

An abstract graphic consisting of several overlapping circles of different colors: green, blue, orange, and white. The circles are arranged in a way that they create a complex, layered effect. The text is overlaid on the green and blue sections.

ENERGY SECURITY BOARD RENEWABLE ENERGY ZONES

Consultation paper
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Executive Summary

The purpose of this document is to outline the options for the implementation of Renewable Energy Zones (REZs) being considered by the Energy Security Board (ESB) and to seek input from stakeholders on both the options and the assessment approach the ESB should take in evaluating these. It sets out options for how REZs could be implemented in the near term, addressing the questions of how to establish a REZ, and how to maintain a REZ once it is established. Longer term options for transmission access and congestion management will be further considered through the post 2025 market design initiative. This builds on the ESB's work to develop REZ Planning Rules during Step 1 of the interim REZ framework.

The REZ implementation options being considered are intended to be able to be implemented on a national, standalone basis without any broader reforms. The ESB is aware of the work underway in various jurisdictions, considering processes to implement REZs in their state. The options discussed in this paper are intended to provide the fundamental measures for REZ implementation which may be complemented by the work of those State governments.

Reasons for proposed reforms

Stakeholders have concerns about efficient and effective connection to, and use of, the grid. Grid connection is difficult in many areas and technical issues, mostly associated with low system strength, affect the timeliness and cost of connection. Once connected, high levels of congestion and significant reductions in marginal loss factors are problematic.

These issues have arisen as many new generators seek access to the grid. Under the current regime, generator's access to the grid is determined by individual decisions, with no coordination and limited transparency regarding the impact. These challenges are the direct consequence of current access regime and a lack of coordination between transmission system augmentation and generation investment.

The current regime requires AEMO and TNSPs to connect new generators, even if transmission capacity is limited and the effect of further generation in the area is to constrain off pre-existing generators. In areas of the grid where there have been large numbers of new connections there have been issues with increased costs and delays to connections, falling loss factors and increasing constraints on generators. These impacts are not manageable by individual investors and the increased cost and risk of connections is not in the long-term interest of customers.

While the current access arrangements may have been adequate in the past with only incremental investment occurring, they are not fit for the future transformational change to the system. In order to deliver additional supply at least cost, a mechanism is required to coordinate the transmission, generation and storage investments. Orderly renewables development will help to reduce risk associated with network congestion, low marginal loss factors and technical difficulties. Orderly development and reduced connection uncertainties would be of benefit both to investors and, in the long run, to customers.

While the actionable Integrated System Plan (ISP) reforms drive coordinated transmission investment, transmission is only one part of the puzzle. The REZ framework could promote coordination by making it more attractive for generators to invest in certain parts of the network and deliver scale efficiencies and reduced risk to parties seeking to connect.

REZs provide a localised solution that applies to specific geographic locations within the power system. They are only a partial solution because outside the REZs, the problems associated with

the current access regime would remain. As the power system evolves and electrical flows vary, issues outside the REZ will be felt inside the REZ.

In the longer term, it will be necessary to transition to a broader based access regime. More locational pricing with financial transmission rights appears to be the only alternative put forward to date that can work across the whole of the National Electricity Market and drive both more efficient investment and more efficient dispatch and use of the network. Addressing the challenges of unmanageable constraints between REZs and customer load without such reforms entails a far greater degree of centralised control regarding the timing and location of new generation and storage than is currently the case.

However, a number of stakeholders have highlighted concerns relating to the costs and risks of moving to locational marginal pricing with financial transmission rights being introduced in the near term. In light of these concerns, the ESB is exploring REZ options that can form a stepping-stone towards the long-term solution for transmission access. The ESB's focus is to find a transition pathway that mitigates the important negative impacts identified by stakeholders.

Coordinated process to establish the REZ

Under a REZ model, the problems associated with an unpredictable connections regime could be addressed using a coordinated process within the REZ. A "cap" would need to be established specifying the hosting capacity of a REZ or stage of a REZ. Generators could then participate in an auction or tender process to compete for the right to connect to a REZ as part of that capped capacity. In return, they receive benefits in terms of cheaper connections due to scale economies, and increased certainty during the connections and approvals process. The cap on capacity would then need to be maintained through some form of access right to the REZ's transmission network. This would provide REZ investors with improved investment certainty.

There are a number of ways in which a REZ could arise e.g. an actionable ISP project, a state government scheme, a dedicated connection asset or a TNSP commercial project. This paper outlines a regulated REZ development model i.e. a REZ identified by the ISP as an actionable ISP project and which has passed a RIT-T. There may be scope for government and commercial REZ development models to incorporate elements of the regulated model.

Where the regulated model applies, then the Rules would establish an entity responsible for coordinating the development of the REZ (the REZ coordinator) and the process for developing the REZ. This role would include deciding which generators initially connect to the REZ, and could also include:

- specifying minimum requirements for parties participating in the REZ process;
- selecting the successful tenderers;
- returning net auction revenue to customers
- providing information to help transmission planners assess whether future REZ stages should proceed
- managing the access regime that applies within the REZ.

The ESB is considering the appropriateness of the REZ funding arrangements. Under the current framework, if a transmission investment associated with a REZ is classified as an actionable ISP project and it passes the RIT-T, it can proceed on a regulated basis funded by customers. A potential enhancement to the model could be to require the REZ coordinator to return net auction revenue to customers. This requirement would have the effect that generators would contribute to

the cost of the REZ's shared transmission infrastructure, as opposed to the infrastructure being funded (in almost all cases) exclusively by consumers.

The ESB is considering what happens to pre-existing generators who are already within a REZ and parties who are well advanced in progressing developments within a REZ ahead of the proposed REZ regime being in place.

Options for access within a REZ

Successful participants in the REZ tender process would acquire a package of access rights. These rights would limit the extent to which REZ generators may be constrained over time due to subsequent generation entry within the REZ causing worsening congestion or loss factors.

This paper describes four options for access within a REZ

- Connection access protection model
- Financial access protection model
- REZ as a region; and
- Early allocation of financial transmission rights.

These options are designed to protect the access of REZ generators between their connection point and the point where the REZ connects to the main transmission network (the REZ reference node). It does not resolve issues arising between the REZ reference node and the regional reference node. As such, REZs provide only a localised solution to the problems associated with an open access regime.

The ESB is consulting on the criteria it should apply when evaluating the different access options. In addition to the usual economic efficiency and cost criteria, it is key that the model is simple and quick to implement, so that it can be applied as an interim measure in the short term. The ESB is also assessing the extent to which each option promotes efficient investment in, and use of, storage. Storage has the potential to play a very valuable role in the context of REZs.

Transition to a whole of system solution

The transmission network recommended by the ISP is an efficient grid, not an uncongested grid. As the power system evolves and more REZs are implemented, congestion outside the REZ can be expected to become more common and impact on dispatch outcomes of generators within the REZ. The ESB considers that a stand-alone REZ model, without additional reform, will not be fit for the future.

The ESB will consider the transition to a whole of system access solution in early 2021. Ideally, the transitional solution could be implemented on a timetable that is designed to be compatible with the other post 2025 market design reforms. Alignment with the longer-term direction would also be important in choosing the preferred option for REZ implementation. However, the interim REZ option chosen would be designed to be able to be implemented in the near future on a stand-alone basis.

