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Dynamic Operating Envelope Policy in the National Electricity Market

A report for the Australian Energy Regulator

FTI CONSULTING

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Executive summary

Dynamic Operating Envelopes can be a useful tool for managing a rapidly evolving energy system

Energy markets globally are experiencing rapid uptake of distributed energy resources ("**DER**") such as solar photovoltaics ("**PV**") and batteries that, unlike more traditional generators, are connected to the system via the distribution network. Australia, in particular, is leading this transition with the highest levels of rooftop solar penetration in the world. This trend towards a more fragmented and decentralised energy market is expected to continue as the National Energy Market ("**NEM**") becomes increasingly two sided, with consumers participating in both the export and import of power.

This rapid growth of DER presents several opportunities for the NEM. It is likely to drive a reduction in carbon emissions and further Australia's Net Zero ambitions as well as lowering consumer electricity bills due to the increase in low marginal cost solar generation. Additionally, DER uptake presents unique opportunities for aggregators and retailers to innovate and compete on new service offerings which may generate additional consumer benefits, such as allowing consumers to be paid for selling power back to the energy grid.

However, increased DER penetration has also increased network congestion, most acutely within distribution networks. In particular, the highly correlated nature of rooftop solar generation within a given area means that distribution networks are increasingly congested during the middle of the day when rooftop solar generation is highest and demand is typically low, therefore increasing the risk of power flow exceeding voltage and thermal constraints. Historically, such issues have been managed through either costly network upgrades or the imposition of static (and often low) limits on the level of power that DER can export onto the network, resulting in potentially unnecessary curtailment of cheap low carbon DER generation.

However, over recent years, Distribution Network Service Providers ("**DNSPs**"), in collaboration with other market participants, have been exploring the development of Dynamic Operating Envelopes ("**DOE**s"), which would allow DNSPs to set export limits dynamically and vary them by time and location. This would allow existing network capacity to be used more efficiently (e.g. by curtailing DER output for a shorter period of time or over a smaller area than would otherwise be the case; or by allowing higher DER exports when network conditions permit doing so), permitting the energy market to maximise DER generation while managing the risk of power flows exceeding constraints. Further, the potential for DNSPs to loosen export limits when there is spare capacity on the distribution network also increases the capacity to address Essential System Service ("**ESS**") requirements using DER, thus lowering ESS prices.

Governance and regulatory frameworks for DNSPs need updating to accommodate DOEs

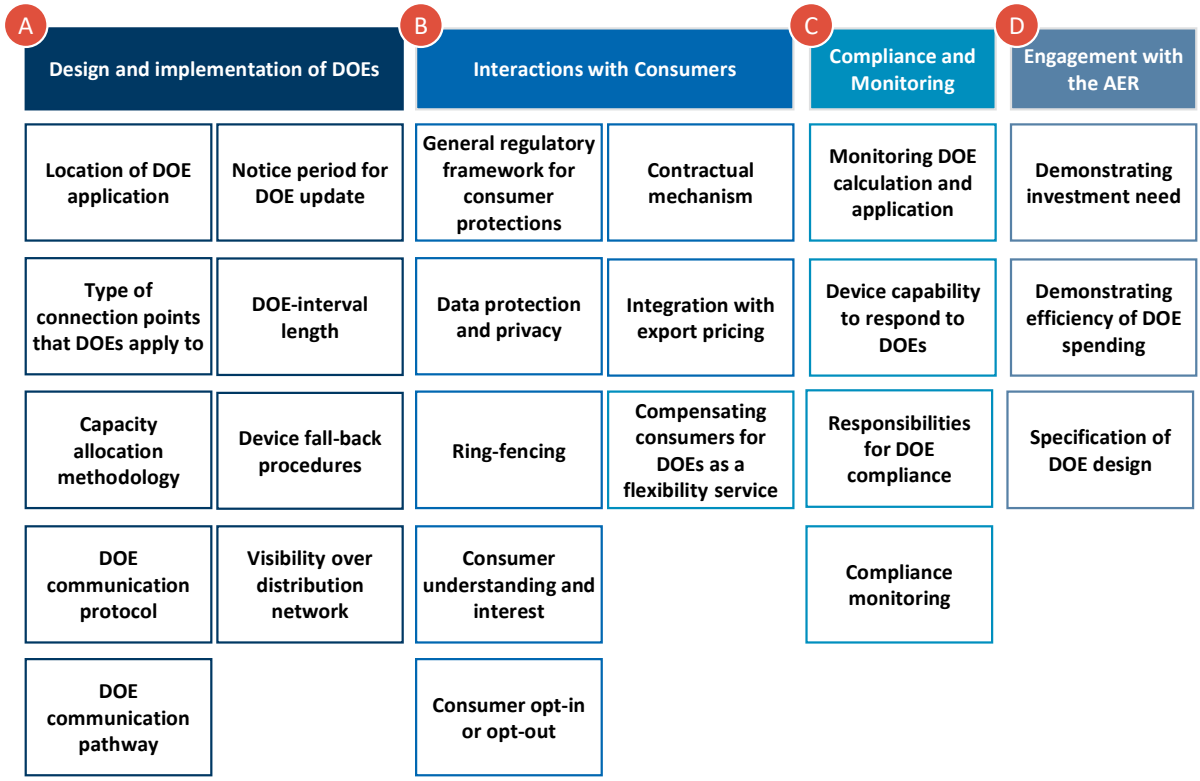
The implementation of DOEs is a significant change to the NEM and its operation. As such, the relevant governance and regulatory frameworks need to be in place to support this transition and to facilitate the implementation of DOEs in a way that maximises consumer benefits. In the first instance, this relates to the DNSPs, which serve as monopoly providers of distribution network

services, are subject to economic regulation by the Australian Energy Regulator ("**AER**") and are already driving the implementation of DOEs in jurisdictions such as South Australia.

In this context, we have been asked by the AER to identify potential gaps in the regulatory and governance frameworks related to the initial stages of DOE implementation within the NEM and consider a set of immediate actions that the AER could take to address these, focusing largely on DNSPs and their interactions with other market participants.

We do this by identifying the different roles that DNSPs fulfil that are likely to be affected by DOE implementation, as shown in Figure E-1 below.

Figure E-1: Potential roles of DNSPs in the implementation of DOEs



Following this, we identify potential gaps that may exist in the frameworks that govern these roles. We assess each gap based on their **Criticality**, **Complexity** and **Need for Intervention**, alongside any other workstreams by other market bodies that may already be seeking to address these gaps. Based on this, we assign each gap an '**Action Status**', which indicates the urgency with which each gap needs to be filled. Our gap analysis identifies a set of gaps that require '**Immediate Action**'. These are gaps which we consider to be critical for the implementation of DOEs, to require immediate intervention from the AER and where other ongoing or planned work will not be sufficient to address the gap on their own. For these gaps, we discuss potential options that may be suitable for filling each gap.

Principles-based approaches to addressing these gaps are likely to be more appropriate given the early-stage nature of DOEs in the NEM

Broadly, we consider that principle-based approaches to addressing the gaps that have been identified are likely to be most appropriate to maximise benefits for the energy system and consumers in the NEM. Given that DOEs are at an early stage of implementation and that network conditions driving the requirement for DOEs vary across the NEM, there is likely to be significant uncertainty and variation between DNSPs on questions such as the most appropriate design of DOEs and the timing of bringing DOEs into operation. Given this, the optimal way of implementing DOEs in each circumstance is likely to vary and it may be appropriate for regulatory and governance frameworks to be sufficiently flexible to accommodate this. Furthermore, consumers may benefit from DNSPs being given the latitude to experiment with and innovate on developing new service offerings associated with DOEs (provided adequate consumer protection measures remain in place).

Therefore, an overly prescriptive approach to the governance and regulation frameworks of DOEs may not be appropriate. However, given the importance and potential impact of DOEs on consumers and the NEM, it is likely to be appropriate for these frameworks to be designed along principles that allow for the necessary experimentation and innovation needed to develop DOEs, whilst still protecting the interests of consumers where it is clearly necessary to do so.

In Table E-1 below, we briefly summarise the potential ways in which the AER can address the gaps we have identified as requiring the AER's immediate action.

*Table E-1: Overview of options to address gaps requiring '**Immediate Action**' by the AER*

Gap	Recommended actions
Design and implementation of DOEs	
Capacity Allocation Methodology *Network capacity can be allocated in a number of different ways, and lack of guidance risks leading to divergent approaches by DNSPs, some of which may be inefficient or unfair to consumers*	• **No requirement for AER to prescribe the detailed capacity allocation mechanism** to be used. • Capacity allocation mechanism to be consistent with following **guiding principles**: ○ Supporting efficient **utilisation of existing DER** and **efficient investment in new DER**. ○ **Maximise utilisation** of available network capacity. ○ **Minimising total costs** of distribution networks. ○ Maintaining and promoting the **social licence** for DOE implementation, including consideration of what customers may perceive as a 'fair' setting of DOEs.

Visibility over distribution network *Levels of visibility vary across DNSPs, and sufficient visibility is required to calculate the dynamic limit and update it in real-time, therefore a base level must be established for DOE implementation*	• **Avoid a prescriptive approach** to specifying the exact type and level of visibility that DNSPs should achieve. • **Empower DNSPs** to demonstrate that they have a level of visibility that balances the need for efficient expenditure alongside specific DOE implementation that DNSP has chosen. • **DNSPs to submit their proposals** alongside their proposed DOE-related spending plans.
Interactions with consumers	
Data protection and privacy *Increased data transference is required for both the implementation and operation of DOEs, therefore increasing the importance of privacy frameworks around this data to protect consumer interests*	• At a minimum, visibility over DOE-related data should be given to the parties **responsible for operating the DOE and for enforcing compliance** with the dynamic limit. Identity of the responsible parties will depend on outcomes of the Energy Security Board's ("**ESB's**") Roles and Responsibilities work. • Parties who wish to access customer data for other purposes (such as to develop new offerings) should justify their needs to the AER. Only data from customers who have given explicit consent would be made available.

	• Specific contractual mechanism giving effect to DOEs **does not need to be prescribed.** DNSPs can be given flexibility to implement through their choice of existing or new contractual mechanisms.
Contractual mechanism *Likely that some part of the contractual arrangements between the DNSP and the consumer will need to be changed in order to recognise that DOEs are in operation and to set out the implications for how the DNSP and the consumer interact*	• Require DNSPs to set out (in their choice of contractual mechanism): ○ **Operating parameters** (interval length, notification period and frequency of changing DOEs) ○ Specify **conditions for revision of DOE.** ○ Specify **communication processes** for DOE changes ○ **Compliance obligations** for consumers and **consequences of non-compliance.** ○ **Related commercial implications** (direct compensation and/or rebate on network charges, where applicable). ○ **Actively inform** customers of the contractual mechanisms that give effect to DOEs. • Further standardisation on contractual mechanisms **could be considered at a later date** as DOEs become more established.
Compliance and Monitoring	
Monitoring DOE calculation and application *Likely to be useful for the AER to define or establish performance monitoring processes specific to DNSP functions in relation to DOEs to ensure consumer protections and transparency in operations*	• DNSPs to **publish capacity allocation methodologies** alongside implementation of DOEs. • DNSPs to **make historic data on the dynamic limits they have set publicly available.** • In the future, AER to **consider expanding its existing monitoring and reporting processes** to cover calculation and application of DOEs, taking into account industry feedback and building on requirements above as needed.

Engagement with the AER	
Demonstrating investment need *DNSPs will likely be required to spend material amounts for DOE implementation and their ability to recover this spending will be dependent on them demonstrating the investment need*	• **Expand guidance in the DER Integration Expenditure Guidance Note** to incorporate specific DOE guidance to comparable level of detail. • Guidance should provide clarity on: ○ Requirement for **benefits calculation.** ○ Requirement for **costs calculation.** ○ Requirement for underlying **forecast. assumptions for DER penetration.** ○ **Counterfactual** against which spending is assessed.

This report is part of a wider set of work developing the frameworks for DOEs

In the course of our work, as we have considered the potential gaps in the governance and regulatory frameworks for DOEs, we have identified a range of completed, ongoing and planned workstreams which may (in part, or fully) address many of the potential gaps that we have identified. This report is therefore part of a wider set of work being undertaken by market bodies and other industry stakeholders regarding the development of the governance and regulatory frameworks for DOEs.

Some of this other relevant work is summarised in Table E-2 below.

*Table E-2: Overview of existing workstreams to address gaps that can '**Leverage Existing Work**'*

Gap	Existing workstreams by other market bodies and stakeholders
Design and implementation of DOEs	
DOE communication protocol	ESB Interoperability Work
DOE communication pathway	ESB Interoperability DER Technical Standards – Roles and responsibility workstream
DOE-interval length	DEIP Outcomes Report (5-minute interval recommended)
Notification period for dynamic limit	DEIP Outcomes Report (24-hour notification period recommended)
Interactions with consumers	
General regulatory framework for consumer protections	Retailer Authorisations and Exemptions Review
Consumer understanding and interest	Customer Insights Collaboration
Consumer opt-in or out	DEIP Outcomes Report

Integration with export pricing	AER Export Tariff Guidelines, Access, pricing and incentive arrangements for DER
Compliance and Monitoring	
Device capability to respond to DOEs	DEIP Outcomes Report
Responsibilities for DOE compliance	ESB Interoperability DER Technical Standards – Roles and responsibility workstream

For the gaps set out in the table above, we therefore recommend that the AER leverages the output from the existing workstreams before considering any additional intervention.

Governance and regulatory frameworks are likely to evolve further as DOEs develop

As DOEs are progressively implemented and the NEM evolves with additional uptake of DER, it is likely that further developments to the governance and regulatory frameworks will be required as more complex and sophisticated DOE designs are developed and brought into operation. Whilst some of these may be more advanced versions of existing elements, for instance more complex capacity allocation methodologies, others may be required to address new gaps that are not currently evident in the energy landscape. This will likely include gaps created by the development of additional DER use cases that interact with DOEs, such as retailers or aggregators actively managing DER in response to market prices or greater use of DER to manage system-level issues. As such, the regulatory and governance frameworks supporting the implementation of DOEs is likely to require ongoing review and consideration by the AER to evolve in-line with the NEM.

1. Introduction and background

1.1. The energy markets of Australia are undergoing a period of unprecedented change as the share of generation from renewable intermittent resources, notably solar and wind, increases rapidly. Moreover, generation is now increasingly fragmented and connected at the distribution (as opposed to transmission) level, with Australian consumers at the forefront of the adoption of rooftop solar generation and other distributed energy resources ("**DER**").

1.2. At the same time, the demand for electricity is also evolving, driven by the adoption of DER technologies including smart home energy management systems, small-scale storage assets and electric vehicles.

1.3. As a result, the National Energy Market ("**NEM**") is becoming increasingly two sided. Whereas in the past, consumers participated in the market only as a source of demand, DER is now empowering consumers to become more actively involved in the energy markets by exporting their DER generation and providing other valuable services to the NEM.

1.4. The rapid growth of DER in the NEM presents opportunities for the power system resulting in significant benefits for consumers, including through the following:

- **Lower consumer bills**. Consumers stand to directly benefit from lower energy bills, most obviously through the greater penetration of low marginal cost solar generation, as well as (for DER owners) through selling energy back into the power system.
- **Additional consumer rewards for DER services**. As markets become increasingly two sided and flexible, there is a greater opportunity for aggregators and retailers to compete and offer tariffs and services that reward consumers for offering their DER flexibility to the market.
- **Carbon emissions reduction**. In line with Australia's net zero ambitions, DER allows consumers to play a key role in decarbonising the economy, by helping them to reduce their reliance on fossil fuel power generation and by potentially enabling more efficient use of energy resources.
- **Innovation and choice**. In turn, by explicitly monetising the flexibility of DER, aggregators and retailers can offer a greater choice of services, and also potentially deliver competition-driven cost savings to consumers.
- **System reliability and security**. From a system operation perspective, altering the behaviour of DER can, if managed appropriately, help the Australian Energy Market Operator ("**AEMO**") and Network Service Providers ("**NSPs**") to maintain a secure and reliable system, both during 'system normal' operation and during system stress events, particularly if multiple sites are aggregated together to act in a coordinated fashion, e.g. via a virtual power plant ("**VPP**") arrangement.

1.5. However, this transition is also posing a number of challenges for the NEM, one of which is increased network congestion. This occurs when the flow of power on the distribution network exceeds its technical limits (transfer capability). In turn, this may result in a need to curtail DER output, equipment damage, reducing the useful life of the equipment or even local blackouts.

1.6. Across the distribution networks of the NEM, these technical limits are increasingly at risk of being exceeded as a result of congestion caused by DER exports onto the network. In particular, the highly correlated nature of rooftop solar generation within a given area means that the network tends to be most congested during the middle of the day, when rooftop solar generation is highest and energy demand tends to be the lowest.

1.7. Historically, Distributed Network Service Providers ("**DNSPs**") have faced different options for managing congestion caused by DER integration. These options include operational responses[1] or network reinforcements[2], leads to the building or upgrading of infrastructure that is likely to be required infrequently and only in periods of extreme stress.

1.8. Another option is setting a static export limit, fixed over time, on the export of power by consumers with DER onto the distribution network. For instance, each household would only ever be able to export 5kW of energy onto the distribution network due to the static limit in place. This allows DNSPs to ensure that distribution networks do not exceed operating constraints.

1.9. Currently, DNSPs use static limits to limit congestion and constraints on local distribution networks. However, this method also constrains the NEM's ability to support greater levels of DER penetration and therefore the ability to deliver Net Zero, while also limiting customer value in the form of potential lost export revenue and usage of electricity generated by DER. The use of static limits may therefore be increasingly undesirable as DER penetration in the NEM grows.

1.10. In the remainder of the section, we summarise the opportunities and challenges presented by the increased uptake of DER (Section A), introduce dynamic operating envelopes ("DOEs") and their use case (Section B) and set out the purpose and structure of this report (Section C).

A. Dynamic operating envelope development in the NEM

1.11. Realising the opportunities presented by DER while mitigating the challenges is a key issue for the NEM's policy makers. Recognising this, the Energy Security Board ("**ESB**") included a workstream dedicated to the integration of DER within its Post 2025 market reform initiative.[3]

[1] For instance, 'transformer tapping' to reduce voltage.
[2] The building or upgrading of infrastructure. Such solutions may not be optimal since they lead to construction of assets that are required infrequently and only in periods of extreme stress.
[3] ESB, Post2025 Market Design Final advice to Energy Ministers Part C, page 28 (link)

1.12. The ESB's Final Advice to Energy Ministers contained a recommendation to develop a system-wide approach to varying DER import and export limits over time and by location in response to prevailing network conditions – which is a functionality known as a Dynamic Operating Envelope ("**DOE**").

1.13. In this subsection of the report, we discuss what DOEs are, the current state of their implementation and related ongoing work in preparation of their implementation.

1.14. As discussed below in 1.21, DNSPs currently manage the impact of DER connected to their networks by setting static export limits. These limits are set at the point of installation of DER equipment and cannot be retrospectively reduced (or increased). Available network capacity has therefore been to an extent allocated on a 'first-come-first-serve' basis.

1.15. Consequently, as the uptake of DER has increased over time, DNSPs that are encountering constraints within their networks (whereby voltage and thermal limits are at risk of being breached) have resorted to allocating tight static limits to new connections.[4]

1.16. Given the fixed nature of static limits, DNSPs typically calculate a consumer's limit based on the 'worst case scenario',[5] meaning that the static limit is more restrictive than required for the significant majority of the time, reducing the potential benefits from DER generating electricity. A secondary impact may be that static limits reduce the incentives for the further uptake of DER by new consumers by limiting the benefits that consumers can receive from exporting electricity and therefore efforts to further decarbonise the energy market.

1.17. As such, it may be more efficient to implement DOEs, which would allow DNSPs to change these limits over time and across different locations in a way that dynamically takes into account the demand and supply for energy, as well as prevailing network conditions. On a localised level, DOEs could be used to manage distribution network issues – primarily network congestion – more flexibly than static limits. This would allow DNSPs to utilise their network capacity more efficiently.[6]

1.18. DOE infrastructure could also potentially be utilised during system stress events. In this case, AEMO could request DNSPs to dynamically tighten export limits that could reduce exports onto the network.

1.19. In the short run, well designed DOEs can also reduce the need for costly distribution network reinforcement and upgrades, by enabling DNSPs to both utilise the capacity already available more efficiently and to limit exports to levels at which further reinforcement is not economic. Both of these impacts will ultimately feed through to benefit customers in the form of lower bills and a greater system security and reliability.

[4] For example, we understand that South Australia Power Network ("**SAPN**") has had to resort to measures such as imposing zero export limits for new installations.
[5] DEIP Page 12.
[6] Although, above a certain level, a more efficient allocation of capacity may result in more unequal outcomes across some groups of customers.

1.20. The potential for DNSPs to dynamically loosen export limits when system conditions allow could increase the capacity of DER to provide valuable Essential System Services ("**ESS**"), such as regulation Frequency Control Ancillary Services ("**FCAS**"),[7] via participation in a VPP, increasing system-wide security. This additional competition within the ESS market should, in turn, result in lower ESS prices.

1.21. We note that DOEs and the active management of DER could in theory be utilised for a number of use cases,[8] some of which are under active discussion and consideration within the NEM. However, for the purposes of this report, we focus primarily on the use case of DNSPs using DOEs to allocate available distribution network capacity across consumers.

