end of 2021 and issued an information request to them in early 2022 to understand what export service related data they currently hold, including estimated expenditure (opex and capex) for export services. A

[60] SA Power Networks, *2020–25 Regulatory proposal – Attachment 6 – Operating expenditure*, 31 January 2019, p. 25; SA Power Networks, *2020–25 Regulatory proposal – Supporting document 5.18 – LV Management Business Case*, 25 January 2019, pp. 13–14.

[61] TasNetworks, *Tasmanian transmission and distribution revised revenue proposals 2019–24,* 29 November 2018, p. 73.

[62] CitiPower, *2021–26 Regulatory proposal*, January 2020, p. 64; Powercor, *2021–26 Regulatory proposal*, January 2020, pp. 73–76; United Energy, 2021–26 Regulatory proposal, January 2020, p.148.

[63] AER, *DER integration expenditure guidance note*, June 2022, pp. 10–23,

summary of the data provided and possible limitations to that data is provided in Attachment B.

A number of DNSPs did not provide any export services-related expenditure data, while several reported some categories of opex and capex data over the 2014-15 to 2020-21 time period. Significantly more data was reported by more DNSPs over the 2018-19 to 2020-21 period than in earlier years. DNSPs noted generally that export service expenditure data is challenging to capture for historic years, especially before 2018-19, as export services expenditure recorded by networks was typically embedded as part of consumption services. However, DNSPs are increasingly categorising expenditure as being for the purpose of export services. This is likely because DNSPs are needing to respond to more network constraints arising from high levels of installed export capacity.

Estimated expenditure was provided for a range of categories including for export overvoltage complaint management, 'other' opex, ICT capex, network monitoring capex, and 'other' capex. In all cases the reported estimates of export service expenditure were a relatively small proportion of overall costs.

In this early engagement, most DNSPs indicated that they do not typically separate export service-related expenditure (whether opex or capex) between export services and other network activities. Some networks highlighted difficulties in doing so noting expenditures to operate, maintain, reconfigure and augment networks can typically address multiple objectives and network constraints and often involve trade-offs.[64] Networks also noted that current export service-related data tends to be held in segregated systems such as – low voltage planning, financial cost centres and customer data billing systems that are not interlinked in the same way as consumption datasets.

DNSPs generally agreed that export service expenditure data was considered vital information for future regulatory determinations, with some noting that while cost breakdowns are not readily available, they can be calculated. There was strong support for AER guidance on the types of costs that can be attributed to export services to assist DNSPs in being able to consistently report this type of data in the future.[65]

Given the increasing use and importance of export services, the publication of the DER integration expenditure guidance note, and recent DNSP expenditure proposals with DER-specific opex and capex components, the AER is keen to better understand the extent to which DNSPs have started to or are considering export service-related expenditure in their network operations, management and planning processes. In particular, how these processes have resulted in export service-related expenditures in recent years, how these expenditures have been recorded in network cost systems (whether explicitly as export service expenditure or in some other form), and the extent to which these expenditures can or cannot be disaggregated into export-related capex and opex.

[64] Based on DNSP data and responses provided as a part of consultation with DNSPs to date as set out in section 3.2.

[65] Based on DNSP data and responses provided as a part of consultation with DNSPs to date as set out in section 3.2.

To the extent incremental export services related costs (capex and opex) cannot be reliably disaggregated from current expenditure data, the AER seeks to understand more clearly the barriers to doing so.

If this consultation process concludes that disaggregating incremental export services opex from existing expenditure data is not viable, the AER seeks views on how data on export services-related costs could be collected in a way that would allow for consistent cost measurement and allocation approach between DNSPs.

Question 16

In the context of developing an OEF and determining incremental efficient export services costs:

a. Have there been any changes in the export service-related cost data (capex and opex) collected since DNSPs provided responses to our initial data consultation process? Please outline these changes, including how these expenditures are categorised and reported, and provide the related cost data.

b. To the extent export service-related costs are not separately captured in your processes and systems, can you disaggregate or estimate these costs from historical expenditure? What are the barriers (i.e. regulatory, technical, practical, cost, etc.) to doing this? What type of AER guidance would be helpful to facilitate disaggregation of export service costs?

c. How export services-related cost data be collected that would allow for consistent measurement and allocation approaches between DNSPs?