The due date for submissions is 12 February 2021 .

1. Introduction

Key points

- The purpose of this document is to give stakeholders the opportunity to comment on the options to introduce an interim framework for the implementation of Renewable Energy Zones (REZs).
- This paper sets out a series of options for how REZs could be implemented, including how to establish a REZ, and how to maintain a REZ once it is established. It also discusses how the shared transmission elements of REZs are funded.
- This paper progresses step 2 of the two-step process agreed at the Energy Ministers' meeting on 20 March 2020.
- The due date for submissions is 12 February 2021.

1.1 Background

Energy Ministers have asked ESB to develop arrangements to support the development of REZ as an interim measure ahead of longer-term access reforms. The ESB is conducting this project in accordance with a two-step process:

1. Rule changes that require the jurisdictional planner to develop a detailed and staged development plan for each priority REZ identified in the ISP. These changes would build on the actionable ISP Rule changes; and
2. the development of a policy framework for the staged development of REZs within a REZ development plan.

The ESB has recently completed Step 1 of this process. Following a consultation on draft Rules, the ESB has submitted REZ planning rules to Energy Ministers. If Ministers accept the ESB's recommendations, they will come into effect on 4 February 2021.¹

The purpose of this paper is to consult on options relating to Step 2. It addresses the questions of how to connect to, access, and fund shared transmission infrastructure within a REZ.

The ESB's REZ framework is designed to support a range of potential delivery models for a REZ. The interim framework will assist parties wishing to develop a REZ by providing a template for resolving key regulatory issues that have presented a barrier to progress in the past. It does not attempt to prescribe all aspects of REZ development. For instance, it does not lock in a particular design option for who is responsible for coordinating the development of a REZ.

1.2 Structure of this paper

This paper is structured as follows:

- Chapter 2 – Background and existing framework. This chapter describes the currently regulatory framework relating to the development and funding of REZs, and outlines a number of related reviews.
- Chapter 3 – Reasons for proposed reforms. This chapter describes the problems that we are trying to solve and explains how a REZ framework could help.

¹ <http://www.coagenergycouncil.gov.au/publications/energy-security-board-renewable-energy-zones-planning-consultation>

- Chapter 4 – Connecting to shared transmission infrastructure within a REZ. This chapter outlines a regulated REZ development model whereby generators participate in an auction or tender process in order to compete for the right to participate in a REZ.
- Chapter 5 – Options for access within a REZ. Successful participants in the REZ tender process would acquire a package of access rights. This chapter outlines options for access rights within a REZ.
- Chapter 6 – Transition to a whole of system solution. The ESB is developing a proposal for how REZ arrangements can provide a stepping-stone towards a long-term, whole of system access solution.

1.3 How to make a submission and next steps

The ESB invites comments from interested parties in response to this consultation paper by 12 February 2021. While stakeholders are invited to provide feedback on any issues raised in this paper, the ESB's consultation questions are summarised in Attachment 2.

Submissions will be published on the COAG Energy Council's website, following a review for claims of confidentiality. All submissions should be sent to info@esb.org.au.

Submission close date	12 February 2021
Lodgement details	Email to: info@esb.org.au
Naming of submission document	[Company name] Response to Consultation Paper on interim REZ framework
Form of submission	Clearly indicate any confidentiality claims by noting "Confidential" in document name and in the body of the email.
Document type	Microsoft Word
Late submissions	Late submissions will not be accepted.
Publication	Submissions will be published on the COAG Energy Council's website, following a review for claims of confidentiality.

The ESB intends to hold a webinar on the material covered in this paper in February 2021. Interested parties are invited to register their interest by email to info@esb.org.au.

Following consideration of submissions made to the consultation paper, the ESB will engage in a series of deep dive stakeholder workshops in order to prepare a recommended policy position on the interim REZ framework. Given the dynamic nature of this policy area, ESB proposes to continue to work on a policy framework and keep the mechanism for implementing the framework under review. Options include an AEMC Rule change process or the ESB could make a recommendation to Energy Ministers under section 90F of the National Electricity Law.

The ESB's proposed timing is set out below:

Deliverable	Indicative timing
Submissions due	12 February 2021
Public forum/webinar and workshops	February 2021
Submit recommendations to Energy Ministers	April 2021

2. Background and existing framework

Key points

- The ESB's REZ consultation is occurring in the context of a set of inter-related reforms.
- There are a range of market reforms that seek to improve coordination of transmission and generation investment including the actionable ISP reforms, transmission access reform and the dedicated connection assets Rule change.

ISP identifies actionable REZs

- The ISP identifies REZs and determines which are actionable. Under current regulatory framework, if a transmission investment associated with a REZ is classified as an actionable ISP project and it passes the RIT-T, it can proceed on a regulated basis funded in whole by customers.
- If a government wishes to promote a particular REZ which would not otherwise form part of the optimal development path in an ISP, the government may make a contribution that can be taken into account in determining whether the REZ satisfies the RIT-T
- Generator contributions may not be considered in a RIT-T, because they are treated as a wealth transfer and so not contributing towards promoting net market benefits.

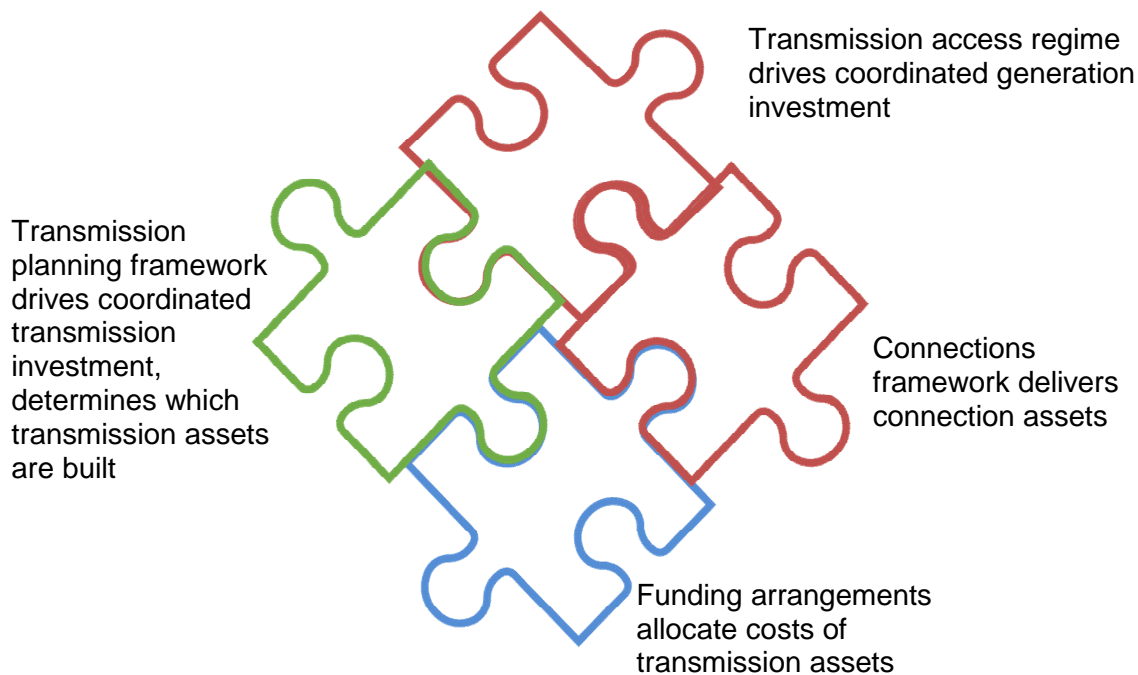
Reforms to facilitate greater sharing of dedicated connection assets – radial REZs

- Currently, generators fund the cost of the connection assets they use to connect to the shared network. Under the Dedicated Connection Asset Rule Change process, the AEMC is considering reforms that would facilitate greater sharing of generator funded connection assets by allowing these connection assets to become part of the shared network - a designated network asset. The reforms are aimed at providing greater certainty for both generation investors and TNSPs. However, these reforms would only operate effectively for sharing radial network connections and are not considered to offer a solution for a meshed REZ.