Several DNSPs have made significant progress towards implementing DOEs

1.22. Over recent years, numerous trials and reviews have been undertaken, or are currently in progress, on the use of DOEs and DER integration more broadly within the NEM, including (but not limited to):

- The Advanced VPP Grid Integration Project undertaken by SAPN in partnership with Tesla;
- Project EDGE, a cross-industry collaboration between AEMO, AusNet and Mondo developing a proof-of-concept of a DER marketplace; and
- The Evolve Project, which is exploring the integration and management of DER in New South Wales.

1.23. Building on the insights of such trials, some DNSPs have already initiated and are advanced in the process of offering DOEs to consumers more broadly. Across the five states that make up the NEM:

- **South Australia** has recently mandated that from late 2022 all new solar installations must have DOE functionality and that all consumers will have the option to enter a dynamic connection agreement with SAPN from the same date, with the aim that the implementation of DOEs will allow SAPN to double the amount of solar energy on their network by 2025.
- In **Queensland**, Energex and Ergon Energy Network have developed dynamic connection standards, effective from late 2021, as part of their plan to transition from passive to dynamic DER connections.
- In **Victoria**, AusNet is in the process of trialling flexible exports for solar generation largely aligned with the processes being implemented in South Australia.

[7] FCAS are used to alter demand or generation in order to maintain the frequency of the NEM within pre-defined operational parameters.
[8] For example, in theory retailers / aggregators could control DER and vary its behaviour in response to market prices. Similarly, in theory AEMO could actively control DER to support system security and reliability.

- Project Edith by Ausgrid in **New South Wales** is in the process of trialling how more network capacity can be made available by flexibly managing network constraints (via 'smart controllers') during peak times.
- **Tasmania**'s generation mix is historically stable and consists predominantly of hydropower. Therefore, DER management is not currently a concern and there has been limited movement towards DOE implementation.

New regulatory and governance frameworks are required to support the rollout of DOEs

1.24. The implementation of DOEs represents a significant change to the NEM and its operation, as they would allow DNSPs to manage their networks more efficiently and allow for a greater volume of DER to be integrated to the wider system. As such, it is critical that suitable regulatory and governance frameworks exist to facilitate effective market operation and ensure that DOEs are operated to maximise consumer benefit, particularly as DNSPs operate as monopoly providers of distribution networks.

1.25. The appropriate frameworks include clearly defining the roles and responsibilities of market participants in respect to DOEs. In the first instance, policy makers must consider whether existing frameworks in place in the NEM are sufficient. Where they are not, updates or new frameworks must be developed and implemented to fills these gaps.

1.26. However, given that DOEs are an emerging tool for operating distribution networks, policy makers may risk stifling innovation if they are too prescriptive during the early phases of DOE implementation. Therefore, while there is a need to implement DOEs rapidly due to the fast adoption of DER across the NEM, the steps discussed in this report represent the initial stages of the implementation process. In the longer term, these frameworks will need to evolve in order to create a long-term fit-for-purpose framework for effective DER integration in the NEM, as laid out in the ESB's DER Implementation Plan.[9]

1.27. To date, several workstreams relating to the implementation of DOEs in the NEM have already been completed or are being carried out by market bodies or industry groups. These includes:

- the Australian Renewable Energy Agency's ("**ARENA**") initiated Distributed Energy Implementation Program ("**DEIP**") Outcomes Report;[10]
- The development of the Rule Change proposal by AEMO on Flexible Trading Arrangement models as suggested by the ESB;
- the ESB's consultation on an interoperability policy for the NEM;[11]
- The Retailer Authorisations and Exemptions Review;[12] and

[9] ESB, Post-2025 Market Design Final advice to Energy Ministers Part B, page 75 (link).
[10] DEIP, Dynamic Operating Envelopes Working Group Outcomes Report, (link)
[11] ESB, Post 2025 DER Implementation Plan – interoperability policy framework, (link)
[12] AER, Retailer Authorisation and Exemption Review (link)

- The AEMC's review of DER technical standards.[13]

B. Purpose of this report

1.28. It is within this context that FTI Consulting has been engaged by the Australian Energy Regulator ("**AER**") to assist it in delivering policy direction and advice to the ESB in relation to DOEs and their implementation within the NEM.

1.29. The implementation of DOEs makes apparent several gaps in the existing regulatory and governance framework, and the objective of this work is to identify these gaps and to examine potential policy options to address them, in order to ensure that consumers are suitably protected as DOEs develop over time. In particular, this work focuses on supporting the initial stages of DOE implementation in the immediate future, whilst maintaining scope for optionality on the further development of DOE offerings in the longer term.

1.30. The introduction of DOEs will involve and affect a range of different stakeholders, including consumers, retailers, aggregators, Original Equipment Manufacturers ("**OEMs**") and DNSPs, as well as, less directly, AEMO and Transmission Network Service Providers ("**TNSPs**"). Some participants (for instance, retailers, aggregators and OEMs) operate within competitive markets that are subject to less extensive economic regulation.

1.31. However, DNSPs, in their role as monopoly providers and operators of distribution networks, are subject to economic regulation by the AER. DNSPs are also driving the transition to DOEs, with implementation already underway in certain jurisdictions, notably South Australia. It is in this context that we consider the immediate actions that the AER could take to address the gaps related to the initial stages of DOE implementation within the NEM, focusing largely on DNSPs and their interactions with other market participants.

1.32. Given the complex set of interactions that allow the energy market to function, it may also be helpful for the AER to provide guidance on some of the contributions of market participants that are not subject to economic regulation. Such activities, while outside the scope of this report, could be considered in future work undertaken for the implementation of DOEs.

1.33. In this report, we therefore:

- **Map out the DNSP roles that will likely be affected by the implementation of DOEs;**
- **Identify potential gaps in the regulatory or governance framework** that arise due to the implementation of DOEs in the NEM for each set of DNSPs' roles;
- **Assess each gap to establish priority areas of focus for the AER**, based on:
  - the *criticality* of the barrier to the implementation of DOEs;
  - the *complexity* of effort or the extent of change from the status quo required to address the gap;

[13] AEMC, Rule determination – Governance of DER technical standards (link)

— the level of *intervention* required from the AER to address the gap; and

— the extent to which other ongoing work is already seeking to address these gaps.

Through this gap analysis, we identify a set of areas where immediate action by the AER is required to address gaps in the regulatory and governance framework that are critical to the implementation of DOEs and which would not be addressed by other ongoing work; and

- **Develop possible options for addressing these gaps** in the AER's regulatory and governance frameworks, with the aim to design actions that maximise the benefits to consumers and deliver efficient market outcomes, whilst also being consistent with a set of good-practice regulatory principles.

1.34. Further, our assessment focuses on the use case of DOEs particularly in the context of DER exports. However, going forward, the functionality of DOEs may be expanded for imports as the energy market evolves and our discussion of the ways in which the identified gaps could be addressed endeavour to maintain optionality for such applications for DOEs in the future.

C. Structure of the report

1.35. This report has the following sections:

- Section 2 sets out the **approach and methodology** applied to identify and assess gaps in the governance frameworks for DOE implementation.
- Section 3 sets out the **gap analysis** conducted for the roles DNSPs will play in DOE implementation and **identifies areas for immediate action by the AER**.
- Section 4 discusses the options to address the gaps that we have identified as requiring immediate action and **provides recommended actions for the AER**.

D. Restrictions

1.36. This report has been prepared solely for the benefit of the AER for use for the purpose described in this introduction.

1.37. FTI Consulting accepts no liability or duty of care to any person other than the AER for the content of the report and disclaims all responsibility for the consequences of any person other than the AER acting or refraining to act in reliance on the report or for any decisions made or not made which are based upon the report.

E. Limitations

1.38. This report contains information obtained or derived from a variety of sources. FTI Consulting has not sought to establish the reliability of those sources or verified the information provided.

1.39. No representation or warranty of any kind (whether expressed or implied) is given by FTI Consulting to any person (except to the AER under the relevant terms of our engagement) as to the accuracy or completeness of this report.

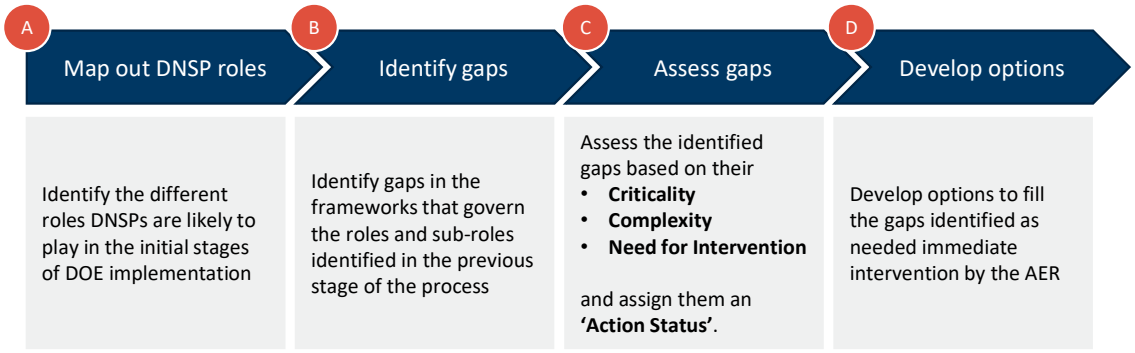
1.40. This report is based on information available to FTI Consulting at the time of writing the report and does not take into account any new information which becomes known to us after the date of the report. We accept no responsibility for updating the report or informing any recipient of the report of any such new information.

2. Approach and Methodology

2.1. This report aims to provide policy guidance in relation to the initial stages of DOE implementation within the NEM.

2.2. We do this by identifying an immediate set of actions for the AER, to ensure sufficient regulatory and governance frameworks exist to support DOE implementation in the short term, while protecting consumers and maintaining optionality for the further development of DOEs in the longer term. An overview of our methodology is set out in Figure 2-1 below.

Figure 2-1: Overview of Methodology



2.3. Each element is described in turn in the following subsections.

A. Map out the DNSP roles likely to be affected by the implementation of DOEs

2.4. As discussed in Section 1, the introduction of DOEs will affect a variety of different market participants. For the purposes of this report and as discussed in Figure 2-1, we focus on DNSPs as they are the entities that appear to be initially driving the implementation of DOEs in the NEM.

2.5. In order to identify potential gaps in the regulatory and governance framework that the AER may need to take action on, we map out the different types of roles that DNSPs fulfil which may be affected as a result of the implementation of DOEs, namely:

- the **Design and implementation of DOEs**, which covers aspects of the technical design of DOEs such as calculating and communicating the export limit;
- DNSPs' **Interactions with consumers**, which covers consumer protections and agreements that may need to be adapted to account for DOEs;
- their requirements for **Compliance and Monitoring**, which covers the disclosure and monitoring obligations that are required to facilitate DOE implementation and operation; and
- their **Engagement with the AER**, such as the regulatory process of submitting and approving plans for DOE-related spending and investment for the purposes of recovery through their regulated revenues.

B. Identify gaps

2.6. For the roles described in the previous step of the methodology, we identify potential gaps that may exist in the regulatory and governance frameworks due to the initial implementation of DOEs. For the purposes of this assessment, we view a 'gap' as any one of the following:

- the absence of relevant regulatory frameworks;
- an area of the existing frameworks that is not sufficiently comprehensive or detailed; or
- an area of the existing frameworks that do not refer to DOEs sufficiently explicitly.

2.7. Such an approach is likely to be appropriate since DOEs are at an early stage of development and it may not be clear what exact specification of DOE services would maximise the benefits to consumers and the wider system in different circumstances. Therefore, it may be most appropriate to develop the regulatory and governance frameworks to allow for a significant degree of flexibility in the design of DOEs, whilst still ensuring appropriate consumer protections and safety requirements are met.

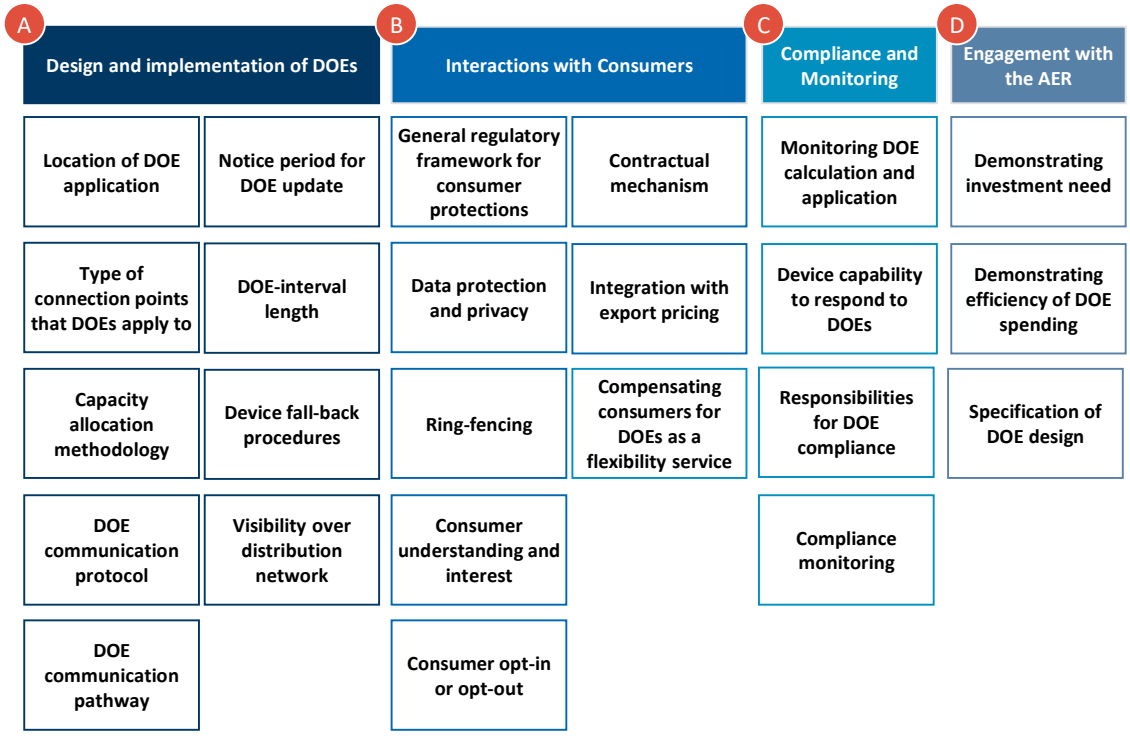
2.8. Finally, for the purposes of this report, we consider only incremental gaps that arise specifically from DOEs, rather than gaps that may exist anyway due to the existence of DER more generally.[14] In other words, these are potential gaps that may arise in the transition from static to dynamic export limits.[15]

2.9. We have categorised gaps under the types of roles that DNSPs are responsible for, as shown in Figure 2-2 below.

[14] For instance, whilst there may be risks associated with consumer equipment (e.g. inverters) not obeying export limits due to cyberattacks, such risks already exist, in principle, in relation to the current static limits. We discuss this risk in more detail in Section 3A regarding 'Device fall-back procedures'.

[15] As opposed, for instance, to potential gaps in the regulatory and governance frameworks that may have already existed due to the need to accommodate rooftop solar panels, electric vehicles or battery storage in the NEM.

Figure 2-2: Potential gaps in the frameworks that dictate DNSP roles in implementing DOEs



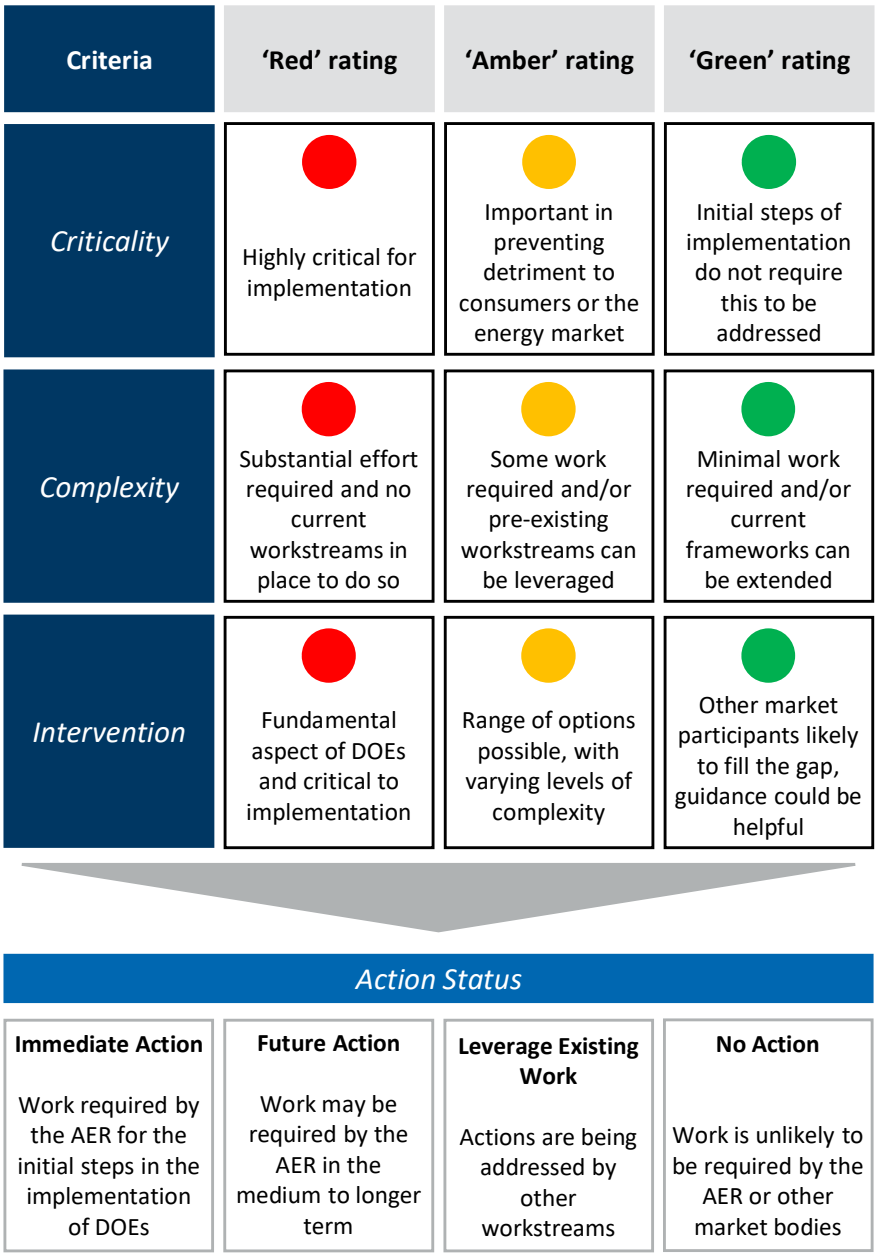
2.10. We discuss each of the gaps in greater detail in Section 3.

C. Assess each gap to establish priority areas of focus for the AER

2.11. In order to focus on aspects of the governance framework that are most integral to the implementation of DOEs, we assess the potential gaps identified via a framework that considers their **Criticality**, **Complexity** and **Need for Intervention**, alongside any other workstreams by other market bodies that may already be seeking to address these gaps.

2.12. Based on this, we assign each gap an '**Action Status**', which indicates the urgency with which each gap needs to be filled. We discuss the ratings for each criterion in Figure 2-3 below.

Figure 2-3: Overview of criteria used to assess gaps in the relevant frameworks



D. Develop possible options for addressing these AER-specific gaps

2.13. Having identified the key gaps in the AER's regulatory and governance frameworks via the Action Status rating in our gap analysis framework, the fourth step of our approach is to discuss options for addressing the gaps identified as requiring immediate action from the AER.

2.14. The options should be designed with the aim of maximising benefits to consumers, whilst also being consistent with a set of good-practice regulatory principles, namely:

- **Facilitate efficient outcomes in the interest of consumers** in both the short- and long-term, including protecting consumers against harm, risks to safety and potential market failures;
- **Regulatory and policy alignment**, with existing policy and regulatory objectives (such as the National Electricity Objective ("**NEO**") and the National Energy Retail Objective ("**NERO**") and, where applicable, be consistent with relevant frameworks such as the ESB's Consumer Risk Assessment Tool;
- **Avoid undue intervention or regulatory burden** to facilitate the desired outcomes;
- **Clarity and Transparency**, on for all market participants and market bodies; and
- **Maintain flexibility**, as given the nascent nature of the DER industry and uncertainty around DOEs, decisions on roles and responsibilities should aim to preserve as much optionality as possible in the range of potential outcomes for the framework around DOEs going forwards.

E. Complementary work

2.15. As discussed above, there are a number of related workstreams being carried out by market bodies to support the implementation of DOEs in the NEM. The outcomes of these workstreams could address many of the gaps that we have identified in our analysis.

2.16. Where this may be the case, we have identified the applicable workstreams. We consider the extent to which these workstreams may address the potential gap in question. If we believe that the workstream would adequately address the gap in question, we do not discuss options for further immediate action in our report.