Testing the efficiency of incremental export services-related opex

The AER must also consider whether the incremental export services-related opex is prudent and efficient (or alternatively, that based on the best available information there is no evidence the cost is materially inefficient).

We have used a variety of fit for purpose approaches to derive the incremental efficient opex costs used to develop other OEFs, with explicitly or implicitly testing the efficiency of the incremental opex data used.[66] These approaches have included using:

- forecast opex from AER approved OEF-related step changes for Victorian DNSPs (bushfire obligation vegetation management OEF) – The forecasts are assumed to be an estimate of efficient cost.

[66] The AER currently uses OEFs for operating and maintaining sub-transmission assets, vegetation management, taxes and levies, termite exposure, cyclones, and backyard reticulation of Evoenergy. Details on how incremental efficient opex have been calculated for these OEFs can be found in the ABR 2021 and the Sapere Research Group and Merz Consulting Final Report, *Review of Operating Environment Factors for Distribution Network Service Providers*, available on the AER's website.

- actual incremental opex reported (licence conditions on distribution assets) – incremental opex is divided by total opex to derive the OEF impact. Incremental opex is assumed to have the same level of efficiency as total opex, and thus they are cancelled out in the OEF.
- estimated efficient opex based on the customer-weighted average costs incurred by the comparator 'efficient' DNSPs (sub-transmission OEF)
- actual opex incurred where those costs are market tested, for example through open tendering of contracts (termite OEFs)
- actual opex incurred to pay taxes and levies where these are exogenously determined and invoiced (taxes and levies OEF).

Engineering assessments of OEF-related actual costs have been considered but not yet applied.

The AER is open to consider other fit for purpose approaches to test efficiency noting the approach that will be applied will depend on the data that is used to derive export services-related opex.

Question 17

How could the efficiency of export services-related incremental opex be tested?

6.3.2 Using an estimation method to derive incremental efficient export service opex

In cases where incremental efficient export services opex is not separately collected, cannot be reasonably disaggregated from existing historical opex cost categories, or readily collected using an agreed set of costs attribution guidance, a third option would be to use a standardised method to estimate DNSPs' export services-related efficient opex.

At a general level, this approach would likely involve a number of steps, including:

- using a standard metric, or some weighted combination of metrics, to proxy the size of the export 'hosting task' the DNSPs face. Examples of metrics from the preliminary consultation with DNSPs in 2021 that could be used to do this include:
  - the number of customers using export services as a percentage of all customers
  - export service energy as a percent of total energy throughput
  - average connected export service installed capacity (kW) per customer average export capacity (kW) per customer.[67]
- calculating a set of weights, if more than one metric were used
- calculating the incremental efficient cost, or cost elasticity, that estimates the average level of incremental opex an efficient DNSP would be likely to incur in providing an additional unit of export hosting services. An elasticity of this type could, in principle, be estimated by econometric analysis of a suitable data set (i.e. where export services opex

[67] The full list of the export service metrics the AER consulted on in 2021 can be found in Attachment B of this paper. Not all of these metrics are relevant candidate metrics for adjusting opex for the effects of export services.

could be specified as a function of appropriate outputs). A data set could be drawn from DNSP data used for opex cost function modelling or other sources in the published literature, where available.

We are interested in stakeholders' views on if and how an estimation method could be applied to derive incremental efficient export services opex in the event it cannot be reasonably disaggregated or collected using actual opex data.

Question 18

Do you see an estimation method as an in-principal option that could be examined for deriving incremental efficient export service opex? Why? Why not?

If an estimation method were required, do you have views on:

- what metrics could best proxy the size of the exporting task faced by DNSPs?
- how weights could be calculated (if needed)?
- how an efficient cost elasticity could be calculated?