Gaps in the current regulatory framework

- While the current regulatory framework provides for the planning and development of transmission development required to support a REZ, it makes no provisions to implement the generation and storage associated with a REZ given this is driven by the market and so therefore changes are needed to the current access regime.
- There is no restriction on a new entrant generator locating at any point within a REZ identified in the ISP, even where that exceeds the designed capacity of the REZ or where it disadvantages generators who may have participated in and contributed to the cost of the REZ.
- Other related reforms include the introduction of REZ Planning Rules, the AEMC's system strength investigation and the actions of several State governments who are introducing policies to develop REZs.

The National Electricity Market has a range of inter-related market design features that seek to deliver coordinated transmission and generation investment. This chapter describes the key elements of the current regulatory framework and discusses a number of related reforms that are currently in train.



2.1 Access to the shared transmission network

The NEM has operated since its commencement as an open access regime; that is, parties may connect to the grid at any point subject to meeting technical requirements and funding only the cost of the assets required to connect to the shared grid. Generators are not required to contribute towards the cost of the shared transmission network, and they receive no assurance that the transmission network will be capable of transporting their output to load centres.

As generators do not hold access rights to any meshed infrastructure, they do not have an incentive to invest in this infrastructure. Doing so would mean that other generators, who have not contributed to the costs, could enjoy physical access to the transmission network via the dispatch process. Each generator would prefer to wait for each other to make the investments and enjoy the capacity created without paying for it – likely leading to systematic underinvestment in transmission infrastructure.

The transmission planning regime has been focussed on ensuring that customer demand is met. Decisions to make investments in meshed transmission infrastructure are made by processes run by monopoly infrastructure providers (TNSPs) and central agencies (AEMO and the AER), as opposed to market participants. This includes ensuring that there is sufficient transmission capacity available to transport electricity to meet peak demand (subject to system and network reliability standards). The implementation by AEMO of the ISP and the related Rules provisions have broadened past considerations to develop a whole of system plan for the efficient development of the power system.

The Rules then seek to ensure that regulated or shared transmission system can be augmented in accordance with the ISP, but the ISP is only 'for information' to prospective new generators. The current access regime continues to apply in the context of a transforming power system. The consequences of the current access regime are discussed further in section 3.1.

Given these issues, the primary way for the shared transmission elements of a REZ to be funded under the NER is via the actionable ISP/RIT-T framework. This would then leave it to individual

market participants to decide whether to invest within the REZ or not. There is also scope for investors to use the framework for dedicated connection assets to achieve a limited form of coordinated generation investment under different access conditions.

2.2 Actionable ISP framework

The actionable ISP framework introduced whole of system planning rather than the previous transmission-centric, project-by-project approach to transmission planning. This has consequences for the funding of REZs.

The Rules have always permitted TNSPs to build new transmission for the purpose of connecting new generation. However, under the previous RIT-T framework, it was problematic for a TNSP to justify such investments due to the scale of the modelling exercise involved. The TNSP is required to demonstrate that the proposed investment maximises net market benefits, recognising that there are any number of alternative locations elsewhere in the NEM where the generation might locate.

For this reason, under the previous RIT-T framework, TNSPs found it necessary to wait until the relevant generation projects became committed before they could be formally included in a RIT-T assessment. This gave rise to the “chicken and egg” problem, whereby generation could not become committed before the transmission was committed and vice versa.

Under the actionable ISP framework, the scale of AEMO’s modelling exercise has increased to an extent that the Rules requirements can now be met before generation projects become committed. The ISP models plausible combinations of generation and transmission solutions required to meet power system needs over the 20-year outlook period. It provides a whole of system plan that includes the optimal generation mix, and the transmission required to support it. The ISP identifies the optimal development path, which is the suite of projects (including generation projects) that efficiently meets a defined set of power system needs, where power system needs are:

- the market reliability standard
- relevant transmission reliability standards
- power system security.

These needs must be achieved having regard to economic efficiency, public policy and good electricity industry practice.

This change of perspective towards whole-of-system planning means that if a transmission investment associated with a REZ is classified as an actionable ISP project and it passes the RIT-T, it is able to proceed on a regulated basis – i.e., the assets would be built, owned and operated by the local TNSP and funded entirely or in part² by customers.

2.2.1 Treatment of government policy within actionable ISP framework

The actionable ISP framework is designed to be able to ensure that power system development is able to adjust in response to government policy. Under the actionable ISP Rules, AEMO may consider a current environmental or energy policy where the policy has been sufficiently developed to enable AEMO to identify the impacts of it on the power system and at least one of the following is satisfied:

- (1) a commitment has been made in an international agreement to implement that policy;
- (2) that policy has been enacted in legislation;

² Part funding would occur where a government or generator makes a contribution. For reasons outlined in section 2.1, generators are unlikely to make a contribution.

- (3) there is a regulatory obligation in relation to that policy;
- (4) there is material funding allocated to that policy in a budget of the relevant participating jurisdiction; or
- (5) the MCE has advised AEMO to incorporate the policy.³

If AEMO considers that one of the criteria is met, then it may adjust the ISP modelling to ensure that the public policy is delivered as part of the optimal development path.

If a government wishes to promote a particular REZ which would not otherwise form part of the optimal development path, it also has the ability to make a third-party funding contribution in support of its preferred option. These arrangements are governed by the treatment of externalities as set out in the AER's Cost Benefit Analysis (CBA) Guidelines.⁴

The CBA Guidelines require AEMO to treat third party contributions differently depending on whether they are contributed by:

- a Registered Participant under rule 2.1 of the NER or any other party in their capacity as a consumer, producer or transporter of electricity in the market (a Participant), or
- any other party (Other Party).

If the project funding is contributed by a Participant, then AEMO may not include it in the ISP modelling on grounds that it is a wealth transfer.

As a government is not a Participant, they are treated as an 'other party'. Generators, on the other hand, are Participants, which means that they are not able to make a third-party contribution towards prescribed transmission assets which would influence the outcome of the ISP or RIT-T process.

2.3 Commercial funding via the dedicated connection asset framework

The current Rules provide a framework for coordinating and sharing connections between generators as dedicated connection assets (DCAs). The DCA framework offers an opportunity to commercially develop a limited but similar scheme to a REZ, on a radial connection to the shared network. DCAs are privately owned and operated connection assets that provide the services required to connect a party to the shared transmission network. In practice, there could be a blurred line between a large DCA with multiple connections and a simpler REZ.