2.17. In some other cases, we have acted in accordance with the AER's guidance, and made a working assumption around the outcome of these workstreams or the expected recommendations of completed workstreams. Where this is the case, we discuss the assumption made and reference the alternate workstream responsible for the final recommendation on that facet of DOE implementation. For the avoidance of doubt, this report should not be interpreted as forecasting the outcome of those workstreams, or as providing any recommendation on the conclusions they would reach.

3. Gap analysis

3.1. In this section, we discuss the gaps identified in the framework governing the implementation of DOEs, and assess them via the three criteria detailed in Section 2 namely:

- the **Criticality** with which the potential gap needs to be addressed for the initiation stages of DOE implementation;
- the **Complexity** of effort needed or the extent of change from the status quo needed to address the gap; and
- the **Level of Intervention** required by the AER to address the gap.

3.2. As discussed previously, we assign an '**Action Status**' to each gap on the basis of these criteria and other commissioned workstreams, allowing us to prioritise the gaps most integral in the initial stages of DOE implementation.

3.3. In the following subsections, we present our assessment of gaps in the frameworks governing the **Design and implementation of DOEs** (Section A), **Interactions with consumers** (Section B); **Compliance and Monitoring** (Section C); and **Engagement with the AER** (Section D). A summary table of our gap assessment is presented in Appendix 2.

3.4. Based on this assessment, we develop potential options for the gaps assessed as requiring '**Immediate Action**'. These are discussed in subsequent sections of this report.

A. Design and implementation of DOEs

3.1. While the high-level definition of a DOE, as set out in paragraph 1.14, is broadly understood and accepted across the NEM, there are a number of further specific design choices and requirements that DNSPs must make or put in place in order to translate the concept of a DOE into being fully functional.

3.2. In this subsection, we discuss roles that we have identified with regards to the design of DOEs and identify gaps that exist in the current regulatory and governance frameworks that relate to these roles. We then undertake an evaluation of each gap against our three criteria, as identified in Section 2C, in order to assess which gaps require immediate action from the AER. This includes setting out our understanding of other related areas of work where relevant.

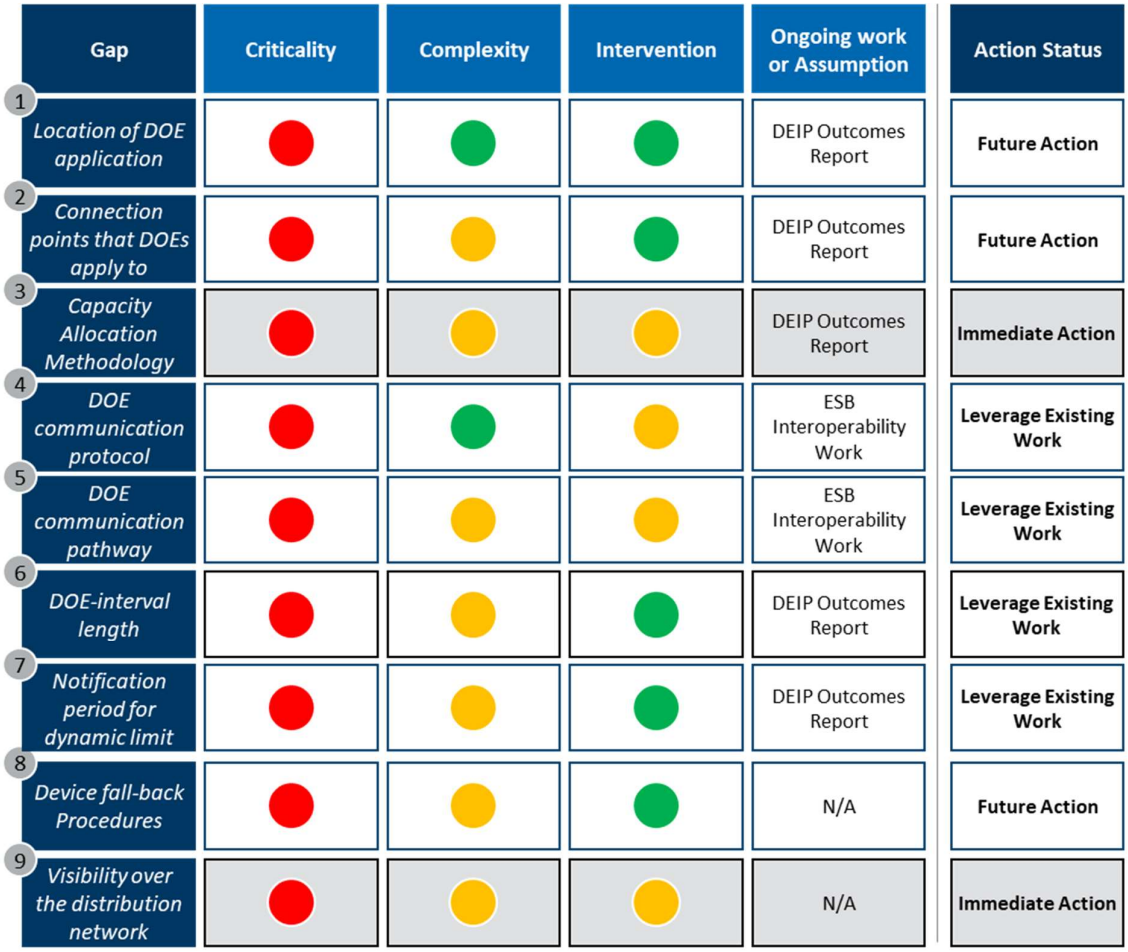
3.3. Specifically, in this subsection we discuss the following gaps:

- Location of DOE application;
- Type of connection points that have DOEs applied;
- Capacity allocation methodology;
- DOE communication protocol;
- DOE communication pathway;

- DOE-interval length;
- Notification period for dynamic limit;
- Device fall-back procedures; and
- Visibility over the distribution network.

3.4. The result of our assessment is summarised below and discussed in turn in the following subsections.

Figure 3-1: Summary of Design of DOE gap analysis



Location of DOE application

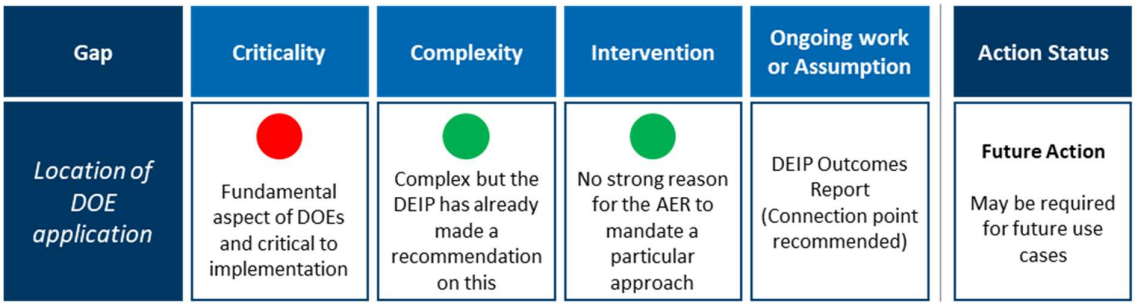
3.5. Before DNSPs can calculate appropriate limits, they must first establish the locational granularity with which the DOE is set, with a wide range of potential options. For example, limits could in theory be set at each connection point (i.e., for each household) or on a device-by-device level (i.e., for each DOE-enabled device).[16] At the other end of the

[16] Flexible demand refers to devices that can vary the timing of when they consume electricity in response to external instructions. For instance, an electric vehicle can be set to charge overnight but can vary when it consumes power

spectrum, DNSPs could potentially allocate limits to retailers or aggregators, who then distribute capacity across their consumers in accordance with this limit.

Assessment of gap

Figure 3-2: Location of DOE application gap analysis



3.6. As summarised above, establishing the location of DOE application is critical to supporting the DOE implementation. Some of the potential designs may be complex, but we are aware that the DEIP Outcomes Report has already considered this in some detail.

3.7. In principle, different approaches may better suit the needs of particular DNSPs or consumer groups, although there may also be costs associated with a lack of alignment throughout the NEM, such as in relation to device compatibility. Currently however, we do not see a strong need for the AER's intervention in this area, particularly in the context of supporting the initial implementation of DOEs.

Action Status

3.8. The location of DOE application has been one of the key focuses of the DEIP's recent DOE Outcomes Report, which concluded that limits are "*best applied initially at a customer's point of connection to the network*", i.e., that DOEs are allocated to each household.[17] We also understand that this is in line with the way SAPN is currently implementing their flexible export limit program.[18]

3.9. For the purposes of the remainder of our report and for issues where a decision in this area is relevant, we believe it is reasonable for the AER to adopt a working assumption that DOEs are applied at the customer's point of connection, in line with the recommendation of the DEIP report. If the location of the DOE application was different, however, the complexity and requirement for intervention may vary from our assessment here.

3.10. In future, as DOEs become more established and the NEM market design continues to evolve, this decision may need to be revisited as it may not serve different potential use cases for DOEs.[19] Therefore, **Future Action** may be required by the AER, for instance, when it becomes

according to external signals. This contrasts with more traditional 'non-flexible' sources of demand for electricity that do not have such features, such as traditional household appliances or electronic devices.

[17] DEIP, Dynamic Operating Envelopes Working Group Outcomes Report, page 52 (link).

[18] SAPN, Flexible Export Limit (link).

[19] Examples could include if DOEs were set for individual devices rather than for a connection point or if DER were to be used as part of a plan for restarting the system after a blackout ('black start').

clearer how the location of the DOE application needed to change to take account of future implementations of DOEs.

Connection points that DOEs apply to

3.11. A variety of different consumers connect DER to the distribution network, including:

- **Residential properties**, which typically connect small rooftop solar installations and, increasingly, battery storage, electric vehicles and other flexible smart home devices;
- **Commercial properties**, such as offices and factories, with solar and storage which are typically larger than residential installations;
- **Community batteries,** which are shared storage assets that typically are significantly larger than residential batteries; and
- **Utility solar farms,** which connect significant amount of solar capacity to the distribution network.

3.12. In theory, all of these types of connections could be offered and operate within a DOE. However, during the current early stage of DOE implementation into the NEM, it is not clear which types of connections will or should be able to have a DOE. The key considerations that are likely to be relevant are:

- Existence of primary load: whether the connection point always exports; or whether it imports and exports at different times;
- Current approach to static limits: whether the connection point is subject to static limits currently and, if so, how tight these limits are;
- Impact on the network: the impact of the connection point on local network conditions, including consideration of the size of the connection;
- Value to the network: for example, whether the connection participates in a VPP and provides valuable services to the network and system;
- Ownership: It may be more suitable to negotiate a DOE agreement with a small number of larger installations rather than a large number of small installations; and
- Technology type: Connection points with flexible storage, such as batteries, may be less affected by dynamic limits than less flexible assets, as exports could be shifted to other time periods.

Assessment of gap

Figure 3-3: Type of connection points that have DOEs applied gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
Connection points that DOEs apply to	Fundamental aspect of DOEs and critical to implementation	Requires further consideration of implications but DEIP work can be leveraged	No strong reason for the AER to mandate a particular approach	DEIP Outcomes Report	**Future Action** DNSPs to decide where to apply DOEs for now

3.13. As summarised above, while deciding which type of connection points are to be offered a DOE is critical step for implementation, we do not consider that immediate action is required by the AER. In particular, we consider that during the initial phases of DOE implementation, DNSPs are well placed to identify which types of connections should be offered a DOE absent any significant guidance from the AER, based on their knowledge of the network and its connections.

3.14. For example, installations at commercial properties are commonly sized relative to site load in order to reduce the level of low value exports.[20] As such, the need to implement DOEs for these connections may be less pressing compared to residential connections, where exports onto the network occur more commonly during the middle of the day when solar generation is high and consumption is typically relatively low.

3.15. To date, the majority of DOE development and implementation has focused on residential connections with rooftop solar. We note that, in the event of DOEs being extended to other types of connections, different approaches to implementing and operating DOEs may be required. For example, it is unlikely that the DOE that is appropriate for a residential customer would also be appropriate for a much larger commercial installation or community battery that likely to be capable of a much higher level of potential output. Similarly, different contractual mechanisms may need to be developed for different technologies. For example, in Queensland, Ergon Energy and Energex have recently developed separate dynamic connection agreements for connections under 30 kVA and those between 30 and 1,500 kVA, and are also aiming to develop options specifically to cover connections with electric vehicles.[21]

Action Status

3.16. Given the above assessment, we consider that while no immediate action is required from the AER, **Future Action** may be required at a later stage. In particular, DNSPs appear to be well

[20] Green Energy Markets, Final 2021 Projects for DER – solar PV and stationary energy battery systems, page 21 (link).
[21] Ergon, Dynamic Customer Standards FAQ, (link).

placed to decide which types of connections should be offered DOEs during the early stages of the DOE rollout, leveraging their understanding of the network and its connections.

3.17. However, if in future it appears that DNSPs are not offering DOEs in a manner that protects and furthers consumer interests, the AER should consider whether guidance or further interventions would be beneficial. For example, if DOEs are only used for residential connection points, DNSPs may only curtail households for the purposes of managing their networks, whilst leaving other connection points unaffected. This means that there is a risk that residential consumers bear the majority of the costs of DNSPs managing their networks (in the form of reduced compensation for exporting electricity) when compared with other connection points, such as businesses or commercial properties, which also might have DER installed.

Capacity allocation methodology

3.18. In order to implement DOEs, DNSPs will be required to allocate the available and scarce network capacity across their consumers. Capacity could be allocated using a wide variety of methods. For instance, the capacity could be allocated via a centrally-based decision by the DNSP, such as a uniform allocation across connection points or based on the connection point's marginal impact on the network as calculated by the DNSPs.

Assessment of gap

Figure 3-4: Capacity allocation methodology gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
Capacity Allocation Methodology	Fundamental aspect of DOEs and critical to implementation	Complex issue but some work has already been undertaken by DEIP	Solution may be driven by DNSPs but guidance likely to be helpful	DEIP Outcomes Report	**Immediate Action** AER to specify expectations for capacity allocation

3.19. As summarised above, we consider that determining the methodology for capacity allocation is critical to the initial implementation of DOEs since the dynamic limit itself cannot be calculated without some underlying methodology, as doing so would be arbitrary and would likely not be acceptable to consumers or in line with consumers' best interests. This may require the AER to specify its expectations on this subject, for instance, even just for the AER to signal to DNSPs that it does not expect to be prescriptive on the precise methodology.

3.20. Further to this, significant work on this aspect of DOE implementation has been undertaken by the DEIP working group, including stakeholder workshops and other external engagement with different market participants.

Action Status

3.21. However, the DEIP working group are yet to provide a particular recommendation and therefore input from other market bodies, such as the AER, is likely to be necessary and

appropriate. Given this, we consider this an area where **Immediate Action** by the AER may be required and discuss potential options further in Section 4A.

3.22. In addition, more complex allocation methodologies, such as explicit or implicit auctions of network capacity, could be adopted although this would require more fundamental market reforms. We provide further discussion of options and principles for capacity allocation models in Section 4A of this report.

DOE communication protocol

3.23. Separate from the calculation of the dynamic limit, any such limit would need to be communicated from the DNSP to devices to facilitate adherence. The manner in which any limit is communicated to a device will be reliant on a set protocol. The limit would also need to be updated over time, in line with the dynamic nature of a DOE.

3.24. In 2021, the CSIP-Aus standard was released by the DIEP,[22] with the intention of providing a national protocol to facilitate communication between DNSPs and devices to enable DOEs. However, there is currently no requirement to use this or any other standard for communicating DOEs.

Assessment of gap

Figure 3-5: DOE communication protocol gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
DOE communication protocol	Fundamental aspect of DOEs and critical to implementation	Complex but the ESB will be making a recommendation	Intervention needed for coordination, but relevant work is ongoing	ESB Interoperability Work	**Leverage Existing Work** Already being addressed by ESB workstream

3.25. The communication of the dynamic limit is inherently critical to DOEs. If communication does not occur, then the limit cannot be varied in response to external signals, defeating the purpose of a *dynamic* operating envelope.

3.26. Having common standards for communicating the limit, facilitated by intervention from the AER or another central authority, could help ensure a degree of interoperability across the NEM and that instructions issued by DNSPs to vary the dynamic limit are clearly communicated and understood by all relevant devices. Additionally, without a common operating language, greater costs could be imposed on retailers/aggregators and OEMs, who may be required to comply with varying communication protocols across states or networks. DNSPs may also face higher costs to implement DOEs if each adopts their own protocol, relative to adopting a single national approach where economies of scale and learning from experience may reduce expenditure. These costs will ultimately to be borne by consumers.

[22] ARENA, Common Smart Inverter Profile (link).

3.27. However, an intervention by a central authority mandating the use of a single standard during the early stages of DOE implementation could in theory stifle innovation or risk cementing the use of a sub-optimal standard.

3.28. Closing such a gap is likely to require some degree of clarification from the AER or other central authority to coordinate the expectations of equipment manufacturers, DNSPs and other service providers.

Action Status

3.29. The ESB Interoperability work that is currently underway includes consideration of the required technical standards for communication and interoperability in the NEM.[23] To avoid stakeholder confusion and duplication of work, the AER should therefore **Leverage Existing Work** to address the gap identified here regarding the communication of the dynamic limit.

DOE communication pathway

3.30. The gap immediately above discusses the protocol through which DOEs should be communicated. However, the adoption of a particular protocol does not in itself specify the exact pathway or entities through which the communication should flow.

3.31. The current CSIP-Aus communication protocol, as described above, allows for a communication pathway that leads directly from DNSPs to devices (or the OEM's cloud platforms), however we note, for instance, that there is currently no communication pathway defined leading from the retailer / aggregator to the DER device, which may be required in future use cases, as we discuss below.

Assessment of gap

Figure 3-6: DOE communication pathway gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
DOE communication pathway	Fundamental aspect of DOEs and critical to implementation	Complex issue but ESB work can be leveraged	Intervention may be required to standardise approach	ESB Interoperability – Roles and Responsibilities	**Leverage Existing Work** Leverage ESB work but AER may need to engage in future

3.32. As for the previous gap, the communication of the dynamic limit is inherently critical to the implementation of DOEs. Additionally, the choice of communication pathway is a complex technical issue and the impact on stakeholders and consumer outcomes could vary significantly between the pathway chosen, providing a basis for possible AER or central authority intervention.

3.33. For example, for the primary use case considered within this report of DNSPs using DOEs to manage distribution network congestion (as set out in paragraph 1.17), the pathway in which

[23] ESB Interoperability – Post 2025 DER Implementation Plan (link).

DOEs are communicated directly from the DNSP to devices may appear to be less costly and simpler to implement, compared to a situation in which the aggregator/retailer would also be required to develop communication capabilities. As such, this approach has been commonly adopted in DOE trials to date.

3.34. However, if in the future policymakers, DNSPs, retailers or aggregators wished to introduce additional DER[24] use cases, such as the ability for retailers to control DER and vary its behaviour in response to market prices, it is unlikely that this would be possible under the DNSP to device communication pathway. In particular, it may not be technically feasible for DER to receive co-incident and possibly conflicting commands from DNSPs and the retailer/aggregator.

3.35. Beyond this uncertainty, DER receiving multiple communications from different parties could increase the complexity of operating the system and may require a hierarchy of commands to be established. For example, in the event that wholesale market prices are very high, retailers/aggregators would likely have the incentive to maximise DER exports. However, if the local network is highly congested, DNSPs would likely set a tight DOE export limit. To deal with such potential conflicting instructions, the DER would need to know which of these commands to prioritise.

Action Status

3.36. We understand that the ESB Interoperability workstream is currently exploring the implementation of technical standards for DER in the NEM, along with consideration of the roles and responsibilities of different stakeholders. To avoid stakeholder confusion and duplication of work, the AER should therefore **Leverage Existing Work** to address the gap identified here regarding the communication pathway.

3.37. However, in the event that the ESB work does not fully close this gap or focuses solely on the DNSP to device pathway, the AER may be required to undertake further work in future.

3.38. For example, we are aware of a potential future use case of DOEs where retailers / aggregators (alongside DNSPs) are also able to influence the output of DER in response to wholesale electricity or ancillary market prices. In order to enable such a use case, it is likely that further work will be required to consider how commands sent by retailers / aggregators are prioritised in relation to commands sent by DNSPs, given that DNSPs would still be responsible for managing congestion on the distribution network and would likely continue to use DOEs to do this.

3.39. If there was a desire to implement such a use case, the AER might have a role to play, although there would likely need to be several pre-requisite steps before the nature of the AER's involvement became clear:

- **Technical feasibility**. In the first instance, we expect that industry would need to establish a technically feasible way for retailers / aggregators to manage DER within

[24] Including, but not limited to, additional use cases for DOEs.

DNSP-set DOEs. We expect that this work would be led by bodies such as the DEIP Technical Standards Working Group. We do not expect that the AER would play a significant role in this stage.

- **Establishing a hierarchy of control**. As mentioned above, if DNSPs and retailers / aggregators are both able to manage DER and set DOEs, instructions from each will have to be prioritised into a hierarchy such that devices are able to know which instruction to follow. The AER may have a responsibility to make a decision regarding this hierarchy and therefore may have to consider options for the potential arrangements for a hierarchy of control.
- **Dispute resolution**. The AER may have to play a role as an arbiter of disputes in the event that retailers / aggregators and DNSPs do not agree on whether the rules and parameters of the chosen arrangements for the hierarchy of control have been followed.