6.4 Preliminary consultation on model specification options

As noted in Section 6.2, the use of an OEF to adjust the econometric opex cost model analysis to assess opex efficiency may be a targeted, interim approach to account for export services in the benchmarking. Another, perhaps more robust, longer-term approach would be to capture export services in the benchmarking models as set out in Section 6.1. This could be done by reviewing and updating, where necessary, input and outputs to ensure the results generated accurately reflect network efficiency.

Under the staged approach proposed in Section 6.2, the primary focus of this section is to seek stakeholders' views on how and to what extent the existing ABR models do or do not account for export services, and the materiality of the impact this is likely to have on the current productivity results. The section also seeks preliminary views on options for updating the model specifications and some of the possible development and implementation issues that would need to be resolved to implement these options. We note that we are proposing to consult in full on these issues in stage two of the process to be commenced in 2023-24.

The inputs and outputs of the various benchmarking models are listed in Box 5.

The PIN models use an index which aggregates all the outputs in Box 5 excluding 'share of undergrounding', divided by an index of the relevant inputs (i.e. all inputs for TFP and MTFP,

capital inputs only for capex MPFP, and the opex input only for opex MPFP), based on shares of outputs and inputs respectively.[68]

The econometric models[69] estimate the relationship between opex (as the input) and four outputs, and so measure opex efficiency. The outputs include, customer numbers, circuit length, ratcheted maximum demand and share of undergrounding. They do not include the energy delivered or reliability outputs included in the PIN models. The econometric opex cost function modelling also differs from the PIN benchmarking techniques in that it uses Australian and overseas data.

Box 5: Inputs and outputs used in the distribution benchmarking models[70]

Inputs

Capital stock (capital) is the physical assets DNSPs invest in to replace, upgrade or expand their networks. Electricity distribution assets provide useful service over a number of years or even several decades. We split capital into:

- overhead distribution (below 33kV) lines
- overhead sub-transmission (33kV and above) lines
- underground distribution cables (below 33kV)
- underground sub-transmission (33kV and above) cables
- transformers and other capital.

Operating expenditure (opex) is expenditure needed to operate and maintain a network. Opex is an immediate input into providing services and is fully consumed within the reporting year.

Outputs

Customer numbers. The number of customers is a measure of the scale of the DNSP and the services a DNSP must provide. We measure the number of customers as the number of active connections on a network, represented by each energised national metering identifier. This output is used in the PIN and econometric models.

Circuit length. This reflects the distances over which DNSPs deliver electricity to their customers.

---

[68] The weights applied to the first four outputs in Box 5 are based on estimated elasticities of total cost to each output derived using an econometrically-estimated Leontief cost function. The reliability output is given a weight based on the AER's estimate of the value of customer reliability (VCR). The weights applied to each input are based on estimated shares of that input to total cost. The cost of the non-capital input is measured by nominal opex. For more details on the input and output weights applied to productivity index numbers, see Economic Insights, *Economic Benchmarking Results for Australian Energy Regulator's 2021 DNSP* Annual Benchmarking Report, 12 November 2021, pp. 122-25.

[69] The ABR presents four sets of econometric results based on two types of econometric opex models — Least Squares Econometrics (LSE) and Stochastic Frontier Analysis (SFA), which use two types of functional form for each model – Cobb-Douglas and Translog.

[70] Economic Insights, *Economic benchmarking assessment of opex for NSW and ACT electricity DNSPs*, November 2014 explained the choice of these inputs and outputs. The ABR included a more detailed explanation of how each ABR model is calculated.

Ratcheted maximum demand (RMD). DNSPs endeavour to meet the demand for energy from their customers when that demand is greatest. This means that they must build and operate their networks with sufficient capacity to meet the expected peak demand for electricity. This output is used in the PIN and econometric models.

Energy delivered (MWh). Energy throughput is a measure of the amount of electricity that DNSPs deliver to their customers. This output is included only in the PIN models, not in the econometric models. This output is used in the PIN and econometric models.

Reliability (customer minutes off-supply or CMOS). Reliability measures the extent to which networks are able to maintain a continuous supply of electricity. Minutes off-supply enters as a negative output and is weighted by the value of consumer reliability. This output is included in the PIN models, but not in the econometric models.