The AEMC is currently consulting on a model which would enable a generator, or a group of generators, to fund designated network assets and have these assets subject to a special access regime.⁵

Designated network assets would form part of the transmission network operated by a primary TNSP (i.e. the local TNSP for each region). The point where an individual facility connects to a designated network asset will be a transmission network connection point. This allows for the application of existing NER arrangements for settlement, metering, calculation of loss factors and TUOS charges, system strength and performance standards, with only minor modifications. As designated network assets are part of a primary TNSP's network, the primary TNSP is responsible for operating and maintaining these assets. However, designated network assets can

³ NER 5.22.3(b)

⁴ AER, Cost Benefit Analysis Guidelines - Guidelines to make the Integrated System Plan actionable, August 2020, section 3.4.1. See <https://www.aer.gov.au/system/files/AER%20-%20Cost%20benefit%20analysis%20guidelines%20-%2025%20August%202020.pdf>

⁵ AEMC, *Connection to dedicated connection assets, Draft determination*, November 2020. See <https://www.aemc.gov.au/rule-changes/connection-dedicated-connection-assets>

be contestably designed, constructed and owned, similar to the existing contestability arrangements for identified user shared assets (IUSAs).

Designated network assets would not be subject to the open access regime that applies elsewhere on the transmission network. A primary TNSP must put in place access policies to protect the access rights of participants funding the provision of designated network assets, similar to the current arrangements for large DCAs.

One key issue for consideration is whether the network infrastructure is radial or meshed. This, together with the funding arrangements, is potentially a key point of difference between a REZ and a designated network asset. If the asset is radial, it better meets the model of a designated network asset as it means that there is a single point of connection between the designated network asset and the shared asset. This is much easier to manage, particularly in terms of any special access regime. The AEMC therefore proposes to limit designated network assets to radial network configurations.

Given the scale of some prospective REZs, there are important reliability and security benefits associated with a meshed network configuration. Having a large amount of generation capacity connected to a line with a single point of failure can result in large credible contingencies, which has consequences for how AEMO operates the power system. Specifically, radial configurations may mean that AEMO needs to constrain the output of the REZ to maintain system security.

The ESB's preference is to develop a REZ model that can also support meshed network solutions. Ideally, the two frameworks should be broadly aligned so that investors are neutral, and there is no incentive to distort efficient transmission development in order to receive a particular regulatory treatment.

2.4 Related reforms

The ESB's consultation on the interim REZ framework is occurring in the context of a number of other related reforms that impact on the implementation of REZs, including:

- State government policies to develop REZs
- REZ Planning Rules
- the AEMC's system strength investigation.

These reviews are outlined below.

2.4.1 State government policies to develop REZs

Several State governments have announced policies to develop REZs in their State, as outlined in the table below.⁶

Main NEM states with targets, key policies				
	Renewable energy target	Emissions reduction target	Renewable Energy Zones	Other key schemes
NSW	n/a	Net zero by 2050	Five proposed <ul style="list-style-type: none"> • Central-West Orana • New England • South-West • Hunter Central Coast • Illawarra 	<ul style="list-style-type: none"> • Govt contracts to underpin 12GW renewable generation, 2GW long-duration storage • Bilateral deal with C'th govt on HumeLink, Qld-NSW interconnector upgrade • Consumer Trustee to plan, underwrite grid
VIC	40% by 2025 50% by 2030	Net zero by 2050	Six proposed <ul style="list-style-type: none"> • South West • Western • Murray River • Central North • Ovens Murray • Gippsland 	<ul style="list-style-type: none"> • Planned second renewable energy auction for 600MW • Amended electricity law to bypass national framework on transmission
QLD	50% by 2030	Net zero by 2050	Three REZ corridors with eight zones <ul style="list-style-type: none"> • Southern, inc Darling Downs • Central inc Fitzroy, Wide Bay • Northern inc Isaac, Barcaldine, North Qld, North Qld Clean Energy Hub, Far North Qld 	<ul style="list-style-type: none"> • 10 projects shortlisted under reverse auction for 400MW renewables inc 100MW storage • Created govt-owned clean energy generator CleanCo • \$500m Renewable Energy Fund • Funding for Copperstring 2.0 transmission line

SOURCE: FINANCIAL REVIEW

The REZ implementation options being considered by the ESB could be implemented on a national, standalone basis. The options discussed in this paper are intended to provide the fundamental measures for REZ implementation which may be complemented by the work of those State governments. The regulated REZ development model would also apply where a REZ that is not being developed via government policy is identified as needed in the ISP.

2.4.2 REZ planning Rules

The REZ planning Rules (developed in accordance with Step 1 of the interim REZ framework) amend the transmission planning framework to support the design of REZs in a way that has regard to the needs of communities and developers, and is also aligned with the optimal development path for the power system as set out in the ISP. This is an incremental refinement of

⁶ Australian Financial Review, 1 December 2020.
 For further information, see: <https://energy.nsw.gov.au/government-and-regulation/electricity-infrastructure-roadmap> <https://www.budget.vic.gov.au/clean-energy-power-our-recovery>
<https://www.dnrme.qld.gov.au/energy/initiatives/queensland-renewable-energy-zones>

the recently finalised actionable ISP Rules and the ESB considers that these changes should form a permanent part of the actionable ISP framework.

The ESB has published a consultation paper and draft REZ planning Rules⁷ and has submitted its recommendations to Ministers. Ministers are currently considering whether to accept the ESB's recommendations.

The options for REZ frameworks contemplated in this document are intended to implement the REZ designs established in accordance with the REZ planning Rules. However, the plans set out in REZ design reports established via the REZ planning Rules would not be set in stone. The REZ planning framework (and transmission planning framework more generally) is designed to be iterative so that plans can evolve over time as new information becomes available and circumstances change.

2.4.3 System strength investigation

The AEMC has recently published the results of investigation into system strength frameworks. This review addresses problems that overlap with the problems addressed by the interim REZ framework; namely, uncertainty, delay and high costs during the generator connection process.

The AEMC's proposed reforms are designed to proactively provide the volumes of system strength needed to maintain system security, and to support more timely connection of new generation so consumers can benefit from having cheaper and lower emissions generation. As such, the two reforms are complementary.

The reformed system strength regime could apply to REZs – i.e., AEMO could identify a REZ as a system strength zone – and planning for system strength could occur as part of the REZ design process. While system strength is a key driver of uncertainty and delay associated with the connections regime, it is not the only challenge. The ESB proposes to design a REZ framework that integrates the new system strength regime in order to deliver a coordinated process for generator connections.