3.40. Regarding the arrangements for a hierarchy of control, potential models that the AER could consider include:

- prioritising DNSP export limits and allow retailers to vary DER behaviour in response to price signals only within the bounds of these limits. In this case, the appropriate DOE communication pathway may be from DNSP to retailer/ aggregator who then communicate with the device. This would allow the retailer/ aggregator to send a single communication to the device that incorporates both DNSP network constraints and retailer/ aggregator price response; or
- allowing DNSPs to have priority to manage DER only during periods of high network congestion, such as during the middle of the day where, typically, solar production and potential for export is high, network demand is lower and therefore electricity prices are low. This would then leave retailers / aggregators to manipulate output from DER to minimise electricity bills for customers outside of these periods. Under this arrangement, both the direct DNSP to device communication pathway and DNSP to retailer / aggregator then to device communication pathway may be appropriate.

3.41. In such a scenario, however, it is unclear whether it would be the sole responsibility of the AER to determine the hierarchy of control since such a responsibility could also fall to other market bodies. For instance, the ESB may conduct a follow-on to its current Roles and Responsibilities and Interoperability work to investigate potential arrangements for the hierarchy of control. As such, whilst future action may be required from the AER, the AER should engage closely with other market bodies in order to determine an appropriate allocation of responsibilities in this space.

DOE-interval length

3.42. Selecting the time interval that each DOE is fixed for is a necessary component of designing a DOE.[25] In theory, the shorter the interval length, for example ten seconds, the greater potential efficiency, as limits can updated more frequently to better reflect the real-time system conditions. However, shorter intervals would also increase the complexity and cost of DOE operation in the form of increased need for computational capabilities, communication requirements and data storage. Conversely, longer intervals, such as one day, offer simplicity, greater certainty to market participants and lower costs, but would almost certainly result in network capacity being allocated less efficiently.

3.43. In addition to efficiency considerations, the appropriate frequency of updates must also account for the capabilities of the DOE-enable devices that will receive the export limit. If a device is unable to process, and therefore implement, a new export limit at sufficiently short intervals, there is a significant risk that an outdated and incorrect limit will be implemented, threatening network security or unnecessary curtailment.

Assessment of gap

Figure 3-7: DOE-interval length gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
DOE-interval length	Length of DOE interval dictates required response and compliance levels	Complex issue but some work has already been undertaken by DEIP	No strong reason for the AER to mandate a particular approach	DEIP Outcomes Report (5-minute interval recommended)	**Leverage Existing Work** Accept DEIP Outcomes Report recommendation

3.44. The updates to the dynamic limit are inherently critical to DOEs, and therefore determining the frequency of these updates is highly critical to the initial stages of DOE implementation. As discussed above, determining the appropriate DOE-interval length is complex and requires the balancing of several aspects such as cost, the technical capabilities of available devices, and market efficiency.

3.45. The DEIP has assessed this aspect of DOE design and have recommended five-minute intervals are adopted or transitioned to over time in order to limit short-term costs while reaping the long-term benefits of frequent export limit updates.[26] In particular, the DEIP highlighted that a five-minute DOE interval would align with the settlement frequency of the NEM, which transitioned to five-minute intervals in 2021.

[25] We note that, in theory, the interval length (i.e. the time for which each DOE command is fixed) could also be a different length of time to the frequency with which DNSPs communicate DOE commands. For example, every hour the DNSP could communicate 24 hours' worth of DOE commands in 5 minute intervals. However, we assume that, in practice, the frequency with which DNSPs communicate with DER is equal to the DOE interval length.
[26] DEIP Outcomes Report, p55 (link).

3.46. Given the variability in the needs of different networks, we do not believe that it is necessary for the AER to mandate a particular interval period in the short run and DNSPs appear best placed to assess the required frequency with which the export limit should be updated within their networks. However, the AER should consider whether DNSPs are sufficiently transparent with consumers, to ensure they are able to understand the DOE offered to them (discussed further in Consumer understanding and interest gap below).

Action Status

3.47. During the early stages of DOE implementation, the AER should **Leverage Existing Work**, accepting the recommendations of the DEIP report and not mandating a particular interval, but indicating its expectation that DNSPs should transition towards five-minute intervals. Further work could subsequently be undertaken to assess the point at which DNSPs should have completed the transition to five-minute intervals.

Notification period for dynamic limit

3.48. For consumers and potentially retailers / aggregators to effectively plan their energy and DER usage, DOEs will need to be communicated by the DNSP to market participants ahead of the point in time at which the dynamic limit needs to be adjusted. For instance, a consumer that has both solar PV and battery storage may choose to discharge their battery ahead of periods of tight export limits, to reduce the risk of potential solar generation being curtailed. Similarly, advance notice would allow aggregators / retailers to better plan their bids into the energy and ESS markets and reduce the risk of not being able to fulfil those bids (if accepted) due to DOEs unexpectedly restricting behaviour.

3.49. Largely, the notice could be based on one of the following two options:

- **Relatively 'real-time' forecasts**, relying on newer information to forecast network usage and export limits in the short-term (for instance, an hour in advance). These are likely to be more accurate due to the use of more reliable information on certain inputs such as the weather[27], however the shorter period of notice may also limit the ability of market participants to adapt in response to the change in limit; or
- **Longer-term forecasts**, relying on forecasts of constraints and usage in the long term, the accuracy of which can vary due to the uncertainty introduced by the forecasting of each underlying input, although the period of notice does allow market participants to adapt network usage behaviour.

3.50. A combination of each approach could also be deployed. For example, in Queensland Ergon Energy and Energex have chosen to provide a 24-hour DOE notice period, comprising of a more granular 5-minute forecast for the upcoming hour, and a less granular hourly forecast for the remaining 23 hours.[28]

[27] Which is likely to have a significant impact on the ability to generate solar power.
[28] Ergon, Dynamic Standard for Small IES Connections, p19 (link).

3.51. There currently exist no requirements or guidance from a central authority on how far in advance the limit must be communicated, meaning that variation between states and networks could arise as DOEs are implemented.

Assessment of gap

Figure 3-8: Notice period for DOE update gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
Notice period for DOE update	Appropriate notice may be required for consumer response	Complex issue but some work has already been undertaken by DEIP	No strong reason for the AER to mandate a particular approach	DEIP Outcomes Report (24-hour notification period recommended)	**Leverage Existing Work** With potential to take future action if required

3.52. As the update and communication of the limit is inherently critical to DOE operations, the notification period for any update will need to be set in order to implement the required communication protocols.

3.53. Determining the optimal length of advance notice is complex and may vary between states and networks, possibly due to network characteristics or existing forecasting capabilities. As such, it appears that during the initial periods of DOE implementation in the NEM, DNSPs are ultimately best placed to decide on an appropriate notice period, leveraging their understanding of the network.

3.54. However, we note that the DEIP has considered this aspect of DOE design, finding that 24-hours advance notice appears appropriate for communicating the updated limit.[29] It also advocates for improvements in longer range forecasting over time.

Action Status

3.55. During the early stages of DOE implementation, the AER should **Leverage Existing Work**, accepting the recommendations of the DEIP report in favour of a 24-hour period. At this point in time, guidance rather than a firm requirement appears more suitable. However, in future further worth may be undertaken to assess whether requiring a minimum notice period across the NEM is desirable, particularly if it appears that market participants are not being given sufficient notice by DNSPs.

Device fall-back procedures

3.56. DNSPs will need to maintain distribution network security and reliability even in the event that DER devices stop being able to receive external communications, for instance, in the event of an internet outage or if there is a failure in the connection to DER devices. Under such circumstances, DOE-enabled devices may need a set of procedures to define how they would operate in the absence of any external instructions. Such a set of fall-back procedures

[29] DEIP Outcomes Report, p57 (link).

will need to be developed and relevant parties would need to agree to adhere to these procedures, for instance, in their operations or in the design of equipment.

3.57. Such device fall-back procedures may include, for instance, fall-back limits to follow if equipment does not respond to instructions to change the dynamic limit.[30] Device fall-back procedures may also need to include feedback or a flow of information to AEMO such that AEMO is aware of the aggregate level of response in the event that procedures are activated.[31]

Assessment of gap

Figure 3-9: Device fall-back procedures gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
Device fall-back procedures	Critical aspect of DOEs due to potential risk to safety and stability	Variety of potential solutions exist	More appropriate as operational question for DNSPs to consider	N/A	**Future Action** AER may have future role (e.g. on standardisation)

3.58. In the context of DOEs, device fall-back procedures are likely to be highly critical for operation given potential risks to safety and network stability if DNSPs are not able to issue instructions to DOE-enabled devices.

3.59. There may be different technical solutions to this potential issue that may include (but not be limited to):

- communicating a set of commands to DER devices in advances and having these stored by the device, with the DER devices following the pre-determined set of instructions in the event of a loss of communications[32]. In the event of relatively short communications outages, such procedures may result in very little disruption to DOE operations;
- having devices default to a static export limit, which could even be set to zero;
- equipping devices with back-up communications, such as making use of mobile data connectivity; or
- some combination of the above.[33]

[30] Fall-back limits may be defined within the technical standards for operating DOEs, which are the subject of work such as the ESB Interoperability Technical Standards work program and the ongoing AEMC Governance of Technical Standards review, which we discuss in more detail below in our report.
[31] For instance, if device fall-back procedures have implications for AEMOs, since they define how DER devices would behave under particular situations that may also require intervention by AEMO at the system level.
[32] For example, the DNSP could set a schedule of DOE commands to the DER device for a 24-hour period in advance.
[33] For instance, the device could default to a static or zero limit if the communications outage lasts so long that it runs out of stored instructions.

3.60. The need for AER intervention to prescribe a specific solution appears to be low given that DNSPs may be better placed to decide on the most appropriate operational solution for their circumstances. In addition, given that communications outages are likely to be a relatively rare occurrence, the need for AER intervention on this gap appears to be relatively low.

3.61. In the context of the AER's responsibilities, it is possible that device fall-back procedures may need to be implemented through connection agreements between consumers and DNSPs, where certain requirements or details on fall-back procedures may need to be specified.

Action Status

3.62. Altogether, it is currently unclear what role the AER should, at present, have in intervening regarding device fall-back procedures, which we consider to be an operational matter for DNSPs.

3.63. **Future Action** may be required by the AER if such procedures are to be implemented, for instance, through connection agreements. For example, it may be appropriate for DNSPs to be required to set out procedures in a clear way and for the AER and other market bodies to be notified of how such procedures have been specified. Alternatively, if DOEs are adopted more widely and it becomes apparent what the most appropriate device fall-back procedures are, there may be benefits to standardisation across the NEM, which may require AER intervention.

3.64. Finally, we are aware that there may be cybersecurity risks associated with DOEs, for instance, in the event of a cyber-attack which results in equipment not adhering to its operating envelope. However, we note that some cybersecurity risks may already exist with static limits, where equipment may similarly become unresponsive in the wake of a cyberattack. It is also possible that the implementation of DOEs may exacerbate such risks, for instance if vulnerability to cybersecurity threats increases when equipment has to respond to more frequent updates to the dynamic limit under a DOE. We note that cyber security controls for DER more broadly are being considered by the DEIP as part of its Interoperability Steering Committee workstream[34] as well as being part of upcoming work in the ESB's DER Implementation Plan.[35]

Visibility over the distribution network

3.65. To properly calculate the dynamic operating limit, DNSPs may need to have a more granular and real-time understanding of their distribution networks compared to the level of visibility that they have today.

3.66. For instance, DNSPs may require more detailed information regarding network topology in order to have sufficient information to model the distribution network such that they can calculate network capacity and the appropriate limits that can be set. In addition, in order to

[34] DEIP, Interoperability Steering Committee, (link).
[35] ESB, DER Implementation plan (link). See page 1, where 'Cyber standards for DER' is highlighted as a future area of work.

update the dynamic operating limit in real-time, DNSPs will likely need to have additional visibility of data about the state of the distribution network at a particular point in time.

3.67. Historically, distribution networks have been built and maintained based on a predominantly one-way flow of electricity, resulting in little need for operational visibility and monitoring of the distribution network at the granularity that DOEs envisage doing. Therefore, we understand that many DNSPs may not currently have the required visibility over their distribution networks to implement DOEs, although the extent of this may vary between DNSPs.

3.68. For example, in Victoria, DNSPs may benefit from data collected via distributor-owned smart meters. We understand that other DNSPs, may have taken a more reactive approach to network monitoring, where network issues are initially identified via consumer complaints.[36]

Assessment of gap

Figure 3-10: Visibility over the distribution network gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
Visibility over the distribution network	 Integral to the forecast, calculation and compliance of DOEs	 Some frameworks exist but may not be sufficient for full DOE implementation	 Range of options as to how DNSPs manage this information	N/A	**Immediate Action** AER to develop guidelines for monitoring of the network

3.69. As shown in Figure 3-10 and discussed above, we consider it to be critical that DNSPs have sufficient visibility over their distribution networks to implement DOEs, since it would likely be very difficult to calculate appropriate limits without such visibility. Furthermore, it is likely to be very challenging to dynamically update these limits without appropriate real-time information on the operation of the network. Having such functionality is critical as it is inherent to a *dynamic* operating limit.

3.70. We are aware of some existing frameworks that govern or seek to promote visibility over assets connected to the distribution network. For instance, the introduction of a DER register in accordance with the AEMC's 2018 rule change has resulted in increased information regarding DER devices connected to the distribution network.[37] In addition, the *Distributed Energy Resources Visibility & Monitoring Best Practice Guide*[38] was developed in 2020 and was established as a voluntary guide to standardise and increase confidence across industry in the quality and performance of DER.

[36] Although further, more proactive monitoring measures may be put into place after areas with particular issues are identified.
[37] The AEMC rule change required that the DER register captures information such as device capacity, inverter type and voltage limits (link)
[38] Solar analytics, Distributed Energy Resources Visibility & Monitoring Best Practice Guide, (link)

3.71. However, DNSPs (to a varying extent depending on the jurisdiction) may need to take further steps to increase their visibility over the network to efficiently implement DOEs and it may be appropriate for the AER to seek assurances from DNSPs that they have an adequate level of visibility that is balanced with the required costs of expenditure.

Action Status

3.72. Overall, we assess that **Immediate Action** may be required from the AER, and discuss potential options to seek such assurances from DNSPs in Section 4A.

B. Interactions with consumers

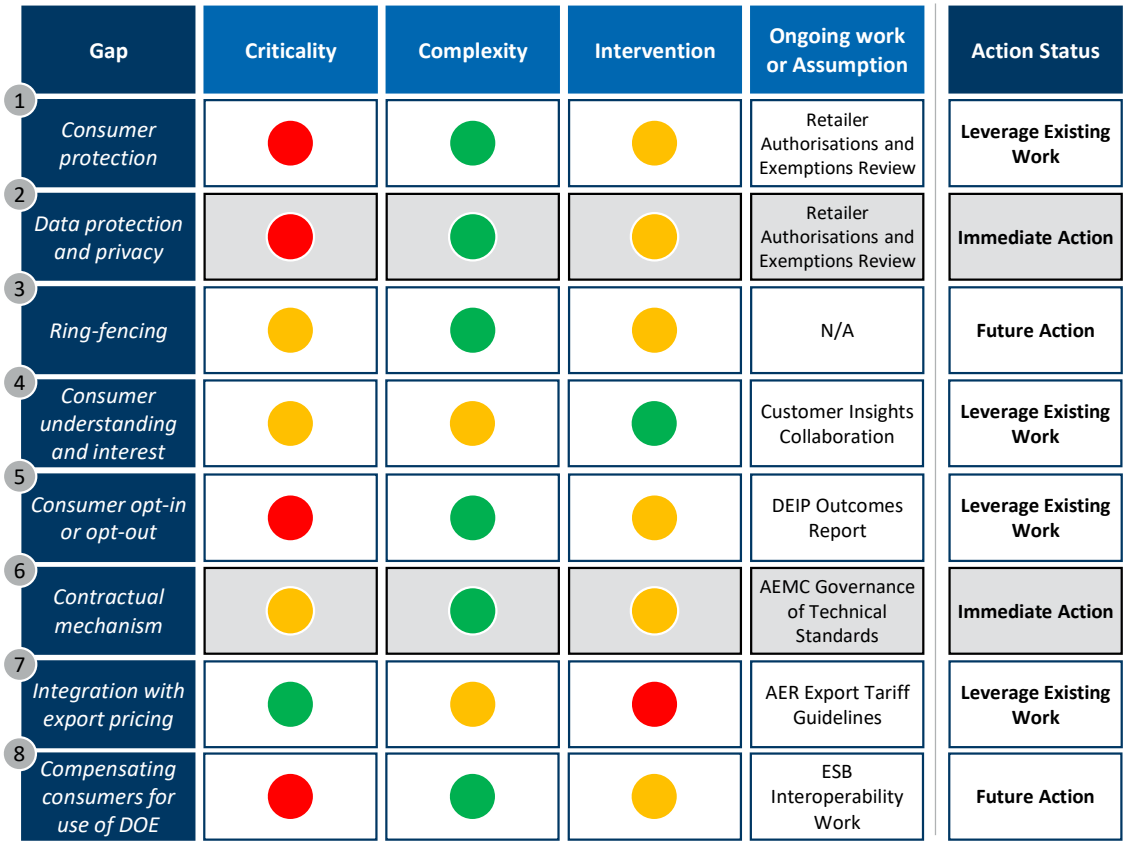
3.73. Aspects of the regulatory and governance framework regarding DNSPs' interaction with consumers may require modification or updating to accommodate the implementation of DOEs in order to continue to ensure that consumers' interests continue to be protected and promoted.

3.74. In this subsection, we discuss potential gaps that we have identified in this space covering:

- General regulatory framework for consumer protections;
- Data protection and privacy;
- Ring-fencing;
- Consumer understanding and interest;
- Consumer opt-in or opt-out;
- Contractual mechanism; and
- Integration with export pricing.

3.75. The result of our assessment is summarised below and discussed in turn in the following subsections.

Figure 3-11: Summary of Interactions with Consumers gap analysis



General regulatory framework for consumer protections

3.76. Currently, consumer protection frameworks do not include specific references to DOEs or contain mechanisms that identify or address any consumer protection issues regarding DOEs.

3.77. Consumer protections for the sale and supply of electricity to retail customers are broadly maintained through the suite of documents that sit within the National Energy Consumer Framework ("**NECF**").[39] These consumer protections place obligations on service providers to ensure certain service standards are maintained during the sale and supply of electricity including, for example, regarding the provision of information, disconnections, hardship processes, resolving complaints and disputes and handling of customer data.

3.78. Currently, DNSP operations and requirements are not generally[40] in the purview of the NECF and have primarily been defined in the National Electricity Rules ("**NER**"). The implementation of DOEs would impact the ability for consumers to export (and, in the future, potentially import) electricity, creating a new role for DNSPs. It is, therefore, unclear whether DNSPs would be, in addition to the NER, bound by additional obligations under the NECF and

[39] NECF includes; National Energy Retail Law (Retail Law), National Energy Retail Rules (Retail Rule), and National Energy Retail Regulations (Regulations).

[40] We are aware of very specific references, such as in the case of life support obligations that apply to DNSPs which are in the NECF.

the associated consumer protection frameworks if and when they started implementing DOEs.

Assessment of gap

Figure 3-12: General regulatory framework for consumer protections gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
Consumer protection	Required to ensure DOEs are implemented in long term interest of consumers	Likely to require an extension of the existing frameworks to cover DOEs	Guidance can facilitate process of extending relevant frameworks	Retailer Authorisations and Exemptions Review	**Leverage Existing Work** AER to confirm that previous work assesses impact of DOEs

3.79. We consider this gap to be critical since regulatory requirements under the NECF have been deemed to be important enough to apply across all providers of retail energy services. It is therefore unlikely to be in the interests of consumers for DOEs to be provided without regulatory intervention and assurances on the basic level of service to consumers, for example, the protocols governing the communication of the setting of the envelopes.

3.80. However, we understand that work underway within the Retailer Authorisations and Exemptions Review is assessing the extent to which the provisions of the NECF can be extended to cover DOEs, indicating that this gap has been recognised and is expected to be addressed.[41]

3.81. The Retailer Authorisations and Exemptions Review is a broad scope of work that considers existing legislative instruments that may be used to apply the consumer protections under the NECF to new businesses and models that are emerging through the integration of DER. This review seeks to identify where the integration of DER poses a risk to consumers and how (or if) the NECF may be used to protect consumers and apply appropriate safeguards.

Action Status

3.82. Given the scope of this review, it is likely that consumer protection requirements resulting from the implementation of DOEs are being assessed and considered and there, that it will be possible to **Leverage Existing Work** to support the regulatory frameworks required for the implementation of DOEs.

Data protection and privacy

3.83. The implementation of DOEs is also likely to result in more data being created and made visible (and even transferred) across the energy network. This increase in the volume and range of dataflows enhances the importance of protection and privacy frameworks that will likely need to be reconsidered within the context of DOEs.

[41] In addition, we are aware that DOEs may also be implemented in such a way that key terms of service and customer protections are set out in the customer's existing contractual arrangements with their energy retailer.