Share of undergrounding: The opex cost function econometric models include this variable for the proportion of a DNSP's total circuit length that are underground. DNSPs with more underground cables will, all else equal, face less maintenance and vegetation management costs and fewer outages. This output is not included in the PIN models.

The increase in export service installed capacity over time raises a number of potential issues related to the specification of the benchmarking models. Table outlines some initial thinking about the ways that export services could interact with the existing inputs and outputs and some preliminary options that could be considered to address the related impacts.

Table 9: Export services interactions with the benchmarking models and options for change

Model specification issue	Options for change
Outputs	
Energy delivered (MWh) or the energy throughput output is measured at the customer meter. It is intended to measure the amount of energy transported to customers over the distribution network. Stakeholders have previously indicated to the AER that it does not include energy delivered into the distribution network via export services and does not reflect the fact that DNSPs are now managing two-way electricity flows. If the measurement of energy at the customer meter is a net amount after deducting energy exports, aggregate energy may not adequately account for the energy supplied from export services and transported on the distribution network. To the extent the current measure of energy delivered does not account for energy exported to the distribution network this output measure is below what it would otherwise be.	Update the energy delivered definition. For example, if the current measure of energy delivered is the net energy delivered to customers over a billing period, then it may be appropriate to change the definition by adding to it the total energy exported by small-scale export service customers.
Ratcheted maximum demand (RMD) is currently measured by the non-coincident summated raw system annual maximum demand (in MW) at the transmission connection point. For each connection point the peak	Update the RMD definition. For example, we could calculate the average energy exports during the same peak hours over which the

Model specification issue	Options for change
delivery hour may be different, and in this sense, they are non-coincident. If small-scale solar PV generators export electricity during the same hourly periods that are used to calculate the maximum demands, then that power adds to the energy transported by the distribution network during those peak periods. This effect may be quite small at present, given the small proportion of energy generated by export service customers and the general non-alignment of export service generation with peak demand periods. Nevertheless, it may become a more important over time as export service generation increases, and as active export services enable customers to shift the timing of their exports to periods of highest value (i.e. peak periods). To the extent the current measure of RMD does not account for energy exported into the distribution network during the peak hours over which maximum demands at transmission connection points are calculated this output measure is below what it would otherwise be.	maximum demands at transmission connection points are calculated and add that amount to the sum of the non-coincident maximum demands recorded at the transmission connection points.
Reliability or customer minutes off-supply (CMOS) could be impacted where the two-way flows of energy resulting from export services cause voltage levels to rise. Increases in voltage can cause the exporting customer's inverter to cut-off so that the customer loses supply. Related issues may also increase the risk of failure of network components. These factors could lead to an increase in CMOS. In this case, network expenditure aimed at increasing export hosting capacity could, to some extent, already be reflected in a lower CMOS measure and higher output.	To the extent the current CMOS measure captures the benefits (increased outputs) from network expenditure targeted at increasing export services hosting capacity no change would be required. If CMOS does not adequately capture the benefits a separate output measure of export services (or hosting capacity) could be needed.

Export services (or a network's hosting capacity) are not currently explicitly included as an output.
 	
It should be noted that if the definitional changes to the energy throughput and maximum demand measures were carried out, and with the noted effect that expenditure to increase hosting capacity may have on CMOS, there is a question as to whether an additional output is needed for hosting capacity.
	If required, add an output to measure the supply of export services and calculate updated output weights. Two alternative approaches to developing an export services output could include:
	
	• measuring total export capacity in some way. For example, the quantity of energy exported could be proxied by various metrics including:
	
	  ○ number of export service customers
	  ○ total installed capacity for export service

Model specification issue	Options for change
	○ total export capacity adjusted for DER curtailment due to network constraints ○ total export service volume • measuring the curtailments of energy exported analogously to the existing reliability measure (which uses CMOS as a negative output). For example, the quantity of export service curtailment could be measured by the volume or percentage of exports prevented due to static and dynamic constraints.
Inputs	
Capital and opex inputs are required for DNSPs to provide export services. Under current model specifications, the opex input should capture all export services-related opex. However, a question surrounds whether the existing five physical capital input measures adequately capture export services-related capex. Export services-related capex to increase hosting capacity could include augmenting transformers, a range of other types of network augmentations, as well as forms of ICT capex. Where this capex increases the 'transformers and other capital' input measured in megavolt-amperes (MVA) this is accounted for in the existing models. To the extent DNSPs are undertaking export services-related capex that does not increase the 'transformers and other capital' input (i.e. capex to replace transformer protection systems) it would not be accounted for.	Add a new 'other capital' input to measure export service capex and capacity otherwise not accounted for under the existing capital stock inputs.