⁷ See <http://www.coagenergycouncil.gov.au/publications/energy-security-board-renewable-energy-zones-planning-consultation>

3. Reasons for proposed reforms

Key points

- While the actionable ISP reforms drive coordinated transmission investment, the current market design does not provide strong enough signals to encourage generators to locate in an optimal place from a whole-of-system perspective.
- Open access applied in combination with actionable ISP carries the risk of either over or under investment in transmission assets, since generators do not have an incentive to invest in accordance with the plan.
- In order to deliver the additional supply at least cost, a mechanism is required to coordinate the transmission and generation investments. Orderly new generation and storage development will help to reduce risk associated with network congestion, low marginal loss factors and technical difficulties.
- A REZ framework could promote coordination by making it more attractive for generators to invest in certain parts of the network both because of the transmission network development to support those generators and other incentives. Generators would be incentivised to participate in a REZ using a set of “carrots” which could include scale efficient connection assets, a simpler connection process and some form of access rights across the REZ.
- REZs provide a localised solution that applies to specific geographic locations within the power system. They are only a partial solution because outside the REZs, the problems associated with open access would remain. As the power system evolves and electrical flows vary, issues outside the REZ will be felt inside the REZ.
- In the longer term, more locational pricing with financial transmission rights are the only alternative put forward to date that can work across the whole of the NEM and drive both more efficient investment and more efficient dispatch and use of the network.
- The ESB is exploring REZ options that can form a stepping stone towards locational marginal pricing and financial transmission rights as a long term solution for transmission access, but does so in a way that mitigates the important negative impacts identified by stakeholders.

This chapter describes the problems that we are trying to solve and explains how a REZ framework could help. Over the next 20 years, there is a need for large quantities of renewable generation to connect to the power system. There is insufficient transmission network capacity in the right locations to support this forecast generation. These issues have been discussed at length elsewhere, most notably in AEMO's 2020 Integrated System Plan (ISP).⁸

The ESB's actionable ISP Rules⁹ help to coordinate power system development by driving transmission investment in line with a whole of system plan. While these reforms drive coordinated transmission investment, transmission is only one piece of the puzzle.

For the whole of system plan envisaged in the ISP to be given effect, generation, storage and demand side solutions should also locate in places that correspond to the least cost development of the power system. However, these new resources do not have a corresponding incentive to locate in places that are optimal from a whole-of-system perspective. Rather, the National Electricity Market (NEM) relies on the market design to deliver efficient generation decisions.

This chapter outlines the shortcomings of the current open access arrangements and how REZs can leverage the planning regime to provide a partial solution to these shortcomings.

⁸ <https://www.aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2020-integrated-system-plan-isp>

⁹ <http://www.coagenergycouncil.gov.au/actionable-isp>

3.1 Current access regime is causing urgent problems

There are a number of areas in the NEM where uncoordinated renewable energy development is leading to network congestion, low marginal loss factors and technical difficulties. As more renewable generation connects, these issues are becoming increasingly widespread.

Generators are exposed to lower revenues until remedies can be devised, approved and implemented. The Clean Energy Council recently conducted a poll of leading debt and equity investors in Australia regarding the challenges facing investors in large-scale renewable energy. The top two concerns were:

- unpredictable grid connection process and associated delays in commissioning (84%); and
- increased risk and constraints placed on operational projects (74%).¹⁰

These challenges are the direct consequence of the current access regime, which requires AEMO and TNSPs to connect new generators that meet specified technical standards, even if the effect is to constrain off pre-existing generators. As a result, there is no way to manage the consequences of large numbers of new connections. This has led to delays in processing connection applications and changing technical requirements as network conditions rapidly change, resulting in a slow, costly and unpredictable connections process.

The current transmission access regime was a design choice that was an acceptable compromise between reflecting the underlying realities of the system and the simplicity of a regional price model. In the first decade and a half of the NEM, low levels of investment and overcapacity meant that this access regime had only a modest impact. More recently, the NEM has numerous renewable generation projects under development, but the network has limited capacity to connect them, with some otherwise attractive areas for investment already at or close to capacity.

While the ISP reforms are an important step forward in delivering needed transmission investment, they cannot solve these problems without changes to the access regime. The ISP identifies the optimal development path, including optimal generation development opportunities, based on minimising the underlying costs. In practice, generation investors respond to market signals and will invest when they consider it profitable to do so. If the electricity market design does not signal to generators (and other resources) the “right” place to invest from a system perspective, actual investment outcomes are likely to diverge from the ISP.

This framework potentially exposes consumers to higher wholesale and network costs than optimal as there is no assurance that the overall development of the power system through this approach will deliver the most efficient outcome. There have been instances where ad hoc generation developments have triggered major transmission investments. This happens because once an investment has occurred, its capital cost is treated as “sunk” for transmission planning purposes.¹¹ When transmission investment follows the generation, it becomes something of a lottery for developers and existing generators who may be substantially affected in either a positive or negative way.

¹⁰ Clean Energy Council, *Clean energy investors meet to tackle challenges and opportunities*, 27 August 2020. Available at: <https://www.cleanenergycouncil.org.au/news/clean-energy-investors-meet-to-tackle-challenges-and-opportunities>.

¹¹ For more information on the regulatory investment test, see the AER's Cost Benefit Analysis Guidelines. Available at: <https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/guidelines-to-make-the-integrated-system-plan-actionable>

Efficient generator investment decisions are a key objective of the transmission access review, which is designing the access reforms as part of the ESB's post 2025 market design process.¹² The AEMC has proposed the introduction of locational marginal pricing (LMP) and financial transmission rights (FTRs).¹³ The purpose of these reforms are to ensure that wholesale market prices signal the value of generation at different points on the network, and to create a mechanism that generators can use to hedge risk associated with market access.

As discussed in the Post 2025 Market Design directions paper,¹⁴ the ESB has received feedback on the model. Generators expressed concerns about complexity, uncertainty, and increased risk associated with this solution. Customer representatives expressed mixed views about whether the substantial benefits would be realised in the current environment. Some stakeholders accepted the need for change but argued that the arrangements should be introduced more gradually. For all these reasons, a broad range of stakeholders have indicated that their preferred focus, at least initially, is to develop arrangements for REZs.

Rules are now in place to action the transmission elements of the ISP. However, under current market frameworks, generators have no direct incentive to invest in line with the ISP or to locate new generation in identified REZs. This paper explores options for implementing REZs that could be adopted by parties seeking to develop REZs, or act as a backstop for REZs identified as needed in the ISP that would not otherwise be developed.

3.2 REZs are a means of providing locational signals

A REZ framework could promote coordination of generation and transmission by making it more attractive for project developers to invest in certain parts of the network. Generators, storage providers and demand side resources could be incentivised to participate in a REZ using a set of "carrots" which could include scale efficient connection assets, a simpler connection process and access protection. This approach could commence sooner than the more sophisticated price-based mechanisms contemplated in the transmission access reform review. However, a REZ framework would be able to easily transition once the full suite of the ESB's post-2025 market design reforms are introduced.

The REZ approach has been adopted in many other jurisdictions. International experience suggests that focussing renewable energy development around zones can offer a way to efficiently and effectively expand the grid to connect renewable energy. Leading examples include:

- Germany's Grid Expansion Acceleration Act¹⁵
- Britain's Transmission Investment for Renewable Generation mechanism¹⁶ and the current offshore coordination project¹⁷
- Texas's Competitive Renewable Energy Zones¹⁸

¹² Information about this review is available at: <https://www.aemc.gov.au/market-reviews-advice/coordination-generation-and-transmission-investment-implementation-access-and>

¹³ See the AEMC's Interim Report here: https://www.aemc.gov.au/sites/default/files/2020-09/Interim%20report%20-%20transmission%20access%20reform%20-%20Updated%20technical%20specifications%20and%20cost-benefit%20analysis%202020_09_07.PDF

¹⁴ ESB, Post 2020 Market Design Directions Paper, December 2020. Available at <https://esb-post2025-market-design.aemc.gov.au/>

¹⁵ Bundesnetzagentur, Grid Expansion in Germany: What you need to know, 2014.