3.84. In order to calculate, forecast and monitor the impact of DOEs, both static data (relating to the performance of DER and the local network) and operational data (relating to 'live' technical information such as power, voltage and frequency) is required. It is likely that this would result in a significant increase in the data being sent and received by various market participants, in particular, for DNSPs who currently receive or process minimal operational data from the connection point.

3.85. Whilst there are existing provisions for the collection of DER specific data (AEMO's DER Register) and for the protection of consumer retail and billing data (Consumer Data Rights), these frameworks do not currently cover the connection point level data that is needed to operationalise DOEs.

3.86. This data is likely to be required by DNSPs to facilitate the safe and effective implementation of DOEs since DOEs are, by their nature, set in response to information on the real-time conditions on the distribution network. In addition, such data may also allow DNSPs, retailers, aggregators or other service providers to develop and tailor additional services to customers that bring additional consumer benefits.

Assessment of gap

Figure 3-13: Data protection and privacy gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
Data protection and privacy	Critical to establish effective data use for DOE implementation.	Likely to require an extension of the existing frameworks to cover DOEs	Guidance can facilitate process of extending relevant frameworks	Retailer Authorisations and Exemptions Review	**Immediate Action** AER to specify expectations regarding data protection requirements

3.87. Whilst we consider the data protection and privacy gap to be critical to ensure consumer outcomes are protected, there are already existing protocols and precedents for protecting consumer data and privacy in the current regulatory frameworks which may be leveraged to address this gap.

3.88. Although captured under the NECF, and therefore subject to consideration in the *Retailer Authorisation and Exceptions Review*, we believe that the further regulatory guidance from the AER would be beneficial to ensure consumer outcomes are protected across the required data flow between the connection point, DNSP, retailer and other market bodies.

3.89. In particular, greater visibility of data between DNSPs, retailers and aggregators may enable them to improve network management and consumer offerings, potentially generating further benefits for consumers. Therefore, to the extent that data protection regulations limit the ways consumer data can be leveraged, it may also limit the potential for DER integration.

Action Status

3.90. On the other hand, concerns regarding privacy and data rights may arise as the data that DNSPs, retailers and aggregators have visibility over for the purposes of setting DOEs, billing management and developing new services offerings may reveal information about consumers' use of their appliances and other behaviours in their homes.

3.91. We therefore consider that **Immediate Action** by the AER may be helpful to set expectations around the protection of consumer data, in particular covering visibility of operational data between entities that will likely be required for DOEs. We discuss this further in Section 4B.

Ring-fencing

3.92. Ring-fencing is applied through regulatory frameworks to DNSPs when they are operating in competitive markets or providing competitive services. The parts of the DNSP that provide competitive services are separated (or ring-fenced) from their monopoly business and revenue streams in order to ensure no conflict of interest or competitive advantage is given to the competitive service offering.

3.93. The application of DOEs is an extension of existing DNSP network operations and, therefore, it may be helped to consider the extent to which these services are competitive in nature, as well as if any conflicts between competitive services and monopoly network provision should be managed through additional ring-fencing arrangements.

Assessment of gap

Figure 3-14: Ring-fencing gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
Ring-fencing	Important for DOE implementation if DOE design interacts with ring-fenced roles	Likely to require an extension of the existing frameworks to cover DOEs	Market bodies will need to provide guidance on aspects that need ring-fencing	N/A	**Future Action** For future consideration when DOEs are integrated into wholesale market

3.94. Assessment of this gap may require some analysis of the necessary roles, but it is likely to be relatively simple and non-essential for the initial roll out of DOEs.

3.95. In the first instance, DOEs will be used as a way of distributing available capacity on the network. As there is no competitive relationship or direct revenue received by the DNSP from these services, it is likely to be appropriate for DOEs to sit within this regulated boundary in the first instance.

3.96. It is important to note however, that as two-sided markets[42] develop and DOEs begin to integrate into wholesale markets for electricity or network services, additional complexities

[42] Two-sided markets may include the development of a competitive market on the distribution network for energy and system services.

that require oversight and economic regulation may arise (e.g. if DOEs are also used by retailers to manager consumers' energy exports and imports).

Action Status

3.97. Therefore, there may be need for **Future Action** for the AER to consider if the utilisation, calculation, allocation or monitoring of DOEs should be regulated or shifted to the unregulated entity.

Consumer understanding and interest

3.98. Future acceptance and take-up of DOEs is likely to depend on consumers having a basic understanding of what DOEs are, the benefits DOEs can bring and how DOEs affect their existing energy services.

3.99. At present, DER devices are marketed to consumers as opportunities to decrease energy bills and receive additional revenues from exporting electricity back into the network.[43] However, DOEs are not mentioned explicitly and so the concept of a consumer's export limit (and therefore, their potential to earn money from exporting electricity) being varied over time is likely to be a new concept to many consumers.

3.100. Therefore, consumers without appropriate information, education and learning opportunities may not understand some implications of DOEs, such as:

- **the rationale or need for DOEs** – including the drivers for DOEs and alternatives presented to consumers (including the interaction with the feed-in-tariff offered for the export of power onto the network);
- **the impact of DOEs on consumers** – this is likely to be specific to or differ between consumers with existing DER devices, consumers looking to purchase DER and consumers without DER;
- **the opportunities created by DOEs** – including the alternative as a static export limit;
- **the use of DOEs** – how these limits are set and how often they are updated;
- **benefits from DOEs** – for individual consumer and the overall energy system; and
- **additional obligations or requirements** on consumers to enable DOEs.

3.101. In addition to this, the introduction of DOEs may be perceived by new consumers as an 'unfair burden' that is not borne by existing DER consumers, which is likely to also hinder both DER and DOE uptake. Given this, the information communicated to consumers and the manner in which this is done will be integral in generating consumer acceptance of DOEs.

3.102. Electricity market information provided to consumers currently primarily focuses on retail electricity usage and billing, which is provided primarily by retailers (through obligations in the NECF) or government education campaigns. DOEs may place greater emphasis on the

[43] See for instance information provided by the Australian government (link) and by the Clean Energy Council (page 4 of link).

role of market participants, potentially including DNSPs, provide some form of additional ongoing information to customers, something for which there are currently no clear regulatory requirements or obligations.

Assessment of gap

Figure 3-15: Consumer understanding and interest gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
Consumer understanding and interest	Consumer buy-in is critical to the implementation of DOEs	Exact content and pathways may be complex to define and communicate	Market body guidance required to facilitate communication	Customer Insights Collaboration	**Leverage Existing Work** With potential to take future action if required

3.103. We consider the potential gap in consumer information is important to ensuring the successful roll out of DOEs and to wider acceptance of DOEs by consumers as a lack of understanding of DOEs may become a barrier to take-up of DER for some consumers.

3.104. However, it is possible that understanding of DOEs will improve over time without the intervention of the AER. As identified in this report, the take-up and use of DOEs has the potential to serve the interests of DNSPs, retailers, aggregators and consumers. As such, incentives to increase consumer awareness of DOEs are likely to exist without the intervention of the AER.

3.105. Furthermore, the ongoing Customer Insights Collaboration ("**CIC**") work program[44] may contribute to addressing this gap as the work seeks to provide insights into communication pathways and consumer requirements. The CIC is an ongoing forum that brings together customer groups and industry to work through issues and risks for consumers resulting from the uptake of DER. Within this, the CIC is expected to consider the impacts for consumers and consumer sentiment (including level of understanding) around DOEs.

Action Status

3.106. As such, the AER may be able to **Leverage Existing Work** from the CIC and through this, may be better placed to act regarding consumer understanding and interest in DOEs as necessary in the future.

Consumer opt-in or opt-out

3.107. The provision of transparent information presents the opportunity for consumers to decide whether they want to participate and receive DOEs. However, there is currently no uniform approach or regulatory requirement as to how DNSPs may approach consumers or gain consumer consent to participate in DOEs. Consumers are expected to be able to opt-in

[44] ESB, Customer Insights Collaboration – Release On, Stakeholder Steering Group, December 2021 (link).

(provide active consent for their devices to receive DOEs) or opt-out to a baseline option, such as a static or zero export limit.

Assessment of gap

Figure 3-16: Consumer opt-in or opt-out gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
Consumer opt-in or opt-out	Fundamental aspect to maintain consumer trust and agency	Likely to require an extension of the existing frameworks to cover DOEs	Guidance can facilitate process of extending relevant frameworks	DEIP Outcomes Report	**Leverage Existing Work** Opt-in has been recommended via another workstream.

3.108. Given the importance of consumer protection and trust in relation to the operations of their DER devices, regulatory requirements that empower them to opt-in to DOEs have been recommended by the DEIP Outcomes Report.[45]

3.109. The DEIP report notes that without 'social licence'[46] and transparent information, the DOE implementation is unlikely to realise its full benefits, with consumers more likely to disengage or optout.

Action status

3.110. Appropriate education and information, combined with active consumer consent through an opt-in process, is likely to generate maximum value for consumers, as well as the system, as more consumers are likely to opt-in to increase their export limits relative to the baseline.

3.111. For the purposes of this report, we assume that the AER is likely to **Leverage Existing Work** by adopting the opt-in approach recommended by the DEIP report.

Contractual mechanism

3.112. In order to implement DOEs, it is likely that some part of the contractual arrangements between the DNSP and the consumer will need to be changed in order to recognise that DOEs are in operation and to set out the implications for DNSP and consumer interactions. There is currently no guidance regarding the specific contractual mechanism which will indicate that DOEs are being implemented at each customer's connection point.

3.113. Under current frameworks, such as the NER, the relationship between a DNSP network and a consumer's DER is governed by the connection agreement (which is required to be in place prior to the installation of solar panels ("**PV**")).

3.114. Whilst the connection agreement may be extended to permit DOEs, there is currently no clear requirement to utilise the connection agreement in order to do so. In South Australia,

[45] DEIP, Dynamic Operating Envelopes Working Group Outcomes Report, page 11 (link)
[46] Implicit support for the roll out of DER from the consumers with and without DER installed.

SAPN have updated their connection agreement (known as Model Standing Offer[47]) to enable DOEs.

3.115. Further, there is currently no requirement on the specific information or terms to be contained within the contractual mechanisms. There is also uncertainty as to whether consumers who sequentially install different types of DER would be required to re-specify the existing single DOE agreement, or whether they would be expected to connect the devices to the network via new DOE agreements.

3.116. Under the assumption that DOEs are implemented at the connection point, and not at device-level, any DER devices connected to the distribution network via the same connection point would be required to share the capacity available at that DOE, i.e., under the same DOE agreement (unless the DNSP was willing to re-negotiate the connection agreement). However, under other designs (e.g. DOE limits tied to individual DER devices), the DOE limit could be additive, and therefore increase based on the number of DER assets connected at each point, with each device connected to the network via an individual DOE agreement.

3.117. This lack of clarity or standardisation poses a risk to consumers as it is unclear what protections are in place and what obligations are applied to both the DNSP or consumer.

Assessment of gap

Figure 3-17: Contractual mechanism gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
Contractual mechanism	Appropriate mechanism required	Likely to require an extension of the existing frameworks to cover DOEs	Regulatory guidance or approval required	AEMC Governance of Technical Standards	**Immediate Action** AER to review ongoing work programs and determine if guidance required

3.118. The contractual mechanism that applies the DOE and the terms that are contained within it are inherently important to the implementation of DOEs and have follow-on impacts for consumer protections as well as for compliance and performance monitoring.

3.119. The AEMC review of the Governance of Technical Standards is currently considering whether the connection agreement is the appropriate legal instrument for giving effect to technical standards that allow for DOE implementation.

Action status

3.120. The AER may leverage this work, however we believe **Immediate Action** is required by the AER to confirm the appropriateness and if further guidance is required. We discuss this further in Section 4B.

[47] SAPN, Model Standing Offer (link)

Integration with export pricing

3.121. Customers could be further impacted by the implementation of DOEs through the amount they pay in export-as-a-service charges following the AEMC's recent Access, Pricing and Incentive Arrangement for DER Rule Change[48] ("**DER Rule Change**").[49,50]

3.122. DOEs can place a dynamic maximum limit on the connection point exports. Therefore, at any one point in time, this export limit is driving the maximum amount of energy flow onto the network. DOEs therefore, if they are binding, may influence the amount a customer's device is able to export onto the network and consequently how much the customer is required to pay to the DNSP in export charges.

3.123. As part of its final determination under the DER Rule Change, the AEMC approved the application of export tariffs by DNSPs to customers who export onto the grid. The AER has consequently provided guidelines[51] to support the development of these export tariffs by DNSPs, in particular regarding the information required to gain AER approval.

3.124. Export tariffs are likely to be priced at different points in time both negatively (as a rebate to consumers) and positively (as a cost to consumers) reflecting the level of congestion on the network and when the network would benefit from more or less exported energy.

3.125. The pricing signals that will exist through the implementation of export tariffs could drive the same objectives for DNSPs as DOEs, that is: less exported energy when the network is congested, and more exported energy when the network has spare capacity.

3.126. We have therefore, identified a gap in considering how feed-on tariffs from retailers, the export charges and DOEs will work together to support consumers and create efficient incentives and outcomes.

Assessment of gap

Figure 3-18: Integration with export pricing gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
Integration with export pricing	 Integration with export pricing not required for initial DOE implementation	 Future interaction with export tariffs likely to require significant review	 Interactions with export tariffs will require significant market body oversight	AER Export Tariff Guidelines, Access, Pricing and Incentive arrangements for DER	**Leverage Existing Work** AER to review existing work and structure tariff options

[48] AEMC, Access, pricing and incentive arrangement for Distributed Energy Resources (link).
[49] Export as a service charges are the payment from the customer to the DNSP for exporting back onto the network. This is made up of an energy volume charge (c/kWh) and potentially a daily charge ($/day). This is different from the feed-in-tariff that, on the contrary, consumers receive from their retailers for exporting power onto the network.
[50] AEMC, Access, pricing and incentive arrangement for Distributed Energy Resources (link).
[51] AER, Export Tariff Guidelines (link)

3.127. Given the ongoing work and implementation of the Export Tariff Guidelines, we believe that the AER is best placed to consider these interactions as part of its Export Tariffs Guidelines and Tariff Structure Statement review process and through the implementation of the rule change.

3.128. However, as both DOEs and export pricing are implemented, the AER may need to consider the cumulative impact of two mechanisms that generate pricing signals in response to network congestion. For instance, AER may wish to investigate whether export pricing and DOE signals would reduce energy export to an unnecessary extent in response to network congestion, due to one set of price signals magnifying the impact of the other.

Action status

3.129. We therefore conclude that further AER guidelines and/or regulatory intervention are not required at this stage and that it may be possible to **Leverage Existing Work**.

3.130. However, as shown in Figure 3-18 above, following the implementation of export tariffs[52] and the increasing uptake of DOEs, the interactions between export tariffs and DOEs may increase in complexity as the market evolves. This is likely to require future review and oversight to ensure the correct incentives are being provided to consumers.

Compensating consumers for use of DOEs

3.131. By complying with DOEs, consumers are providing flexibility to the market at a time when such flexibility is becoming increasingly valuable across the NEM. However, currently it appears that DOEs will be implemented without consumers being compensated by DNSPs for this flexibility or the risk of being subject to restrictive limits. Additionally, there is no guidance or requirement from central authorities regarding consumer compensation related to DOEs.

Assessment of gap

Figure 3-19: Compensating consumers for DOEs as a flexibility service gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
Compensating consumers for DOEs as a flexibility service	Low impact on DOE-uptake and efficiency in initial stages of DOE implementation	Will require consideration of interactions with pricing and other compensation	Guidance needed to prevent DNSPs overutilising DOEs and harming consumers	ESB Interoperability DER Technical Standards – Roles and responsibility workstream	**Future Action** May be required to protect consumers and reward valuable flexibility

3.132. Establishing consumer compensation for DOEs is non-critical aspect of implementation, with DNSPs able to operate DOEs as a 'free to use' service. Additionally, if compensation were to be implemented, designing a new mechanism that is consistent with other related market structures and financial flows, such as export tariffs, ancillary service markets and whole

[52] Starting 2025.

energy prices, would likely be a highly complex exercise. As such, it appears that during the early stages of implementation, DOEs will be operated without consumer compensation.

3.133. However, there is a risk that, absent an appropriate compensation mechanism, DOEs are over-utilised by DNSPs in order to minimise other expenditure, for example on network improvements. This would shift the burden of cost from all consumers (recognising that DNSP expenditure is recovered from the entire consumer base) onto just those consumers who are subject to (uncompensated) DOEs, reducing fairness and potentially harming consumer buy-in. It could also result in an inefficient delay or avoidance delay of network investment, to the detriment of all consumers.[53] Intervention by a central authority to support consumer compensation, including for those who signed up for DOEs before the introduction of compensation, therefore may help to mitigate this risk, while also likely improving consumer buy-in.

3.134. There are several mechanisms that could be adopted to enable consumer compensation for DOE operation. For example, it could be incorporated into a number of different capacity allocation methodologies, as discussed in more detail in Box 1 below. Alternatively, a simpler approach could be providing discounts to network charges for those consumers who have a DOE, as a reward for their flexibility.

Action status

3.135. Given the non-critical nature of the gap and the likely complexity of designing an effective compensation mechanism, we do not believe this gap should be a priority for the AER during the initial stages of DOE implementation. However, **Future Action** may be required to ensure that consumers are protected and sufficiently rewarded for the valuable flexibility they provide to the network.

C. Compliance and Monitoring

3.136. The development and implementation of DOEs across distribution networks in the NEM is an extension to the current provision of export services to customers, where customers are subject to static export limits. Given that with DOEs, the export limit is expected to be varied dynamically over time, the type and level of monitoring and the actions that may need to be taken to ensure compliance with a dynamic limit may be quite different compared to with static limits. As such, an updated framework is required with a different of roles and functions for DNSPs.

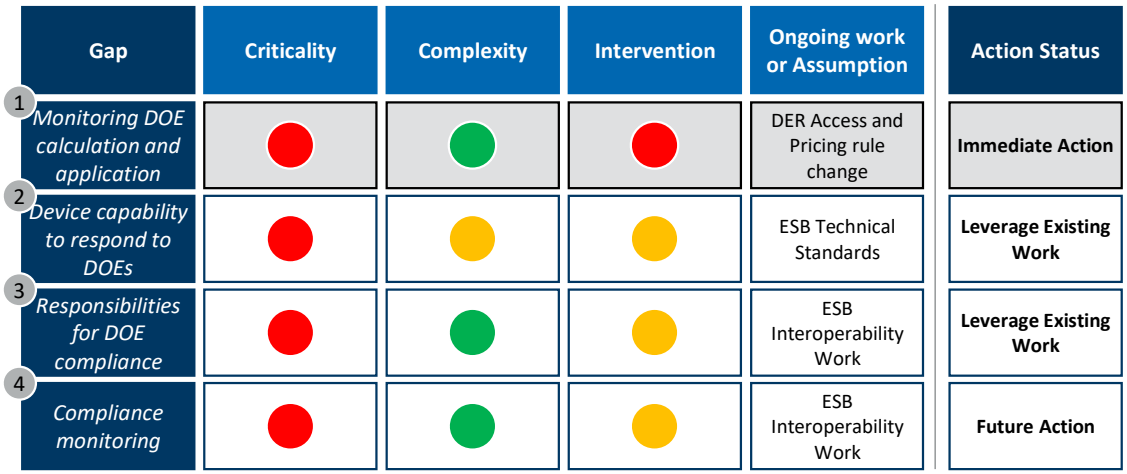
3.137. In this subsection, we discuss functions that we have identified with regards to compliance and monitoring and identify gaps that exist in the current regulatory and governance framework that relate to these functions. Specifically, we discuss:

[53] We note that the recent AEMC Access, pricing and incentive arrangements for DER rule change included a requirement for the AER to develop a Customer Export Curtailment Value (CECV) methodology, which aims to value the "*detriment to customers and the market when DER exports are curtailed and help guide efficient levels of investment for export services*" and therefore may mitigate this issue (link).

- Monitoring DOE calculation and application;
- Device capability to respond to DOEs;
- Responsibilities for DOE compliance; and
- Compliance monitoring.

3.138. The result of our assessment is summarised below and discussed in turn in the following subsections.

Figure 3-20: Summary of Compliance and Monitoring gap analysis

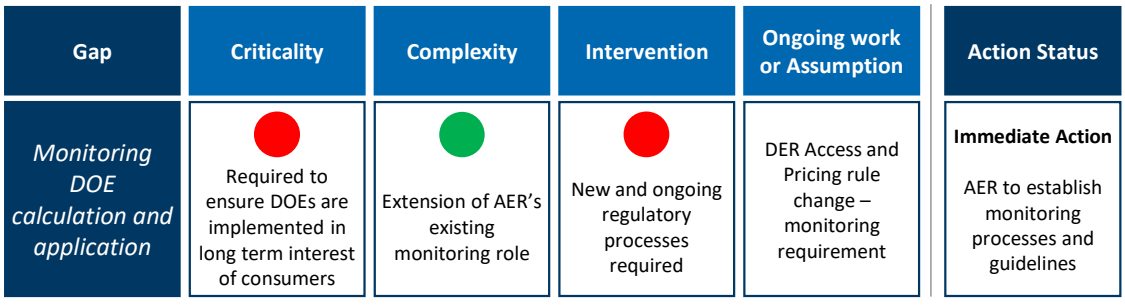


Monitoring DOE calculation and application

3.139. This gap refers to the oversight that may be required over the methodology that DNSPs use to calculate and set dynamic limits. This function is necessary to ensure that network capacity is allocated appropriately and that DOEs are being utilised in line with the long-term interest of consumers and with the NEO.