The AER seeks stakeholder views on the extent to which the existing outputs and inputs listed in Box 5 account for, or do not account for, export services. In particular, the AER seeks views on the potential ways that export services may interact with the benchmarking models summarised in Table 9 above.

This information will assist us in understanding the nature of any problems with existing model specifications and the magnitude or materiality of the impacts these problems may have on the productivity results. We also seek preliminary views on options to address any potential shortcomings in the benchmarking models, noting that we are proposing to fully consult on these issues as part of stage two to commence in 2023–24.

Question 19

To what extent do the existing outputs and inputs listed in Box 5 account for, or not account for export services? Please consider in your explanation:

- how the given output or input accounts for, or does not account for export services
- how this impacts the productivity results generated, and the materiality of any impact
- how you see these issues changing over time as the level of installed export capacity increases and technology changes?

How could the existing outputs and inputs be modified or added to better account for export services in the productivity results? Please consider the options outlined in Table 9 in your response and include in your explanation what you see as the key developmental and implementation issues that would need to be resolved to progress the modification(s) (i.e. data availability for the benchmarking period (currently 2006-21), new definitions, conceptual or technical issues that would need to be resolved).

Attachment A: Stakeholder feedback template

The template below has been developed to enable stakeholders to provide their feedback on the questions posed in this consultation paper and any other issues to which they would like to provide feedback. The AER encourages stakeholders to use this template and to provide reasons for stakeholders' views to assist the AER in considering the views expressed by stakeholders on each issue. Stakeholders should not feel obliged to answer each question, but rather address those issues of particular interest or concern. Further context for the questions can be found in the consultation paper.

1. Submitter details

ORGANISATION:

CONTACT NAME:

EMAIL:

PHONE:

Section 4: Incentive review for export services

AER Question	Stakeholder feedback
1. Do stakeholders consider further incentive measures are required to ensure DNSPs provide efficient levels of export services?	
2. Do stakeholders agree with these objectives for assessment of the merits of enhancing incentives for export services?	
3. How significantly does the average low level (and value) of constraints currently experienced by most NEM exporting customers influence the need to enhance incentives for the provision of export services at this time?	
4. What level of accuracy and robustness of data metrics would stakeholders consider appropriate for a financial incentive mechanism to operate? For example, are stakeholders comfortable with the use of approximated/modelled inputs for the purpose of a STPIS export service performance measure given most DNSP face significant data visibility issues? Do stakeholders agree that the CECV is the appropriate valuation of improvements or decline in export service performance? Should a non-symmetrical (penalty only) STPIS mechanism apply for export service levels about the basic export level?	

Do stakeholders agree that there are significant concerns with implementing a STPIS mechanism for export services at this time? Are there any other issues we have not considered? Should the AER explore establishing a paper trial to test the robustness of a selection of potential metrics? What metrics do stakeholders suggest should be included in a paper trial?	
5. Should a GSL for export services be further explored? If a GSL were to be implemented, do stakeholders agree a GSL would best relate to the basic export level and would the applicable jurisdictional CECV be the appropriate compensation for failing to meet the basic export level?	
6. Should a bespoke export service incentive mechanism be explored further?	
7. Should an allowance and/or margin incentive mechanism be explored further? Do stakeholders think appropriate output measures could be used to assess a DNSPs performance given the flexibility of these approaches? Should consumers drive these types of proposals?	
8. What sorts of reporting measures do stakeholders consider are likely to impose reputational incentives on DNSPs? Do stakeholders consider reputational incentives are sufficient to address concerns about DNSPs provision of efficient export services?	