¹⁶ Ofgem, <https://www.ofgem.gov.uk/electricity/transmission-networks/critical-investments/transmission-investment-renewablegeneration>.

¹⁷ <https://www.nationalgrideso.com/news/latest-report-and-consultation-offshore-coordination-project-released>

¹⁸ Clark, J. 2013, <https://gwujeel.files.wordpress.com/2013/07/miso-ercot-cost-allocation-methods.pdf>

- New Zealand's transmission to enable renewables project¹⁹
- Mid-Continent Independent System Operator's (MISO's) Renewable Portfolio Standards²⁰.

Each of these programs are bespoke, reflecting the unique characteristics of the relevant market design and power system. These schemes are also paired with other measures to coordinate generation and transmission, including nodal pricing in the US and New Zealand, and firm access in Britain and Germany. The fact that in other jurisdictions REZs are typically paired with some other form of access regime – such as nodal pricing, generator TUOS, or centralised connections – lends weight to the ESB's view that REZs are only a partial solution to the challenge of coordinating generation and transmission investment (see below).

However, what each of these policies share is that they involve strategic choices to facilitate large-scale renewable generation at a jurisdictional and policy level. This top-down commitment provided investment certainty required for parties to participate in a coordinated development. REZs can help to give investors confidence in light of the numerous challenges currently facing new generation developments.

3.3 REZs are only a partial solution – a long term solution is still required

In developing its proposals for the REZ framework, the ESB has sought to ensure that the interim arrangements will not create any barriers to implementing long term arrangements. Other than the status quo, each of the options considered in this paper are designed to either integrate with, or be capable of coexisting with, transmission access reform.

REZs are only a partial solution to the broader challenges that access reform seeks to address. This is because REZs provide a localised solution that applies to specific geographic locations within the power system.

Outside the REZs, the problems associated with the access regime would remain. In an interconnected power system, investment decisions elsewhere on the power system resonate across the grid – including within REZs – affecting power flows and the supply and demand balance faced by other market participants. A comprehensive solution needs to apply on a market-wide basis, not in isolated pockets. In essence, REZs need some form of access regime to work.

The issues outlined in Box 1 (next page) apply equally to REZs as to other parts of the network. Generators outside of the REZ will automatically physically utilise the meshed REZ transmission infrastructure, because of the way that electricity flows across the meshed network. Similarly, generators within the REZ will need to utilise the rest of the meshed network in order to transport their product to consumers. The delineation of REZ infrastructure from the rest of the meshed network will not resolve these issues.

Congestion is likely to be a normal, everyday feature of efficiently sized transmission infrastructure to accommodate variable renewable generation – not an anomaly. This is because the cost of building the incremental transmission infrastructure to allow for the dispatch of variable renewable generation for the sunniest or windiest of times exceeds the benefits to reducing the cost of dispatch or reducing emissions at those times. It is more cost effective, and reduces

¹⁹ New Zealand Electricity Commission, 2008. Final report on the transmission to enable renewable project (phase 1), available at <https://www.ea.govt.nz/dmsdocument/16625>

²⁰ MISO, 2017. MTEP17 MVP Triennial Review, available: <https://www.misoenergy.org/Library/Repository/Study/Candidate%20MVP%20Analysis/MTEP17%20MVP%20Triennial%20Review%20Report.pdf>.

emissions by a greater extent, to build more variable renewable generation than can always be accommodated by the transmission infrastructure, even if that variable generation cannot be always used, so that there is more renewable generation being used at the shoulder periods.

Box 1 Challenges of access rights on a meshed electricity network

The simplest form of transmission access rights are physical access rights. Such an approach is common in markets for other commodities and services other than electricity – including gas transmission pipelines, airports and ports. In electricity, such an approach would mean that holders of these physical rights would have their electricity dispatched in preference to those holders that did not hold physical access rights.

This approach can work well for ‘radial’ electricity transmission lines - where the transmission line connects to the rest of the network at a single point. In the NEM's regulatory framework, this would largely consist of connection assets. There already exists within the framework the ability to hold physical access rights to these assets. Connecting parties directly pay for (and can own) these assets, and in return receive physical rights to the assets. The AEMC is currently working on a rule change on dedicated connection assets which is considering improvements to these arrangements to facilitate greater sharing of radial connection assets

Unfortunately, physical access rights do not work well on meshed alternating-current networks – where each element connects to the rest of the network at two or more points given the detrimental effect such an arrangement would have on what consumers pay. This applies to the majority of the NEM's transmission infrastructure. The pathways that electricity take from generation to load across a meshed alternating current network cannot be directly controlled like, for example, trains at a railway junction.

Instead, electricity travels throughout the network according to the laws of physics. The output of every generator and electricity drawn by every electrical appliance at every location affects the flows on each and every line in the meshed network, to varying degrees, depending on the relative location and concentration of generation and load.

This makes defining appropriate access rights to an electricity network much more difficult than other forms of network.

Given the likely levels of congestion, the question of access – how to ration scarce transmission capacity – is likely to be even more important in the future than it is now. REZs have been cited as a solution to these issues and therefore as an *alternative* to the introduction of locational marginal pricing and financial transmission rights. We do not consider this is the case, for the reasons set out above.

REZs rely on a planning-based approach to decide which parts of the network are best suited to development. Under a REZ model, the ISP (or other centralised model, such as government policy) would be used to determine the location of new generation developments. While the ISP is the best available starting point for decisions about the efficient development of the power system, the ESB's view is that it should not preclude opportunities for the competitive market to decide where generators should locate.

Box 2 Congestion management in the NEM

The current design of the NEM does not manage congestion well. It rewards generators for bidding in ways that are contrary to efficient operational outcomes.

One such inefficiency that arises is a consequence of 'disorderly bidding', also known as 'race to the floor bidding'. In the presence of congestion, generators know that the offers they make will be unlikely to affect their regional reference price. The profit maximising behaviour of a generator is to bid at the market floor price of -\$1,000/MWh. This maximises their individual dispatch quantity, and hence the revenue they receive (the dispatch quantity multiplied by the regional reference price). All generators affected by the constraints are incentivised to maximise their share of the limited transmission capacity by engaging in this 'race to the floor' bidding behaviour. When one's competitors are racing to the floor, not racing to the floor reduces a generator's share of dispatch, and hence revenue.

The NEM dispatch engine selects market participants to be dispatched by minimising total as-bid costs while ensuring that the pattern of dispatch is consistent with the physical capacity of the system. It uses as an input the bids made by market participants; it does not distinguish between the underlying actual costs of generators. As a result, in the presence of congestion and disorderly bidding, dispatch is shared based on administered rules between generation with higher and lower underlying costs, all of whom are bidding at the same price. This results in productive inefficiencies – it would have been more efficient for the lower cost generation to be dispatched ahead of the higher cost generation – and ultimately in higher prices for consumers.