Assessment of gap

Figure 3-21: Monitoring DOE calculation and application gap analysis



3.140. As shown in Figure 3-21 above, we consider that it is critical that some monitoring of DNSPs occurs in order to ensure that they are calculating and implementing DOEs in line with the approved methodology and in the long-term interests of consumers.

3.141. DNSPs are currently subject to performance monitoring by the AER including via yearly reporting,[54] the regulatory reset process and performance incentive schemes. The inclusion of the monitoring of DOEs could therefore be included in these requirements through an extension of the AER's existing monitoring role.

Action status

3.142. Further, through the DER Rule Change,[55] the AER already has been given the role of monitoring DNSPs' performance in providing export services. This monitoring responsibility could be adapted and extended to include DNSP performance with and delivery of DOEs. **Immediate Action** from the AER is recommended to develop these guidelines and options for principles and development are further discussed in Section 4C.

Device capability to respond to DOEs

3.143. In order for DNSPs to use DOEs to manage the distribution network, there must first be DER devices that are compatible with the DNSPs' chosen communication protocol (discussed in paragraphs 3.23 to 3.29 above).

3.144. There currently exists no requirement or guidance for consumers to install DER that is compatible with certain communication protocol. Currently, this is to be expected as a single national communication standard to facilitate DOEs has not been set (as previously discussed in paragraph 3.24). However, if a national standard is set, intervention from a central authority could then be used to accelerate the take of DER that is compliant with this standard. For example, consumers could be required to comply with the chosen communication standard, in a similar way to other existing standards, such as AS/NZS 4777.2.

Assessment of gap

Figure 3-22: Device capability to respond to DOEs gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
Device capability to respond to DOEs	Critical for the efficiency and uptake of DOEs	Complex issue but some work has already been undertaken by ESB workstream	Oversight may be useful to ensure standardisation	ESB Technical Standards for interoperability	**Leverage Existing Work** ESB workstream is considering DOE device capabilities

3.145. Having compatible devices on the network is a critical aspect of DNSPs being able to implement DOEs. Furthermore, the more consumers that have compatible devices and opt-in to DOEs, the great the benefit to the network provided by DOEs. Therefore, there may be a case for a central authority to intervene to increase the take up of compliant devices, such as imposing a mandate on consumers to purchase compliant equipment after a certain date.

[54] AER, Objectives and priorities for reporting on regulated electricity and gas network performance (link)
[55] AEMC, Access, Pricing and Incentive arrangements for Distributed Energy Resources, page vii (link)

3.146. However, such an intervention could also impose costs on consumers, either through requiring them to update their DER before they otherwise may have, or through requiring them to purchase more expensive equipment. Additionally, mandating the technical capability to offer DOEs, while keeping DOEs opt-in (as discussed in paragraphs 3.107 to 3.111 above), risks that consumers may incur costs without receiving any benefits.

3.147. Given the complexity of the issue, along with the potentially significant impact on network and consumer outcomes, there appears to be a case for intervention from a central authority.

Action Status

3.148. We understand that the issue of communication standards for DER (and hence device capability to respond to DOEs) is currently under consideration within the ESB's interoperability workstream. As such, we propose that the AER **Leverages Existing Work**, to avoid duplication of work and avoid stakeholder confusion.

Responsibilities for DOE compliance

3.149. Currently, it is unclear as to how (and via what mechanism) compliance with DOEs will be enforced and which parties would be responsible.

3.150. Whilst the consumer enters into the connection agreement with the DNSP, it is unlikely to be appropriate for consumers to have sole responsibility for ensuring that their equipment complies with the dynamic limit. Consumers are generally unlikely to have the technical understanding to be able to monitor the operations of their equipment and therefore, consumers are unlikely to be well-placed to manage the risks of potential non-compliance with the dynamic limit. Placing the onus on consumers to ensure compliance may therefore create undue burden and place undue risk onto the consumer.

3.151. We understand that the compliance process and the appropriate way in which risks should be allocated between DNSPs, retailers and aggregators and consumers are issues that are being considered in detail most recently within the ESB Interoperability DER Technical Standards work (Roles and Responsibilities workstream). The ESB work program considers these issues from the point at which the consumer decides to invest in a DER device to the point where the device falls into a non-compliant state and where actions must be taken to bring the device back to a compliant state.[56]

3.152. The ESB work identified three key compliance responsibilities:

- **Install responsibility –** ensuring the device is able to receive and respond to DOEs at the point of installation.
- **Performance responsibility** – identifying when a device is not able to receive or respond to DOEs (when it falls into a state of non-compliance).

[56] This series of steps is referred to as the 'customer journey' in the ESB work.

- **Customer relationship responsibility** – working with the customer to bring the device back to compliance.

3.153. Following this, the ESB work program is now considering the five broad parties that are involved in the delivery of the DER service and the appropriateness of each in maintaining compliance and the ongoing customer relationship. Specifically:

- **DER retailer** (party from whom the customer purchases DER) – the DER retailer is primarily only active at the time of purchase and installation and therefore may not be well suited to manage longer-term performance of DER equipment or the ongoing customer relationship.
- **DER installer** (party who installs customer DER) – the DER installer would be well suited to manage compliance at the point of install however, as above, is unlikely to have a longer-term customer relationship or to have the systems to manage ongoing compliance with the dynamic limit.
- **OEM** (party who manufacturers DER and smart cloud systems) – The OEM may be well positioned from a technical standard point to manage compliance, as they may be able to check settings and track performance remotely via their systems. However, the OEM is unlikely to maintain the ongoing relationship with the customer required to maintain compliance. Furthermore, OEMs are typically new and smaller market participants and the allocation of additional risk and obligation may overburden businesses and limit innovation.
- **Retailer / Aggregator** (the party financially responsible for connection point and electricity retailing) – The retailer/ aggregator is likely to be best positioned to manage the ongoing customer relationship due to its existing relationship with the customer through the sale of electricity / energy plans. However, broader consideration of the appropriateness of the retailer/ aggregator to manage compliance is required given the potential impacts of future use cases. For example, whilst the most immediate use case for DOEs may be the allocation of network capacity by the DNSP, a future use case may involve the retailer/ aggregator utilising customer exports to respond to wholesale or ancillary market prices.[57] This future use case has the potential to create a conflict between the DOE issued by the DNSP and the retailer / aggregator decisions on the management of DER.
- **DNSP** – The DNSP may be well suited to manage install and performance compliance as they are likely to have connection point visibility and are direct counterparties to the connection agreement. In addition, responsibility for ensuring ongoing adherence to DOEs aligns with DNSP's own performance obligations. However, DNSPs do not have the

[57] We discuss this potential use case in more detail in Section 3A *DOE Communication pathway*.

primarily relationship with the customer and customer relationship capability build would be required by DNSPs if allocated compliance responsibility.

3.154. In addition to the responsible party, we consider that it is currently unclear as to what mechanism or contractual instrument will be used to require adherence to the DOE both at the point of installation and on an ongoing basis. Depending on with whom the compliance obligation sits, options may include putting in place obligations through the connection agreement with the DNSP or through the aggregator or retailer who is financially responsible for the connection point.

Assessment of gap

Figure 3-23: Responsibilities for DOE compliance gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
Responsibilities for DOE compliance	Ensure risks are allocated appropriately and proportionally	Complex but the ESB will be making a recommendation	Guidance on Compliance, obligation and enforcement responsibilities	ESB Interoperability DER Technical Standards – Roles and responsibility workstream	**Leverage Existing Work** Already being addressed by ESB workstream

3.155. We have identified this gap as critical for the initial stages of DOE implementation to ensure DOEs are utilised efficiently and risks are allocated to the party best placed to manage them. Whilst the this is a complex issue, the depth of analysis and engagement undertaken by the ESB will likely provide recommendations to market bodies on this issue.

3.156. In addition, the ESB work has sought to engage broadly across both market bodies and market participants in the discussion of roles and responsibility of compliance. Although no decision been finalised, the collective discussions will look to inform decision making and support future guidance on responsibilities once the allocation of roles has been finalised.

Action Status

3.157. It is likely that the AER may **Leverage Existing Work** from the risk and compliance allocation assessment undertaken through the ESB work as it is directly considering DOEs. As such, we consider that no further AER intervention is required for the initial stages of DOE implementation. Going forward, the AER could expect to be an active stakeholder and provide feedback as the implementation of DOEs in the NEM continues.

Compliance monitoring

3.158. Compliance monitoring refers to the role of ensuring that customer equipment at the connection point adheres to the dynamic limits that are set and communicated. The exact methodology is dependent on the risk allocation and other technical considerations such as access to data and notifications of non-compliance.

3.159. As discussed in 3.52 above, the ESB is considering compliance monitoring as part of its roles and responsibility work program. Responsibility for compliance monitoring is largely

dependent on where the responsibility for ensuring DOE compliance is allocated, as well as being influenced by technical considerations such as who has access to monitoring data and how they would be notified that the system is non-compliant.

3.160. There is likely to be significant need for regulatory frameworks and the AER and other market bodies to define the compliance monitoring role and potential thresholds or trigger points when compliance action needs to be taken.

Assessment of gap

Figure 3-24: Compliance monitoring gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
Compliance monitoring	Required to ensure DOEs are implemented in long term interest of consumers	Complex but the ESB will be making a recommendation	Guidance on compliance, obligation and enforcement responsibilities	ESB Interoperability DER Technical Standards – Roles and responsibility workstream	**Future Action** May be required once existing work provides clarity on data issues

3.161. As with responsibilities for DOE compliance, we have identified that the compliance monitoring function is critical for the implementation of DOEs as customer equipment must adhere to the dynamic limit in order to protect the network as intended. Given the criticality of this gap, regulatory guidance may be required on how this monitoring occurs.

3.162. The parties identified in paragraph 3.153 are being considered by the ESB in their appropriateness for compliance monitoring. However, it is worth acknowledging, that in the development of roles and responsibilities no single party currently involved is perfectly suited to assume all compliance responsibilities[58]. Therefore, the ultimate outcome may result in splitting compliance responsibilities across multiple parties or developing a new party responsible solely responsible for compliance. This is being considered in detail within the ESB work.

3.163. As discussed above, whilst this work could be leveraged by the AER, other issues which influence compliance monitoring, such as AER performance monitoring of DOEs, are likely to inform compliance monitoring decision making. Therefore, regardless of the outcome of ESB responsibility work program, the AER is likely to be required to engage either within a rule change process or via broader DOE performance monitoring considerations. As such, **Future Action** may be required by the AER to establish responsibilities for compliance monitoring.

Action status

3.164. As discussed above, whilst this work could be leveraged by the AER, other issues which influence compliance monitoring, such as AER performance monitoring of DOEs, are likely to inform compliance monitoring decision making. Therefore, regardless of the outcome of ESB

[58] As identified by the ESB roles and responsibility work – install responsibility, performance responsibility and customer relationship responsibility.

responsibility work program, the AER is likely to be required to engage either within a rule change process or via broader DOE performance monitoring considerations. As such, **Future Action** may be required by the AER to establish responsibilities for compliance monitoring.

D. Engagement with the AER

3.165. In order to bring DOEs into operation, DNSPs are likely to need to spend money to support planning and investment, for example, in the form of new systems, equipment and training. For DNSPs to recover such spending through regulated revenues, the AER, as the economic regulator of DNSPs, would be required to oversee and approve such spending.

3.166. There is therefore likely to be substantial interaction between DNSPs and the AER in a process where plans for DOE-related spend are proposed by DNSPs, then considered and approved by the AER, before spending takes place.

3.167. In this subsection, we discuss DNSP roles we have identified in relation to DOEs in this context covering:

- Demonstrating investment need;
- Demonstrating efficiency of DOE spending; and
- Specification of DOE design.

3.168. The result of our assessment is summarised below and discussed in turn in the following subsections.

Figure 3-25: Summary of Engagement with the AER gap analysis

	Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
1	*Demonstrating investment need*				Draft DER Expenditure Guidance Note	**Immediate Action**
2	*Demonstrating efficiency of DOE spending*				Draft DER Expenditure Guidance Note	**No Action**
3	*Specification of DOE design*				N/A	**Future Action**

Demonstrating investment need

3.169. In order to gain approval for undertaking spending related to DOEs, DNSPs will likely be required to first demonstrate a need to spend money, for example, through identification of a network issue which DOEs may solve, such as alleviating network congestion.

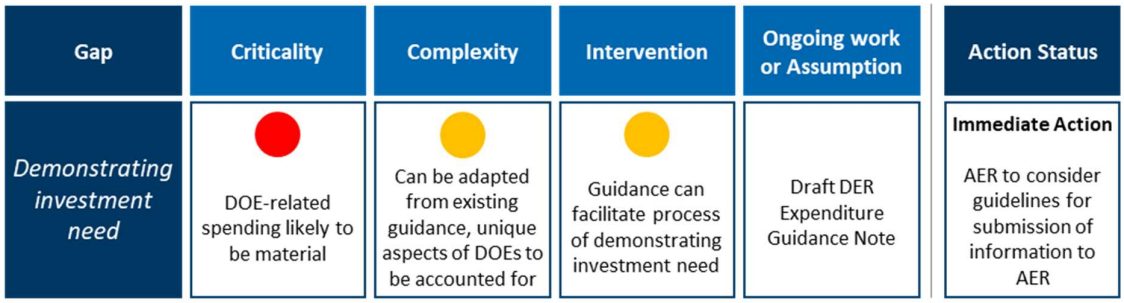
3.170. While SAPN successfully applied for DOE-related spending in its regulatory proposal for the 2020-25 regulatory period,[59] currently DNSPs do not have any clear guidance from the AER

[59] SAPN, Determination 2020-25 (link).

regarding the information that they are expected to provide in order to demonstrate the need for DOE-related spending specifically, or regarding the needs which DOEs may be able to address. Moving forwards, there may be merit in the AER providing such guidance in order to facilitate the development of acceptable business plans and DOE investment proposals from DNSPs, similar to how the AER has provided guidance on DER integration expenditure.

Assessment of gap

Figure 3-26: Demonstrating investment need gap analysis



3.171. We consider this gap to be critical as DNSPs are likely to need to spend a material amount in order to bring DOEs into operation in the near future.

3.172. In addition, without some ability to recover such DOE-related spending through regulated revenues, the development of DOEs in the NEM may be significantly delayed or, in many situations, DNSPs may be unwilling to implement DOEs at all.

3.173. The AER has existing expenditure forecast assessment guidelines[60] setting out the processes, techniques and associated data requirements which the AER uses to assess whether DNSPs have adequately demonstrated a need for expenditure. However, there are currently no explicit references to DER or DOE related spending.

3.174. In addition, the AER has published the DER Integration Expenditure Guidance Note.[61] This note provides further guidance to DNSPs regarding DER-related expenditure, by outlining what the AER expects to see in DER integration investment proposals and how these proposals will be assessed.

3.175. However, these guidelines do not contain specific references to DOE-related expenditure. The existing guidance for DER-related spending may not be sufficient to facilitate DOE implementation since additional issues may need to be considered in order to demonstrate the need for DOE-related spending. For instance, one issue that is currently not addressed is the counterfactual scenario against which DOE-related spending is assessed, i.e., it is unclear whether the proposed DOE-related spending is likely to be assessed against a scenario with no DER at all, with DER operating with static limits or against potential network augmentation spending.

[60] AER, Expenditure Forecast Assessment Guideline 2013 (link).
[61] AER, Draft DER Integration Expenditure Guidance Note (link).

Action status

3.176. We therefore consider that **Immediate Action** may be required for the AER to provide additional guidance regarding the information that DNSPs will be required to submit on their DOE-related investment plans. We discuss the options for such requirements further in Section 4D.

Demonstrating efficiency of DOE spending

3.177. In addition to demonstrating a case for DOE-related spend, DNSPs will be required to justify to the AER that plans for spending that is intended to be recovered through regulated revenues are efficiently incurred.

3.178. To this end, plans for DOE-related spend are likely to need to meet certain standards of quality in order to satisfy the AER that the spending is likely to be cost efficient.

3.179. Whilst the potential benefits that DOEs could bring to the distribution network have been well documented, it is likely the AER will still expect DNSPs to demonstrate that DOEs are the most efficient and credible option for addressing distribution network requirements as part of DNSP spending plans to ensure that customers get value for money, since these costs would ultimately be recovered through regulated revenues.

Assessment of gap

Figure 3-27: Demonstrating efficiency of DOE spending gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
Demonstrating efficiency of DOE spending	Costs recovered through regulated charges should be efficiently incurred	Regulatory framework exists for assessing efficiency in spending	Oversight required to ensure customer value for money	Draft DER Expenditure Guidance Note	**No Action** Utilise existing frameworks for assessing efficiency

3.180. Whilst we consider that it is in the interests of consumers in the NEM for DOE-related spending that is recovered through regulated charges to be incurred in an efficient way, this gap is not critical to the implementation of DOEs. In particular, if the case for DOE-related spending is properly demonstrated (as outlined in the previous gap 'Demonstrating Investment Need') then net benefits to consumers would already be generated by spending on DOEs relative to other credible options.

3.181. Since the AER is responsible for economic regulation of DNSPs and therefore ultimately responsible for setting regulated prices, it is already directly involved in the regulatory process of assessing and approving such spending.

3.182. Engagement between the AER and DNSPs on demonstrating and assessing the efficiency of spending plans is therefore already a part of the established regulatory process.[62] Whilst it could be argued that DOEs are a new form of spending, the AER is likely to have previous experience of assessing the efficiency of spending on new service offerings.

3.183. Furthermore, DNSPs themselves may have an incentive to achieve efficiency in their spending plans under the price control regime anyway. This would be the case if DOE-related expenditure was treated in a similar way to other categories of spending, whereby DNSPs are given a fixed cost allowance. Under such a regulatory framework, the DNSP could benefit from spending less than their cost allowance if they were allowed to keep some portion of the underspend.

3.184. On the other hand, if DOE-related spending is treated as a pass-through cost item, then this would, by itself, negate the need for a cost efficiency assessment. In this case also, further action from the AER is not required to address this specific gap.

Action status

3.185. As such, we consider that **No Action** is required to address this gap beyond the existing regulatory frameworks that exist for assessing efficiency in DNSPs' spending plans.

Specification of DOE design

3.186. As part of their regulatory submissions to the AER, it is likely that DNSPs will need to submit information regarding how DOEs will be operated and utilised. At this stage, it is unclear what kind of information is required or to what level of detail this information needs to be specified by DNSPs in submissions to the AER.

Assessment of gap

Figure 3-28: Specification of DOE design gap analysis

Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
Specification of DOE design	May be relevant to considerations on efficiency or consumer protection	May be uncertain given early stage of DOE development	Unlikely to be significant benefit in AER being very prescriptive	N/A	**Future Action** But no strong case for AER to mandate design of DOE currently

3.187. Whilst we consider this potential gap to be important, it is likely that information on the specifics of DOE design would be of interest to the AER insofar as it contributes to supporting other regulatory objectives, such as to demonstrate efficiency of spending or the protection of consumers.

[62] DNSPs will likely only be able to apply for DOE-related funding within their normal five yearly regulatory cycles, unless a cost pass-through event occurs, as defined under Cl.6.6.1 of the NER (link).

3.188. In addition, given the stage of development of DOEs and the dynamic nature of the wider DER space, many aspects of DOE design might vary considerably between DNSPs or over time in response to factors such as technological change, changing consumer requirements or evolving implementations of DOEs.[63]

Action status

3.189. Furthermore, to the extent that the specification of DOE design relates to the capacity allocation methodology, this will be discussed separately in Section 4A of this report.

3.190. Therefore, whilst **Future Action** from the AER may be required, we do not consider it necessary for the AER to take any immediate action to mandate details regarding the specification of the DOE design at this time.

[63] Part of which may be dependent on DNSPs' own capabilities, which may vary according to, for instance, the level of information and data each DNSP has regarding its own distribution network.

4. Discussion of Options

4.1. The gaps identified as requiring **Immediate Action** in Section 3 are gaps which we consider to be critical for the implementation of DOEs, which require immediate intervention from the AER and where other ongoing or planned work will not be sufficient to address the gap on its own.

4.2. In this section, we discuss potential options that may be suitable for filling these gaps in respect of the different type of DNSP roles likely to be affected by the implementation of DOEs, as summarised in Table 4-1 below.