Section 5: Export service performance reports

AER Question	Stakeholder feedback
9. What export service performance metrics should we ideally capture, even if this is only feasible or practical in the long-term? (a) Do stakeholders agree that the ideal measurement of export service performance would use equivalent measures to those used to measure import service performance – and that this would entail measuring interruptions to exports (or network export curtailment) per exporting customer? (b) Do stakeholders agree with our view that it would not be feasible to report involuntary export curtailment per exporting customer in the short term (that is, for the inaugural export performance report due by end-2023)? That is, do you agree with our	

understanding that this metric is not currently measurable, or cost effective to measure?	
10. Do stakeholders agree that financial year 2020–21 is a reasonable base year to start reporting data for most export service performance metrics? If not, what would you recommend and why? Considering current constraints to collecting export service performance metrics, what metrics are useful and feasible to collect for the inaugural export performance report (to be published by end-2023)? Do you agree with using the potential metrics summarised in Table 5, and are there particular factors we should consider in tracking those metrics? Relatedly, Attachment B summarises our understanding of current data holdings and limitations, and the potential usefulness of each metric. Please provide comments if you have any views on Attachment B.	
11. Do stakeholders agree with the data imitations, impacts and potential solutions summarised in Table 6? Please advise if there are other key limitations we have overlooked or if there are further solutions to explore. Several of the potential solutions in Table 6 refer to the need for the AER to tightly specify how data should be collected or estimated to ensure comparability. What should the AER consider or be aware of in pursing such an approach?	
12. Do stakeholders have input on our proposed approach to develop the inaugural export performance report as part of the 2023 electricity network performance report? Please provide any views on the proposed project steps and timelines, including suggestions to improve the approach? If option one (early release of the export performance report based on 2021–22 data) is feasible, do you prefer this over option two (December 2023 release of the export performance report based on 2022–23 data)?	

Section 6: Update to benchmarking reports

AER Question	Stakeholder feedback
13. To what extent do the existing benchmarking techniques in Box 4 account for and / or do not account for export services?	

How does this impact the productivity results generated by these techniques, and are these impacts currently material? How do you see these issues changing over time as the level of installed export capacity increases and technology changes?	
14. Do you agree that the options identified above are possible options for adjusting the benchmarking framework to account for export services? Are there any other options?	
15. What are your views on the proposed staged approach? What if any changes would you suggest?	
16. In the context of developing an OEF and determining incremental efficient export services cost: a) Have there been any changes in the export service-related cost data (capex and opex) collected since DNSPs provided responses to our initial data consultation process? Please outline these changes, including how these expenditures are categorised and reported, and provide the related cost data. b) To the extent export service-related costs are not separately captured in your processes and systems, can you disaggregate or estimate these costs from historical expenditure? What are the barriers (i.e. regulatory, technical, practical, cost, etc.) to doing this? What type of AER guidance would be helpful to facilitate disaggregation of export service costs? c) How export services-related cost data be collected that would allow for consistent measurement and allocation approaches between DNSPs?	
17. How could the efficiency of export services-related incremental opex be tested?	
18. Do you see an estimation method as an in-principal option that could be examined for deriving incremental efficient export service opex? Why? Why not? If an estimation method were required, do you have views on: • what metrics could best proxy the size of the exporting task faced by DNSPs?	

• how weights could be calculated (if needed)? • how an efficient cost elasticity could be calculated?	
19. To what extent do the existing outputs and inputs listed in Box 5 account for, or not account for export services? Please consider in your explanation: • how the given output or input accounts for, or does not account for, export services. • how this impacts the productivity results generated, and the materiality of any impact. • how you see these issues changing over time as the level of installed export capacity increases and technology changes. How could the existing outputs and inputs be modified or added to better account for export services in the productivity results? Please consider the options outlined in Table 9 in your response and include in your explanation what you see as the key developmental and implementation issues that would need to be resolved to progress the modification(s) (i.e. data availability for the benchmarking period (currently 2006-21), new definitions, conceptual or technical issues that would need to be resolved).	