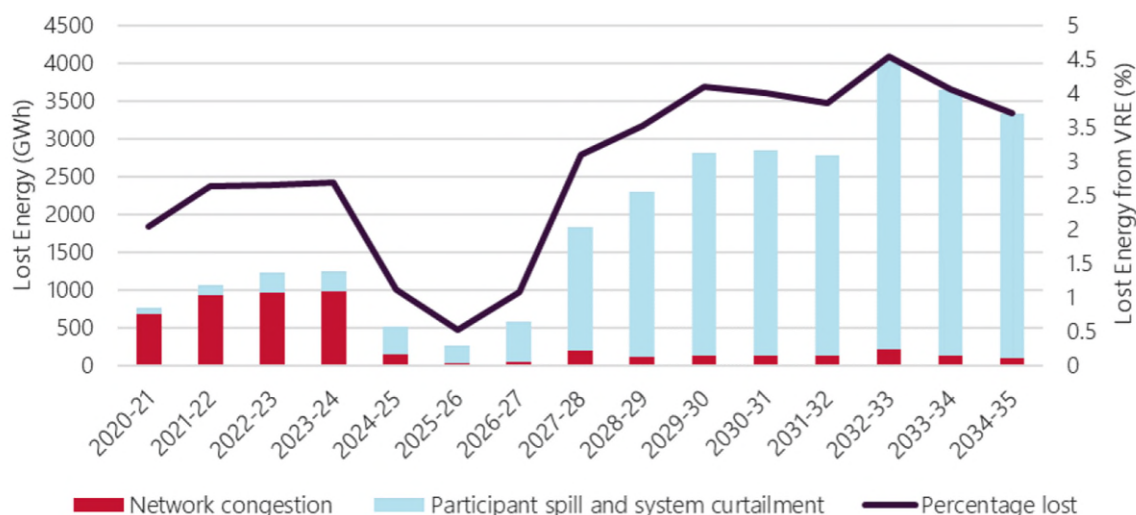
Disorderly bidding also contributes to counter-price flows, as generators in a constrained region can bid at the price floor knowing that they will receive the regional reference price in their region. Some of this generation may then be dispatched to meet load in a neighbouring, unconstrained region, potentially displacing lower-cost generation in that region. This can result in energy flowing from a high price region into a low price region (i.e. counter-price flows), implying that higher cost generation is being dispatched to meet demand.

In addition to causing productive inefficiencies, counter-price flows reduce the "firmness" of the inter-regional settlements' residue, which is used as a hedge to manage price risk between regions.

When counter-price flows occur, AEMO has a mandate to intervene in the market by "clamping" flows. It does this through intervening in the dispatch process to limit the accumulation of negative settlements residue beyond \$100,000. It is difficult for market participants to anticipate when flow clamping will occur, creating uncertainty for generators which is likely to be reflected in higher contract prices.

A stand-alone REZ framework will not resolve ongoing operational challenges. While REZs can help to ensure that new transmission capacity is efficiently utilised, the proportion of renewable energy that is unable to be used due to congestion and spill is forecast to increase over time.

Figure 1 NEM VRE lost due to congestion and spill, central scenario, 2021-35 (GWh)



Source: AEMO ISP, Appendix 6.

In order to achieve efficient dispatch and avoid volatile market outcomes, measures to improve congestion management are required.

In the longer term, the objective of access reform is to shift to a model where generation investment is based on clear and consistent information about the most efficient locations for investment to support efficient outcomes for customers. Locational marginal pricing with financial transmission rights is the only alternative put forward to date which can work across the whole of the NEM and drive both more efficient investment and more efficient dispatch and use of the network. Locational marginal prices bring wholesale market price signals into alignment with underlying power system conditions. This facilitates efficient power system operation and provides a stronger basis for informed investment decisions by both supply side investors and transmission planners. Locational marginal pricing also removes the incentives for disorderly bidding. Extensive materials discussing this model are available on the AEMC's website.²¹

Investors would triangulate information about where the best quality and most accessible renewable resources are, where transmission capacity is available, and anticipated future investment. If the new generation is optimally located, less new investment is required to meet demand using a smaller generation fleet. More granular prices therefore help to align investors' commercial interests with the interests of customers.

However, the introduction of locational marginal pricing and financial transmission rights is a significant change. In submissions to the September Post 2025 Market Design consultation paper, generators expressed concerns about complexity, uncertainty, and increased risk associated with this solution. Customer representatives expressed mixed views about whether the substantial benefits would be realised in the current environment. Some stakeholders accepted the need for change, but argued that the arrangements should be introduced more gradually. For all these reasons, a broad range of stakeholders have indicated that their preferred focus, at least initially, is to develop arrangements for REZs.

In light of these concerns, the ESB is prioritising the development of REZ arrangements as a first step in improving transmission access.

Developing the REZ models in more detail will enable stakeholders to get a more granular understanding of the strengths and weaknesses of the best pathway to locational marginal pricing

²¹ See: <https://www.aemc.gov.au/market-reviews-advice/coordination-generation-and-transmission-investment-implementation-access-and>

and financial transmission rights. The ESB will build on this work to investigate alternative paths for change which mitigate the risks in transition and the impact on existing contracts.

3.4 How do the proposed reforms address the identified problems?

The ESB is exploring how REZs can form a stepping-stone towards an enduring solution to transmission access, but do so in a way that mitigates the important negative impacts identified by stakeholders. The intent, by introducing a REZ-specific access regime, is to improve on the current arrangements quickly and with modest disruption and cost to the market.

In the remainder of this paper:

- The proposals outlined in Chapter 4 are directed towards mitigating the problems associated with an unpredictable grid connection process, by establishing a coordinated process for generator connections; and
- The options outlined in Chapter 5 seek to address the risk of constraints being placed on operational projects, by changing the access regime than applies to REZs; and
- Chapter 6 notes the need to transition REZs from a partial, localised solution towards a whole of system solution and next steps in considering how that might be achieved.

Questions for consultation

1. Are REZs an appropriate interim solution to the challenges associated with open access?
2. What are the likely consequences of a framework that addresses these challenges on a localised rather than a system wide basis?

4. Coordinated process to establish the REZ

- Under a REZ model, the problems associated with an unpredictable connections regime are addressed using a coordinated process. Generators participate in a tender process to compete for an access right and specialised connections process. In return, they receive benefits in terms of cheaper connections due to scale economies, increased certainty during the connections/approvals process and improved investment certainty as they are entitled to access rights within the REZ.
- The process for developing a REZ could be established on a case-by-case basis, depending on the nature and risk profile of the REZ. This chapter outlines a regulated REZ development model. There is scope for a government and/or commercial REZ development model to incorporate elements of the regulated model.
- The capacity made available to generators via the tender process would be capped at a level that reflects the capacity of the transmission infrastructure within the REZ. Other generators would be able to connect to the REZ after the initial tender process, however they would need to do so in accordance with the REZ access regime. Options for REZ access regimes are discussed in Chapter 5.
- Where the regulated model applies, then the Rules would establish the identity of the party responsible for coordinating the development of the REZ (the REZ coordinator) and the process for developing the REZ. Their role could include:
 - specifying minimum requirements for parties participating in the REZ process
 - selecting the successful tenderers
 - returning surplus auction revenue to customers
 - providing information to help transmission planners assess whether future REZ stages should proceed.
- As part of this model, generators could contribute to the cost of the REZ's shared transmission infrastructure, as opposed to the infrastructure being funded (in almost all cases) exclusively by consumers.
- The ESB is considering what happens to pre-existing generators who are already progressing developments within a REZ chosen for development before work to develop a REZ commences. There is also a question as to how the interim REZ arrangements might apply to brownfields developments.