Table 4-1: Overview of options to address gaps requiring 'Immediate Action' by the AER

Gap	Recommended actions
Design and implementation of DOEs	
Capacity Allocation Methodology *Network capacity can be allocated in a number of different ways, and lack of guidance risks leading to divergent approaches by DNSPs, some of which may be inefficient or unfair to consumers*	• **No requirement for AER to prescribe the detailed capacity allocation mechanism** to be used. • Capacity allocation mechanism to be consistent with following **guiding principles**: ○ Supporting efficient **utilisation of existing DER** and **efficient investment in new DER**. ○ **Maximise utilisation** of available network capacity. ○ **Minimising total costs** of distribution networks. ○ Maintaining and promoting the **social licence** for DOE implementation, including consideration of what customers may perceive as a 'fair' setting of DOEs.
Visibility over distribution network *Levels of visibility vary across DNSPs, and sufficient visibility is required to calculate the dynamic limit and update it in real-time, therefore a base level must be established for DOE implementation*	• **Avoid a prescriptive approach** to specifying the exact type and level of visibility that DNSPs should achieve. • **Empower DNSPs** to demonstrate that they have a level of visibility that balances the need for efficient expenditure alongside specific DOE implementation that DNSP has chosen. • **DNSPs to submit their proposals** alongside their proposed DOE-related spending plans.
Interactions with consumers	

Data protection and privacy *Increased data transference is required for both the implementation and operation of DOEs, therefore increasing the importance of privacy frameworks around this data to protect consumer interests*	• At a minimum, visibility over DOE-related data should be given to the parties **responsible for operating the DOE and for enforcing compliance** with the dynamic limit. Identity of the responsible parties will depend on outcomes of the ESB's Roles and Responsibilities work. • Parties who wish to access customer data for other purposes (such as to develop new offerings) to justify their needs to the AER. Only data from customers who have given explicit consent would be made available.
Contractual mechanism *Likely that some part of the contractual arrangements between the DNSP and the consumer will need to be changed in order to recognise that DOEs are in operation and to set out the implications for how the DNSP and the consumer interact*	• Specific contractual mechanism giving effect to DOEs **does not need to be prescribed.** DNSPs can be given flexibility to implement through their choice of existing or new contractual mechanisms. • Require DNSPs to set out (in their choice of contractual mechanism): ○ **Operating parameters** (interval length, notification period and frequency of changing DOEs). ○ Specify **conditions for revision of DOE.** ○ Specify **communication processes** for DOE changes. ○ **Compliance obligations** for consumers and **consequences of non-compliance.** ○ **Related commercial implications** (direct compensation and/or rebate on network charges, where applicable). ○ **Actively inform** customers of the contractual mechanisms that give effect to DOEs. • Further standardisation on contractual mechanisms **could be considered at a later date** as DOEs become more established.

Compliance and Monitoring	
Monitoring DOE calculation and application *Likely to be useful for the AER to define or establish performance monitoring processes specific to DNSP functions in relation to DOEs to ensure consumer protections and transparency in operations*	• DNSPs to **publish capacity allocation methodologies** alongside implementation of DOEs. • DNSPs to **make historic data on the dynamic limits they have set publicly available.** • In the future, AER to **consider expanding its existing monitoring and reporting processes** to cover calculation and application of DOEs, taking into account industry feedback and building on requirements above as needed.
Engagement with the AER	
Demonstrating investment need *DNSPs will likely be required to spend material amounts for DOE implementation and their ability to recover this spending will be dependent on them demonstrating the investment need*	• **Expand guidance in the DER Integration Expenditure Guidance Note** to incorporate specific DOE guidance to comparable level of detail. • Guidance should provide clarity on: ○ Requirement for **benefits calculation.** ○ Requirement for **costs calculation.** ○ Requirement for underlying **forecast. assumptions for DER penetration.** ○ **Counterfactual** against which spending is assessed.

4.3. Each of the gaps and their corresponding options are discussed in turn in the following subsections.

A. Design and Implementation of DOEs

4.4. In this subsection, we discuss potential options for how the AER may address the gaps identified in Section 3A that we have identified as requiring **Immediate Action**, in relation to the design and implementation of DOEs. As summarised in Figure 3-1, we discuss how the AER might address gaps related to:

- Capacity allocation methodology; and
- Visibility over the distribution network.

Capacity allocation methodology

4.5. When implementing DOEs, DNSPs will, at times, be required to put in place a process that defines the dynamic export (and, if applicable, import) limits for individual consumers at specific time intervals. While for the majority of the time, these operating envelopes can be relatively loose (not binding on individual consumers), there may be times when the total network capacity exceeds the volume of power that consumers wish to export onto the

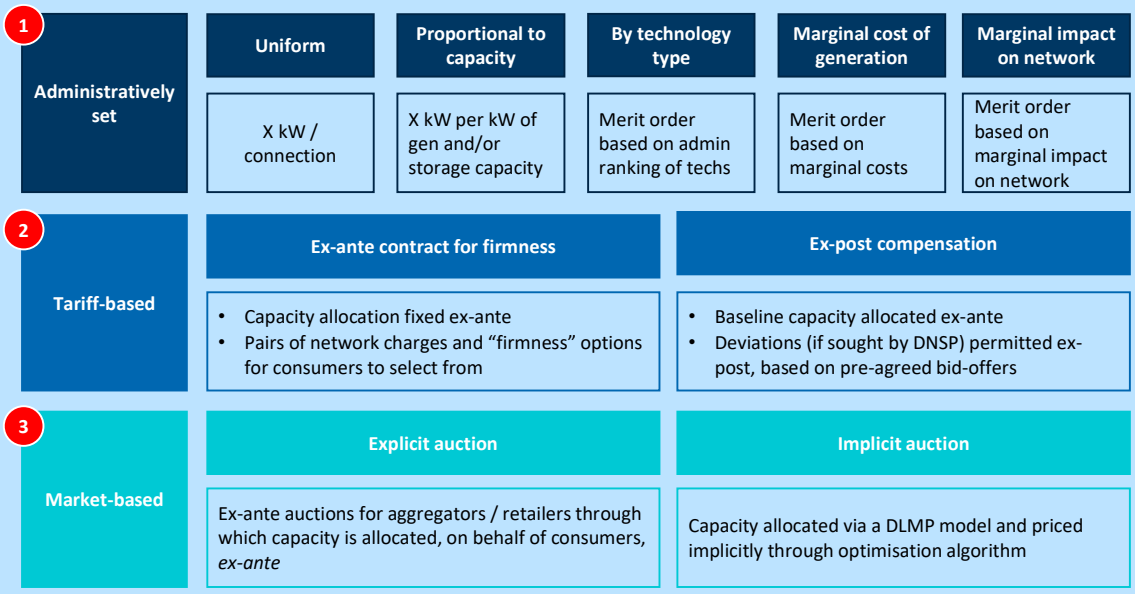
network. At those times, DNSPs may need to ration the network capacity that is available for exports from consumers' premises in order to comply with relevant operating limits. To do so, DNSPs would need to allocate the network capacity taking into account both the response by the DOE-enabled consumers as well as the behaviour (e.g. expected exports) from consumers whose DER has not been DOE-enabled.

4.6. In Box 1 below, we set out number of example capacity allocation approaches for DOEs that could potentially be adopted within the NEM. This highlights the wide range of potential approaches, each with its own specific advantages and disadvantages. The most appropriate approach is likely to vary depending on the specific circumstances for a particular DNSP, as well as on the trade-offs that policy-makers need to make between efficiency, fairness and consumer acceptability (as the most economically efficient outcomes may not be sufficiently equitable, or could be too complex and therefore challenging for consumers to understand and accept).

Box 1: Capacity allocation methodologies

There exists a spectrum of options for determining how distribution network capacity could be allocated across consumers. This spectrum ranges from centralised approaches, such as uniformly allocating capacity between connection points and other administratively set allocations through to more sophisticated competition-based allocations and market-based mechanisms that would require more significant reforms to implement, such as allocation via a distribution locational marginal price ("**DLMP**") model. Figure B-1 below summarises a number of possible allocation approaches that sit within this spectrum.

Figure B-1: Example spectrum of capacity allocation options



Administratively set approaches rely on a centrally-based decision to allocate capacity based on the central authority's preferences. For example, capacity could be allocated uniformly across all consumers in a given area, or alternatively, could be more tailored to a consumer's location or installed DER capacity. Unlike the other two options examined below, this variant does not explicitly consider consumers' willingness to pay for the ability to use the distribution network or financially incentivise consumers to alter their demand for power in response to network conditions.

Tariff-based approaches incentivise consumers to self-select a particular type of energy contract that differs in terms of the 'firmness' of the import and export capability at each connection point. As a general principle, tariff-based approaches would allow consumers to pay higher distribution network charges in exchange for being less likely to be subject to binding import or export limits (and vice versa).

Fully market-based approaches more closely resemble the allocation of transmission capacity between price nodes, where capacity is effectively allocated either via implicit or explicit auctions

and the pricing of distribution network capacity is fully consistent with the prevailing network conditions.

The **locational granularity** with which capacity is allocated is a further aspect to consider. For example, a DNSP could treat its entire network as a single zone (as is the case for the current static limits). Therefore, under a uniform allocation model, every DOE-enabled consumer within a state would be subject to the same dynamically varying limit. Alternatively, the network could also be divided into multiple zones, such as by substations or local low-voltage areas, in order to better reflect the differences in network topology across the network.

All of these options vary significantly in terms of simplicity, consumer acceptability, economic efficiency and fairness (including, for example, between DOE-compliant and legacy DER owners within a given DNSP's footprint, among DOE-compliant DER owners – to the extent that DOEs vary locationally, across DNSPs, etc). At this stage, there is no single obvious capacity allocation methodology that appears to be the most appropriate one to implement.

4.7. As discussed in Section 3A, we consider that, given the significant potential impact of the calculation methodology chosen on consumers outcomes and market efficiency and the lack of a clear recommendation from the DEIP Outcomes Report, immediate action is required by the AER with regards to this gap.

Options for AER action

4.8. In order to fill this gap, it would, in the first instance, be useful for the AER to provide guidance on its expectations for the capacity allocation methodologies adopted by DNSPs. This guidance could vary significantly in the level of detail and specificity, ranging from:

- highly prescriptive guidance, where the AER would specify a particular capacity allocation methodology (or a small number of methodologies) that DNSPs must use when applying DOEs;
- light-touch guidance, where the decision could be left entirely with DNSPs, allowing them to select the option they consider to be most appropriate; and
- middle-ground guidance that would adopt a similar approach to the DEIP Outcomes Report, which does not identify a single preferred allocation option, but instead sets out a number of guiding principles for DNSPs to follow when developing their specific methodology.

4.9. Given the very early stage of DOE implementation in the NEM and the focus on ensuring streamlined delivery of DOE services for the immediate future, the AER should consider being less prescriptive with its guidance initially. Additionally, recognising the significant differences that exist between DNSPs and networks across the NEM, attempting to prescribe a 'one-size' fits all approach to capacity allocation may result in the potential benefits of DOEs failing to materialise. It therefore appears that, during this initial phase of DOE implementation, DNSPs are best placed to develop the methodology through which capacity

is allocated across their network, leveraging their knowledge of their respective distribution networks.

4.10. However, a fully light-touch approach, with little to no direction given to DNSPs, is unlikely to ensure that consumers are adequately protected and, as a consequence, consumer confidence and uptake of DOEs (and, in turn, DER) may be harmed.

4.11. As such, the AER may wish to adopt a principles-based approach to its guidance. If so, it will be important to consider the benefits and trade-offs that exist between different capacity allocation approaches and how different principles may, through encouraging or disincentivising the adoption of certain approaches, affect consumer outcomes.

4.12. For example, principles that encourage more sophisticated capacity allocation options, along with greater levels of locational granularity, should in theory lead to more economically efficient market outcomes:

- Consumers who are connected to the network in locations with greater hosting capacity and fewer network operability issues may be able to benefit from less restrictive limits.
- Similarly, recognising differences in household characteristics, such as varying DER installation sizes and consumption patterns, could facilitate allocations that maximise the use of available network capacity.

4.13. Likewise, a key advantage of encouraging fully market-based and tariff-based approaches is that consumers are financially incentivised to vary their demand for power (and therefore network capacity) in response to network conditions.

- Under tariff-based approaches, consumers who behave in a manner that supports network operation, and are therefore willing to accept more restrictive DOEs, are rewarded through cheaper tariffs.
- Under market-based approaches, the prices faced by consumers incorporate the impact on the network of their behaviour. Prices fall when DER generation is high and system loads fall, incentivising consumers to increase demand. Conversely, when DER generation is lower, prices will rise, incentivising consumers to lower demand.

4.14. However, we recognise that economically efficient market outcomes, with strong financial incentives for consumers, may also have disadvantages in terms of consumer understanding, perceived fairness and ultimately, acceptability of DOE. This would need to be taken into account when identifying the most appropriate methodology. Therefore, when considering this aspect of DOE implementation, the AER is likely to leverage the principles for capacity allocation methodologies as stated by the DEIP in their Outcomes Report, which also reflect the value of encouraging transparency, consumer buy-in to the concept of DOEs, and maintaining the 'social licence' for reform – especially during the early phases of DOE adoption.

4.15. This may lend itself to encouraging more simple allocations, possibly uniform across all consumers in a given area or proportional to installed capacity, as opposed to more

sophisticated methods, such as those requiring the introduction of new markets and/or consumers paying for varying levels of DOEs.

Recommended Action for AER

4.16. At this point in time, it is unlikely to be appropriate for the AER to require DNSPs to implement a particular detailed capacity allocation mechanism. Instead, it may be more appropriate to leave the choice of capacity allocation mechanism to DNSPs in order to allow the flexibility to implement capacity allocation mechanisms that are most suitable for a DNSPs particular circumstances.

4.17. However, it may be appropriate for the AER to set out guidance in the form of a number of principles for DNSPs to follow in order to ensure that DOEs are implemented in a way that promotes the interests of consumers. These principles could include:

- **supporting the efficient utilisation of existing DER and efficient investment in new DER,** to support one of the motivating factors for DOEs to allow for less curtailing of DER output and better utilisation of electricity generated by DER;
- **maximise utilisation of available network capacity,** in line with the key use case driving the implementation of DOEs;
- **minimising total costs of distribution network management,** in order to minimise the costs of managing the distribution network that has to ultimately be recovered through customer bills. This includes the potential avoided costs of additional spending on network reinforcement and is in line with the implementation of DOEs where it is demonstrably the most efficient solution; and
- **maintaining and promoting the 'social licence' for DOE implementation** by avoiding undue complexity or inequality in the way that DOEs are implemented across the customer base. As discussed above, the impacts on consumer understanding and perceived fairness of DOEs may be particularly important in the early stages of DOE implementation to support the take-up of DOEs. This principle should not be interpreted as requiring the same dynamic limit to apply uniformly across all connection points (or all types of connection points) in a DNSP's network. For instance, it may be appropriate to allow DNSPs to apply different dynamic limits to residential homes compared to commercial properties or community batteries.

4.18. Ultimately, the AER's principles should aim to facilitate an implementation of DOEs that benefits customers in the form of lower bills, greater system security and reliability and greater usage of renewable electricity.

Visibility over the distribution network

4.19. As highlighted in our gap analysis, to properly set the dynamic export limit and update it over time to take account of changing network conditions, DNSPs may require more visibility over the distribution network than they currently have.

4.20. The visibility that we refer to incorporates both having a static picture of the location and design of assets as well as more dynamic real-time operating information such as active power flows, the voltage and fault levels in particular locations. Both types of information are required to facilitate the setting of and dynamic updating of DOEs over time.

Options for AER action

4.21. In order to address this gap, the AER may consider two broad options for seeking assurances from DNSPs that they have the appropriate level of visibility over their distribution networks to facilitate DOE implementation:

- a more **prescriptive approach**, where the AER sets out information that DNSPs are required to have and potentially how this information should be used in operating DOEs; or
- a more flexible **principle-based approach,** where the AER specifies the outcomes or capabilities that DNSPs should be able to achieve with the information they have available to enable the operation of DOEs.

4.22. Such assurances could, for instance, be sought through the AER's regulatory process for approving DNSPs' DOE-related spending plans. Under the current regulatory framework, DNSPs are required to demonstrate the investment need for DOE-related spending and present a positive business case for the implementation of DOEs. It may therefore be appropriate for the process to include a specific requirement for DNSPs to demonstrate to the AER how they expect to achieve an adequate level of visibility over the distribution network. DNSPs may prepare such details in any case if, for instance, their spending plans included investments required to achieve this visibility.

4.23. It may, however, be difficult for the AER to be prescriptive in specifying the exact ways in which DNSPs achieve this visibility on their distribution networks. Reasons for this may include:

- that the required level of visibility over the distribution network may vary depending on the way in which DOEs are implemented. For instance, more visibility over the distribution network may be required if the DNSP wants to allocate capacity in a more granular way;[64]
- that the current level of visibility over the distribution network varies between DNSPs; or
- that there are significant differences in the characteristics of distribution networks. For instance, two distribution networks may differ significantly in areas such as network topology, asset profile or asset age, meaning that the level of visibility required to adequately implement DOEs differs significantly, even if DOEs were implemented in the same way on these networks.

[64] Local granularity is discussed further in Section 4A.

4.24. Taken together, such factors suggest that it would be difficult for the AER to specify a given level of visibility that would result in an efficient level of expenditure and good consumer outcomes in all cases. This is line with the findings of the DEIP report, which also acknowledges that DNSPs are likely to differ from one another regarding their access to network data.[65]

Recommended Action for AER

4.25. Therefore, an approach that is closer to the **principles-based approach** outlined above may be more suitable for assessing whether DNSPs have the required visibility over their distribution networks.

4.26. The AER should avoid a prescriptive approach to specifying the exact type and level of visibility that DNSPs should achieve. As discussed above, the efficient level of expenditure on network visibility may vary significantly between DNSPs and the way in which DNSPs choose to implement DOEs.

4.27. Instead, the AER could empower DNSPs to demonstrate that they have an appropriate level of visibility over their distribution networks to facilitate their intended design and implementation of DOEs, which balances the need with the expenditure required to achieve the DNSP's proposed level of visibility.

4.28. This could be submitted to the AER alongside DNSPs' plans for DOE-related spending that they are expected to submit to the AER in order to recover costs through their regulated revenues.

B. Interactions with consumers

4.29. In this section, we discuss potential options for how the AER may address the gaps identified in Section 3B that we have identified as requiring **Immediate Action**, in relation to considerations for interactions with consumers. As summarised in Figure 3-11, the relevant gaps are:

- Data protection and privacy; and
- Contractual mechanism.

Data protection and privacy

4.30. The implementation and ongoing operation of DOEs is likely to result in a greater volume of data being transferred across the energy network, specifically data being sent and received regarding the operation of consumer DER and consumer energy supply behaviour.

4.31. DNSPs may require visibility of this data to both forecast and monitor the impact of DOEs. Consumer data includes both static and operational data on the operations and capacity of

[65] DEIP Outcomes report, page 58 (link).

DERs. While the definitions are yet to be developed[66] fully, for the purposes of this report we interpret them as follows:

- **Static data**[67] is information about a consumer's DER system that does not change or only changes because of direct updates to the device settings. Key static data elements include maximum export capacity, inverter mode or voltage (ride through) settings, as well as default export limit settings in the event of a communication failure.
- **Operational data**[68] (or dynamic data) relates to the changing output or input of the DER. Specifically, operational data includes active / reactive energy flows at the consumer connection point to the distribution network, at relevant temporal granularity.[69]

4.32. Whilst increased visibility through the collection and receipt of consumer data could enable DNSPs[70] to implement and use DOEs more accurately and efficiently, increased visibility of customer data creates a need for the AER to consider action on this gap to ensure that consumers' rights are adequately protected. Data protections and protocols would therefore need to address the data made visible to third party entities, including the access rights to this consumer data, as well as the cyber security and data handling protocols.

Options for AER action

4.33. In order to address this gap, the AER may consider extending existing data protection protocols and requirements that specifically reference the protection of consumer data to cover the implementation of DOEs.

4.34. In doing so, the AER may examine how specific data protections and protocols should be drafted. For example, data protection requirements could vary between:

- Limited visibility, where data may only be visible at the connection point level and to entities who require access for the calculation and compliance of DOEs in the management of network constraints and system security.[71] Data protection protocols would require de-identification of all data and no linkages between metering, billing, or settlements systems.

[66] For example, it is not yet clear whether information would be visible to DNSPs for each inverter individually (in case of multiple DER devices at a single consumer's premises, or whether only the aggregate position at the consumer connection point would be visible).
[67] Static data is currently collected at the time of DER installation and processed and stored as part of AEMO's DER Register.
[68] Operational connection point level is not collected or processed by DNSPs. Connection point level data for the purposes of settlements and billing at the customers meter, is collected by the Metering Coordinator and provided to retailers, DNSP and AEMO for the purposes of settlements and billing. Billing and settlements data is covered by Consumer Data Rights, as discussed in Section 3B
[69] Further operational data collection may include battery state of charge and frequency.
[70] In the future, there may also be a new 'price response' use case for retailers or aggregators to take responsibility for the operation of DOE.
[71] In some circumstances, retailers/ aggregators or OEMs may have access to / visibility over this operational data given their financial relationship with the customer. This traditional relationship is covered under the Consumer Data Rights (and NECF).

- Increased visibility, where operational data may be visible at the device level and to entities who gain access for the calculation and compliance of DOEs as well as providing additional services to consumers.

4.35. Whilst increased visibility may allow DNSPs (and, in the future, retailers, aggregators or other service providers) to develop and tailor additional services to customers, it could introduce increased risks or concern over data privacy from more parties having access to this data.

4.36. As such, the AER may look to develop protocols that strike a balance between enabling the development of DOEs and other services to consumers, while maintaining data privacy. Going forward, as the sophistication of DER systems and DOEs evolve, more and different types of data may be generated and transferred across the electricity network in the future. For example, if a consumer has multiple DER devices installed behind their meter, information on the operation and power flow of individual devices[72] (behind the connection point) may be recorded.