Attachment B: Data stocktake and assessment against criteria

This attachment provides detailed information on the export service metrics we assessed and collected through our initial consultation process with DNSPs. It includes both a:

- summary of our assessment of each metric's subtility against our criteria (Table 4), including a summary of DNSP comments and example secondary metrics. Shading for representative assessment purposes is scaled; with red indicating a metric is not consistent with the criteria through to dark green indicating a high level of suitability.
- stocktake of the data we collected or have identified as unavailable, including a summary of the identified limitations (Table 11). We use the following definitions when describing how we have disaggregated data in Table 5:
  - network type refers to CBD, urban short, short rural or long rural feeders
  - customer type refers to residential, non-residential low voltage and non-residential high voltage
  - feeder refers to specific identified feeders
  - DER type refers to solar PV, solar PV + battery, solar PV + battery + vehicle to grid, battery, vehicle to grid, other, CER generation, non-CER generation

Table 4: Initial response received from networks on proposed export service metrics based on availability and suitability

Data metric	Suitability having regard to the criteria					Availability	Information driver	Example secondary metric uses	Summary DNSP Comments
	Measurable	Cost effective to capture	Difficult to game	Not significantly influenced by exogenous factors	Reflects services to customers				
Number of export customers							Relevant customer base export services.	Used for normalising other metrics, % penetration rates to total customer base.	Most DNSPs regarded this an important basic measure, cannot be used directly for performance measure.
Total connected customer energy resource capacity (kW)							Indication of the maximum customer generation capacity.	Maximum generation capacity per customer.	Useful metric, but it would need to be compared to baseline forecast to provide any indication of performance.
Total connected export capacity (kW)							Indication of the maximum possible export capacity allowed.	Difference between maximum generation capacity and export capacity, % capacity constrained, available export capacity per customer.	Can only account for static capacity limit and excludes dynamic export limits, indicator of network's hosting capacity, not fully useful measure by itself.
Metered net export volume (kWh)							Indicator of the level of exports distributed on the network.	Total export volume, average export volume per customer.	Important measure for calculating DER hosting service output, determine by factors not in control of DNSP.
Number of customers provided with zero export limits							Static zero export limits likely represent more lost distributed generation than operational curtailment.	% customers with zero export limits.	Possibly available but not suitable or aligned with principles as it is a binary measure of outcomes.
Customer complaints-overvoltage							Overvoltage is likely to be a proxy indicator for a lack of available hosting capacity.	Trend of overvoltage complaints.	Available but some consistency required for definition of complaints.
No. of customers with export limit below that requested							Export limits likely represent greater loss of generation than operational/actual curtailment.	% customers constrained below export capacity.	May be aligned and relevant for performance measures and benchmarking.
Voltage at the connection point							Proxy/estimation approach for network export curtailment.		It is an outcome measure for DER as it is generally required as part of delivering efficient consumption services.
Opex and capex to provide export services							Levels help inform a proportionate incentive scheme. Will also inform possible changes to the ABR for export services.	Benchmarking and performance reporting, expenditure per customer.	Export service costs are often combined with consumption services. DNSPs request clear AER guidance to measure export service expenditure. It is important input measure for benchmarking.
Export volume curtailed (kWh) due to network constraint (voltage, thermal)									Not available, challenging to measure consistently across various networks.
Export volume curtailed (kWh) due to connection limitation									Not available, challenging to measure consistently across various networks.

Data metric	Suitability having regard to the criteria					Availability	Information driver	Example secondary metric uses	Summary DNSP Comments
	Measurable	Cost effective to capture	Difficult to game	Not significantly influenced by exogenous factors	Reflects services to customers				
Customer complaints - related to export service connection							Direct measure of customer dissatisfaction with provision of export services.	Trend of export related complaints over time.	Available with some networks, influenced by exogenous factors, can be improved as a metric in future.

Table 5: Stocktake of current 2020–21 data holdings and extent of limitations

Ref	Metric	Current availability	Current limitations
Export measures (MWh)			
1	Net metered volume of energy exported	Disaggregated by network type for Jemena, Powercor, CitiPower, United Energy, AusNet Services, Evoenergy	Data disaggregated by network type not provided for SAPN, TasNetworks, Ausgrid, Essential Energy, Endeavour Energy, Energex, Ergon or PWC
Expenditure measures ($)			
2	Estimated export service expenditure by customer energy resource-related overvoltage complaint management, other opex, ICT capex, network monitoring capex, other capex	Provided for SAPN, Powercor, CitiPower, United Energy, Ausnet Services, Evoenergy, TasNetworks (Jemena?)	Not provided for Ausgrid, Essential Energy, Endeavour Energy, Energex, Ergon, PWC. Note that while Ausgrid, Essential and Endeavour did not provide this data, they will be required to publish DER expenditure data (although in an aggregated form) under their licence conditions.[71] Data not disaggregated by network type or feeder.
Customer number measures (’s)			
3	Export customers by: • start and end of period • customer energy resource type	As above for start and end of period End of period numbers by feeder and per customer energy resource type provided for all DNSPs. End of period numbers by customer and network type provided for all DNSPs except Energex, Ergon and PWC.	As above for start and end of period. End of period numbers by customer and network type not provided for Energex, Ergon and PWC. Current limitations are minor, with data already provided to AEMO’s DER register by postcode and disaggregated by residential vs business and solar, battery, other.
4	Customers with AS4777.2 compliant inverters	Disaggregated by feeder for all DNSPs	Data not provided disaggregated by customer and network type for Ergon, Energex and PWC

[71] NSW DNSPs are required to publish the level of their operating and capital expenditure that is primarily for the purpose of addressing network constraints on DER exports (including reasons for expenditure options). While these requirements are effective from 1 July 2024, IPART requests the NSW DNSPs use their best endeavour to provide IPART this information from 1 July 2021. See IPART, *Final report: Revise of the electricity distribution reliability standards*, May 2021, p. 65; IPART, *Electricity networks reporting manual*, June 2021, p. 4.

		Disaggregated by customer and network type for all DNSPs except Ergon, Energex and PWC	
5	Customers with static zero export limits	As above	As above
6	Customers with static non-zero export limits	As above	As above
7	Customers with dynamic/flexible export limits	As above	As above
8	Customers requesting export capacity	As above	As above
9	Customer complaints relating to DER	As above	Data not provided disaggregated by customer and network type for Ergon, Energex and PWC. While we received data, DNSPs advise that of the data requested, customer complaints relating to customer energy resource connections (as well as general enquiries) would be the least useful and has limitations.
10	Customers receiving overvoltage	As above	As above
Capacity measures (kVA or kVah)			
11	Customer energy resource installed capacity (kVA) by solar PV, solar PV+ battery, battery, inverter	As above	Data not provided disaggregated by customer and network type for Ergon, Energex and PWC Provided in kW rather than kVA for Essential Energy. Current limitations are minor, with data already provided to AEMO's DER register by postcode and disaggregated by residential vs business and solar, battery, other.
12	Approved export capacity (kVA)	As above	As above
13	Battery and DER generation installed storage capacity (kVAh)	As above	As above
14	Customer requested export capacity (kVA)	As above	As above
Metrics and ratios calculated from data			
15	Metered volume of energy exported per export customer (MWh)	Calculated from data under 1 and number of DER generation customers under 3	Data disaggregated by network type not provided for SAPN, TasNetworks, Ausgrid, Essential Energy, Endeavour Energy, Energex, Ergon or PWC.

16	Requested to approved export capacity ratio (%)	Calculated from data under 12 and 14	Data not provided disaggregated by customer and network type for Ergon, Energex and PWC Provided in kW rather than kVA for Essential Energy
17	Customers with compliant inverters of the total export customer population on the network (%)	Calculated from data under 3 and 4	Calculated from data under 3 and 4
Export curtailment measures (kWh)			
18	Export volume curtailed due to network constraint (voltage, thermal)	Not available	Not available
19	Export volume curtailed due to connection limitation	Not available	Not available
Generation measures (MWh)			
20	Total productive customer energy resource output: Gross generation net of curtailment (export limits and inverter output limits)	Not available	Not available