4.37. This granular data would provide enhanced visibility to DNSPs. However, any increase in data being transferred would further strengthen the need for carefully defined data protection and protocols. Data protocols developed by the AER may need to be flexible in order to support the evolving access and risks to consumer data.

Recommended Action for AER

4.38. For the time being, we consider that, at a minimum, visibility over DOE-related data should be given to the parties responsible for operating the DOE and for enforcing compliance with the dynamic limit.

4.39. In the immediate future, the party responsible for operating the DOE is likely to be the DNSPs. However, we note that the roles and responsibilities for enforcing compliance are the subject of ongoing work by the ESB's Roles and Responsibilities workstream.

4.40. As discussed above, we recognise that there may be benefits in allowing further visibility over DOE-related data to enable the development of new service offerings. As such, the AER could consider allowing parties who wish to access consumer data to do so after justifying their needs via concrete use cases that generate consumer value. The framework for assessing this value could be made consistent with the AER's existing frameworks for assessing the net benefits of spending plans.

Contractual mechanism

4.41. As discussed above in Section 3B, it is likely that the contractual arrangements between the DNSP and the consumer will need to be updated with the implementation of DOEs, but currently, there is no guidance or requirements on the specific contractual mechanism that DNSPs should utilise.

[72] For instance, the priority with which different customer devices are able to export or import energy in relation to one another.

4.42. Any updates to the arrangements would likely include operational, data access and compliance requirements that are placed upon both the DNSP and consumer, such as:

- the requirement for consumer devices to meet certain DOE-related standards and communicate certain information to the DNSP;
- the conditions under which DNSPs can utilise DOEs to limit the customer's DER and details on how the DOE is set; and
- the ability for the DNSP to inspect customer DER to monitor compliance with DOEs.

4.43. In Box 2 below, we set up two example arrangements that may be used to enable DOEs.

Box 2: Contractual mechanism options

Updating the Connection Agreement

The connection agreement between a DNSP and its customers sets out the terms and conditions of the customers' access to the network. The agreement could therefore be updated to include terms governing the provision for DOEs.

This approach has been adopted by SAPN to implement DOEs on their network, as discussed in Section 3B, while in Queensland, Ergon and Energex have also recently developed dynamic connection agreements.[73] As such, the adoption of dynamic connection agreements may be relatively simple to roll out across the remaining states in the NEM. Further, the legal provisions and consumer protections covering the connection agreement are already in place, reducing the need for further reforms.

Include in export tariffs

An alternative option may be to include a provision for DOEs within DNSPs' export tariff arrangements. Following the completion of the DER Rule Change (as discussed in Section 3B), DNSPs are now able to develop export tariffs to charge consumers for their exports onto the network. Therefore, conditions could be added to the export tariff that obligate consumers to comply with DOEs in order to export onto the network.

This mechanism would therefore be subject to regulation by the AER and considered for review under the Tariff Structure Statement process.

Options for AER action

4.44. In order to fill the gap, the AER could consider specifying the exact contractual mechanism that DNSPs should use when implementing DOEs within their network (examples of which are set out in Box 2 above).

4.45. Adopting this approach would provide more clarity to consumers and other market participants, while promoting consistency across the NEM. It could also allow the AER to be more prescriptive in specifying particular terms and conditions that should be included

[73] Ergon, Connection standard, (link).

within the contract in order to protect the interests of consumers. Together, these outcomes should, in theory, improve consumer buy-in for DOEs and potentially increase DOE participation.

4.46. However, the AER should consider whether specifying an exact contractual mechanism is appropriate during the early phase of DOE implementation in the NEM. In particular, there may be some benefit in affording a degree of flexibility to DNSPs to identify and then implement the mechanism which they deem to be most appropriate. This could also allow DNSPs to develop innovative contracts or service agreements over time, to the benefit of consumers. For example, DNSPs may over time incorporate more sophisticated interactions between export pricing (as discussed in Section 3B) and DOEs to provide more efficient outcomes for consumers and the network.

4.47. In addition, certain aspects of DOEs may also be implemented through contractual mechanisms between the consumer and the retailer or aggregator. For instance, consumers may be compensated for exporting energy through a rebate on their electricity bills, which are calculated and charged by a retailer or aggregator rather than the DNSP. Given that consumers have existing financial relationships with their retailer or aggregator, this approach may be more cost efficient and acceptable to consumers compared to, for instance, setting up a separate financial relationship between the consumer and the DNSP. It could, therefore, be in the interests of consumers for the AER to allow DNSPs, retailers and aggregators the flexibility to determine the set of contractual mechanisms to implement DOEs with.

4.48. Flexibility could be accompanied by a set of principles or AER guidance to ensure that there is a sufficient degree protection given to consumers and that these protections apply consistently across the NEM (for example, by providing consumers with sufficient information on how DOEs will be applied). Additionally, while a principles-based approach would typically be more high-level than the option of requiring the use of a specific contractual mechanism, the AER could still consider requiring DNSPs to include certain minimum levels or types of information where appropriate, without specifying the exact contractual mechanism used.

4.49. DNSP flexibility could be accompanied by a set of principles or AER guidance to ensure that there is a degree of consistency across the NEM and that consumers are sufficiently protected (for example, provided with sufficient information on how DOEs will be applied). Additionally, while a principles-based approach would typically be more high-level than the option of requiring the use of a specific contractual mechanism, the AER could still consider requiring DNSPs to include certain minimum levels or types of information where appropriate, without specifying the exact contractual mechanism used.

Recommended Action for AER

4.50. We do not consider it necessary for the AER to prescribe a specific contractual mechanism through which DNSPs should give effect to DOEs as it is currently not clear which contractual

mechanism would be most for this purpose. As discussed above, there may be benefits to allowing DNSPs the flexibility to implement DOEs through their choice of contractual mechanism.

4.51. Instead, it may be more appropriate to require that DNSPs implement DOEs in a way that gives customers visibility over key elements of DOEs in the contractual mechanisms. These could include requiring DNSPs to:

- set out the operating parameters of the DOE, such as the maximum and minimum values of the dynamic limit and the frequency at which it is updated;
- set out any conditions under which the operating parameters might be revised, for instance, if DOE uptake reaches a dramatically higher level or situations where the DOE may need to operate outside of normal parameters;
- specify communication processes for how the DNSP would inform customers of changes to the dynamic limit. For instance, whether notification would be in advance via text message or an app or retrospectively;
- any compliance obligations that might fall on customers, alongside the definition and consequences of non-compliance;
- commercial implications of DOEs for customers, such as direct monetary compensation or a rebate on bills or network charges where applicable; and
- actively inform their customers of where the contractual mechanisms relating to DOEs are set out.

4.52. As we discuss above, these elements of DOEs could be set out in contractual mechanisms between the consumer and the DNSP (for example, in the connection agreement) or in mechanisms between the consumer and the retailer / aggregator (for example, through additions to the existing retail electricity contract). The DNSP should also be able to give the AER a clear explanation as to which contractual mechanism will give effect to the elements set out above.

4.53. As DOEs become more established and the exact contractual mechanisms adopted by DNSPs are clear, the AER may wish to consider whether pursuing a more standardised and prescriptive approach may be more in the interest of consumers.

C. Compliance and Monitoring

4.54. In this section, we discuss potential options for how the AER may fill the gaps identified in Section 3C as requiring **Immediate Action**, in relation to compliance and monitoring. As summarised in Figure 3-20, the only relevant gap relates to monitoring DOE calculation and application.

Monitoring DOE calculation and application

4.55. As discussed in Section 3C, we consider it critical that DNSPs' use of DOEs is monitored to ensure that they are utilised in line with the long-term interests of consumers. Additionally, an effective and transparent monitoring process should act as an incentive for DNSPs to submit high quality DOE business plans that rely on realistic performance standards and consumer outcomes, while also encouraging consumer buy-in and trust in DOEs more broadly.

4.56. Numerous aspects of DNSPs' use of DOEs could in theory be monitored, such as the value of consumer exports curtailed via DOEs,[74] the value of network augmentation avoided, or the improvement in network performance.[75]

4.57. The AER has a number of existing mechanisms and processes for monitoring DNSP performance, including the five-yearly regulatory reset process and the AER's annual performance reporting functions (the Electricity Network Performance Report and the Annual Benchmarking Report). However, while these may capture some elements of DOE performance, one of the more critical aspects that is unlikely to be adequately captured by existing processes is whether DOEs are being calculated and communicated in line with DNSPs' stated (and AER approved) methodology.

4.58. In the absence of such monitoring, DNSPs may impose overly restrictive limits on consumers, resulting in more curtailment than is necessitated by network conditions, or allocate capacity across consumers in a manner that was not agreed (either with the AER or as part of the DNSP's contractual agreement with consumers).

Options for AER action

4.59. Given the AER's existing monitoring processes, there may be an opportunity to adapt and widen the scope of these functions to include the performance of DOEs. For example, the annual performance reporting functions stated above, which assess the relative cost and operational efficiency of DNSPs in providing services to customers, could be updated to include the specific requirements to publish information on the performance of each DNSP in providing DOE services.

4.60. Additionally, we note that the AER is currently updating these annual reporting processes to include further oversight of export services, following the AEMC's recent DER Rule Change which recognised exports as a core service offering of DNSPs.[76] Given the potential interactions between export services and DOEs, as discussed in Section 3C, the AER may opt to review and develop the monitoring of both service offerings in tandem in the future.

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[74] This could leverage the Customer Export Curtailment Value (CECV) methodology currently under development by the AER, as required by the AEMC's recent DER Rule Change (link).

[75] Which could, for example, be measured by the avoidance of blackouts or faults triggered by voltage or thermal constraints being exceeded.

[76] AEMC – Access, pricing and incentive arrangements for DER (link).

4.61. The AER could also consider introducing new requirements for DNSPs to publish open and transparent descriptions of their capacity allocation methodologies when they implement DOEs. Alongside this, DNSPs could also be required to publish historic data on the dynamic limits that they set across their networks over time. This information could, for instance, be made available on their websites in a publicly visible database that enables a historic record of the dynamic limits to be viewed.

4.62. Such a requirement would give visibility over both the method behind and outcomes of the calculation and setting of the dynamic limit, providing valuable information to interested market participants, such as consumers considering purchasing DER or whether to opt-in to DOEs. The data could also serve as a foundation for more sophisticated performance monitoring frameworks in the future. Furthermore, such a requirement for transparency may, itself, build trust in DOEs and discourage the DNSPs from 'gaming' behaviour by establishing a record of the outcomes of DNSP decision-making that could be compared against their stated capacity allocation methodologies.

4.63. Regardless of the specific approach (or combination of approaches, as the options presented above are not mutually exclusive of one another) considered by the AER, the benefits must be considered relative to the cost to the DNSPs of complying with the monitoring processes, to avoid undue regulatory burden. For example, requiring DNSPs to provide granular data frequently may improve consumer buy-in but the cost to DNSPs of producing this data may outweigh the benefit.

Recommended Action for AER

4.64. We consider that DNSPs should be required to make descriptions of their capacity allocation methodologies publicly available at the time when they implement DOEs. In addition, these descriptions should be kept up to date to reflect the capacity allocation mechanism that the DNSP is using at the time. The incremental regulatory burden of such an obligation may be relatively low given that the DNSPs are likely to have needed to prepare such information for submission to the AER to obtain approval for DOE-related spending ahead of implementation of DOEs.

4.65. In addition, DNSPs should be required to make historic data on the dynamic limits they have set publicly available, for example, on their websites. As discussed above, such information supports transparency, allows third-party reconciliation between the DNSP's stated methodology and the resulting dynamic limits and could form the basis of a future enhanced monitoring framework.

4.66. Going forward, the AER should consider whether its existing monitoring and reporting processes for DNSPs should be expanded to cover the calculation and application of DOEs. The decision on whether an enhanced monitoring framework is required should take account of feedback from industry after DOEs have been in operation and leverage the requirements on transparency outlined above.

D. Engagement with the AER

4.67. In this section, we discuss potential options for how the AER may address the gaps identified in Section 3D that we have identified as requiring **Immediate Action**, in relation to considerations for engagement with the AER. As summarised in Figure 3-25, the only relevant gap relates to demonstrating investment need for DOEs.

Demonstrating investment need

4.68. As identified in our gap analysis, when submitting any investment plans to the AER, DNSPs need to demonstrate that there is a need to undertake the spending in order to recover the costs through regulated revenues. This will also apply to DOE-related spending.

4.69. Under the current regulatory framework, for any expenditure that they intend to recover through regulatory revenues, DNSPs must demonstrate that the expenditure aligns with the objectives of efficient network investment, specifically:

- meeting or managing the expected demand;
- complying with applicable regulation;
- maintaining the reliability, quality, and security of supply of *standard control services;* and
- maintaining the reliability of security and safety of the network.

4.70. Whilst there are regulatory frameworks that give guidance to DNSPs on forecasting expenditure and further guidance regarding DER-related spending, there is no explicit reference in these pieces of guidance that is specific to DOEs.

Options for AER action

4.71. To address this gap, it may be useful for the AER to provide guidance to DNSPs on the AER's expectations regarding what information should be provided to properly demonstrate the need for DOE-related spending. We consider that similar guidance to that which is provided in the DER Integration Expenditure Guidance Note regarding DER may be appropriate in this case.

4.72. For instance, such guidance could clarify:

- the information required for an appropriate **benefits calculation** that sets out the expected value that DOE-related spending might generate;
- the information required for an appropriate **cost estimate** for the DOE-related spending;
- whether the DNSP should provide a **forecast of the level of expected DOE penetration**, which would likely impact the scale of the potential benefit that DOEs could generate and allow the AER to validate the calculations of both costs and benefits; and
- **the counterfactual** against which DOE-related spending is assessed. The incremental benefit that DOEs may generate would likely differ when compared against different

counterfactual scenarios, such as compared to a scenario with no DER at all, with DER operating with static limits or against potential spending on network augmentation.

4.73. Such guidance would give clarity to DNSPs regarding what they would be expected to provide to the AER and what they would be required to demonstrate to establish a need for DOE-related investments. Guidance of this nature would also help to avoid situations such as where SAPN submitted plans for DOEs to the AER with no guidance on what information would be most relevant or useful for the AER to make a decision regarding SAPN's proposals.

4.74. In addition, the level of information required and the extent to which the guidance is prescriptive regarding the specific information that is required from DNSPs is a further issue for consideration for the AER.

4.75. Given that DOEs are at an early stage of development and implementation, it is likely that the regulatory process for demonstrating investment need for DOE-related spending would not be highly standardised. This may be driven by the fact that DNSPs may use DOEs for different purposes depending on the specific needs or issues faced on their distribution networks, as well as their consumers' needs and behaviours. In addition, DNSPs may have different visibility of their networks, and therefore varying access to the information they can use to support their design of and investment case for DOEs.

4.76. As such, we consider that it may be appropriate for the information requirements and prescriptiveness of this guidance to be set at a level consistent with the existing DER Integration Expenditure Guidance Note, which is discussed further in Box 3 below. This is because the existing guidance is relevant to DER, which itself is an emerging set of technologies.

Box 3: DER Integration Expenditure Guidance Note

In the context of increased DER penetration, the AER has developed guidance to assist DNSPs in applying for expenditure to integrate DER into their networks, specifically by increasing hosting capacity.[77] This guidance outlines the different pieces of information that DNSPs need to consider (and include within their business cases) in order to gain the approval required to recover the relevant network augmentation expenditure. The note covers:

1) The **AER's role**, specifically, that DER integration expenditure is not explicitly addressed by the AER's existing guidance, and therefore, DNSP proposals for this have varied and taken different approaches to quantifying the benefits of DER;

2) The **justification needed for DER integration expenditure**, specifically, identifying a problem with DER integration, identifying potential solutions and assessing the relative costs and benefits involved; and

3) The methodology to **quantify DER benefits**, which include wholesale market benefits, network benefits, and environmental benefits.

[77] AER, DER integration expenditure guidance note, June 2022, page 4.

The guidance refers to DOEs in several contexts, including the requirement for DNSPs to explain their approach to integrating DER and as a criterion for assessing existing network hosting capacity. However, as stated above, the guide focuses specifically on justifying expenditure to increase network hosting capacity (e.g. through augmentation), as opposed to justifying expenditure on DOEs.

4.77. In addition, there are likely to be issues that relate to spending on both DER integration and DOEs, since DOEs are a way of operating connection points that have DER installed. As such, it may be helpful for the guidance to address issues that cut across spending plans for both DER integration and DOEs to ensure consistency. For instance, the DNSP's forecast of the level of DER installed on their distribution networks may be an input into demonstrating the investment need for both DOEs and for integrating DER. It may therefore be appropriate for the AER to require similar levels of detail in the forecasts used to demonstrate the investment need in both cases.

Recommended Action for AER

4.78. Given the above considerations, it may be appropriate for the AER to issue guidance on the information that they expect DNSPs to submit in support of plans for DOE-related expenditure. Such guidance should be in-line with the level of detail in the DER Integration Expenditure Guidance Note.[78]

4.79. In addition, to account for issues that are common to both DER integration and DOE-related spending, it may be appropriate for the guidance regarding DOEs and DER integration to be consolidated under the same guidance framework. To the extent that the guidance in the DER Integration Expenditure Guidance Note is reviewed and updated, this could also apply to the guidance concerning DOE-related spending.

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

Appendix 1 Glossary

$	Australian Dollar
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ARENA	Australian Renewable Energy Agency
c	Cent
CIC	Consumer Insights Collaboration
DEIP	Distributed Energy Implementation Program
DER	Distributed energy resources
DER Rule Change	Access, Pricing and Incentive Arrangement for DEC Rule Change
DLMP	Distribution locational marginal price
DNSP	Distribution Network Service Provider
DOE	Dynamic operating envelope
ESB	Energy Security Board
ESS	Essential System Services
FCAS	Frequency Control Ancillary Services
kWh	Kilowatt-hour
MATCH	Monitoring and Analysis Toolbox for Compliance in a High DER future
NECF	National Energy Consumer Framework
NEM	National Energy Market
NEO	National Electricity Objective
NER	National Electricity Rules
NERO	National Energy Retail Objective
NSP	Network Service Provider
OEM	Original Equipment Manufacturers
PV	Photovoltaics
SAPN	South Australia Power Network

TNSP	Transmission Network Service Provider
UNSW	University of New South Wales
VPP	Virtual Power Plant

Appendix 2 Summary of gap analysis

	Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
1	*Location of DOE application*	🔴	🟢	🟢	DEIP Outcomes Report	**Future Action**
2	*Connection points that DOEs apply to*	🔴	🟡	🟢	DEIP Outcomes Report	**Future Action**
3	*Capacity Allocation Methodology*	🔴	🟡	🟡	DEIP Outcomes Report	**Immediate Action**
4	*DOE communication protocol*	🔴	🟢	🟡	ESB Interoperability Work	**Leverage Existing Work**
5	*DOE communication pathway*	🔴	🟡	🟡	ESB Interoperability Work	**Leverage Existing Work**
6	*DOE-interval length*	🔴	🟡	🟢	DEIP Outcomes Report	**Leverage Existing Work**
7	*Notification period for dynamic limit*	🔴	🟡	🟢	DEIP Outcomes Report	**Leverage Existing Work**
8	*Device fall-back Procedures*	🔴	🟡	🟢	N/A	**Future Action**
9	*Visibility over the distribution network*	🔴	🟡	🟡	N/A	**Immediate Action**
10	*Consumer protection*	🔴	🟢	🟡	Retailer Authorisations and Exemptions Review	**Leverage Existing Work**
11	*Data protection and privacy*	🔴	🟢	🟡	Retailer Authorisations and Exemptions Review	**Immediate Action**
12	*Ring-fencing*	🟡	🟢	🟡	N/A	**Future Action**
13	*Consumer understanding and interest*	🟡	🟡	🟢	Customer Insights Collaboration	**Leverage Existing Work**

	Gap	Criticality	Complexity	Intervention	Ongoing work or Assumption	Action Status
14	*Consumer opt-in or opt-out*	🔴	🟢	🟡	DEIP Outcomes Report	**Leverage Existing Work**
15	*Contractual mechanism*	🟡	🟢	🟡	AEMC Governance of Technical Standards	**Immediate Action**
16	*Integration with export pricing*	🟢	🟡	🔴	AER Export Tariff Guidelines	**Leverage Existing Work**
17	*Compensating consumers for use of DOE*	🔴	🟢	🟡	ESB Interoperability Work	**Future Action**
18	*Monitoring DOE calculation and application*	🔴	🟢	🔴	DER Access and Pricing rule change	**Immediate Action**
19	*Device capability to respond to DOEs*	🔴	🟡	🟡	ESB Technical Standards	**Leverage Existing Work**
20	*Responsibilities for DOE compliance*	🔴	🟢	🟡	ESB Interoperability Work	**Leverage Existing Work**
21	*Compliance monitoring*	🔴	🟢	🟡	ESB Interoperability Work	**Future Action**
22	*Demonstrating investment need*	🔴	🟡	🟡	Draft DER Expenditure Guidance Note	**Immediate Action**
23	*Demonstrating efficiency of DOE spending*	🟡	🟢	🟡	Draft DER Expenditure Guidance Note	**No Action**
24	*Specification of DOE design*	🟡	🟡	🟢	N/A	**Future Action**