If the current access regime were to apply in the context of new transmission capacity built in accordance with the actionable ISP framework, then the capacity would be available to whichever generators are able to successfully complete their connection applications first.

In the absence of a coordination mechanism on the generation side, there is the risk of haphazard connections with generators racing to get connected as new transmission capacity becomes available. Investors would be exposed to the risk of an unpredictable grid connection process and associated delays in commissioning and to the investment decisions of other parties. There is also the risk of a lottery effect as developers attempt to anticipate the outcome of the transmission planning process.

At present, each generator connects on a piecemeal basis and funds its own dedicated transmission line, substation and (in some cases) system security assets. This approach is likely to be more expensive than a coordinated approach that takes advantage of economies of scale.

The proposals outlined in this chapter are directed towards mitigating the problems associated with an unpredictable grid connection process, by establishing a coordinated process for generator connections for a REZ. This chapter outlines a regulated REZ development model for stakeholder feedback.

The objectives of the ESB's regulated REZ development model are to:

- Overcome current problems associated with an uncoordinated connections process;
- Ensure that the group of projects that become part of the REZ (the REZ participants) is selected on a basis that aligns with the long term interests of consumers; and
- Reduce the level of risk and cost borne by customers.

The ESB seeks stakeholder views on the appropriateness of these objectives. The ESB's proposed measures for achieving these objectives are discussed below.

Governments or commercial parties may wish to invest in new renewable energy developments in excess of the minimum requirements that are reflected in the regulatory framework. Where REZs are being developed for policy reasons, the regulated REZ development model described in this chapter could provide a framework and level of national consistency.

If a REZ development is being driven by government policy, the government may also determine how its policy should be implemented. As noted in Chapter 2, some governments, including New South Wales and Victoria, are looking at options to build REZ developments independently of the RIT-T/ISP framework set out in the Rules. Similarly, if a REZ is a commercial initiative wholly funded by the private sector, the relevant issues should be resolved on a commercial basis.

However, governments or commercial parties might choose to incorporate elements of the regulated model (such as the role of the REZ coordinator) into their own arrangements. In particular, they might choose to adopt one of the access options discussed in Chapter 5. Other things being equal, aligned REZ development models have the potential to be simpler and easier to implement. However, there may be bespoke circumstances which make it appropriate to establish different arrangements for a given REZ.

4.1 Framework to coordinate connections

Objective 1

Overcome current problems associated with an uncoordinated connections process for a REZ.

The ESB proposes to establish a framework to coordinate connections. Rather than having the open access regime apply to the REZ, generators²² would participate in an auction or tender process in order to compete for the right to be a foundation generator within the REZ. The capacity made available to generators via the tender process would be capped at a level that reflects the hosting capacity of the REZ (see section 4.2.2). Other generators would be able to connect to the REZ after the initial tender process, however they would need to do so in accordance with the REZ access regime. Options for REZ access regimes are discussed in Chapter 5.

The current regulatory framework imposes no such requirement on new generators. Hence, for the REZ framework to be useful, generators need to be incentivised to participate. The benefits of successfully participating in a REZ tender process are:

- Cheaper connections due to scale economies
- Increased certainty during the connection and approvals process
- Improved investment certainty as they would receive access rights within the REZ.

The current uncoordinated approach to generator connections leaves potential for cost savings which can be harnessed via the REZ framework. Scale efficient connection and system security assets would be planned as part of the REZ design process (with scope for refinements as the technical characteristics of the participating generators become known). For instance, rather than each generator having their own substation and dedicated transmission line, generators could

²² The treatment of storage is discussed in section 5.2.

share substations with multiple bays. This approach would achieve substantial cost savings and reduce the community impact of the REZ.

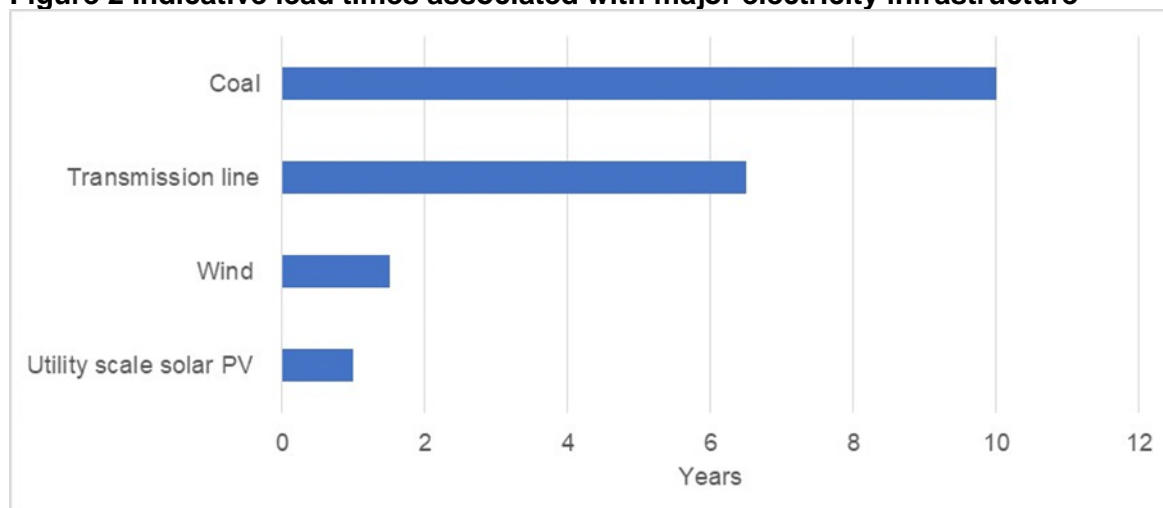
The National Electricity Rules already provides for scale efficient network connections,²³ which are intended to achieve a similar outcome. However, this framework has been almost unused to date because it relies on cooperation between commercial rivals, each of whom are trying to coordinate complex projects with many moving parts. The current Rules framework also makes it simpler and more profitable for transmission networks to manage generator connections on a case-by-case basis rather than to seek a scale efficient solution given that there are a natural monopoly.

The REZ framework addresses these issues by establishing an entity (the REZ coordinator – see Box 3) that is responsible for coordinating the connection of generators to the REZ as part of an integrated process that also involves the allocation of access rights. The objective of this process would be to allocate the new capacity associated with the REZ stage to a set of foundation REZ generators, in a way that delivers an efficient overall outcome. The ESB is considering a range of options for the form these access rights might take, as outlined in Chapter 5. Parties which have not successfully participated in the tender process are still allowed to connect in the REZ, however, they will not have access to the connection benefits or the access right framework.

The coordination approach will remove some of the issues with uncoordinated open access, however, it may also create other project risks for an investor to contend with. For example, investors' project development timelines may be dependent on the timeline of the REZ coordinator.

Due to the long lead time associated with transmission investment relative to variable renewable generation and storage, the ESB's initial thinking is that the tender process would occur after the REZ planning process, including the RIT-T.

Figure 2 Indicative lead times associated with major electricity infrastructure



Source: AEMO

Technological change means that variable renewable generation can be built much more quickly than the transmission it requires to gain access to market. It may be difficult for solar and wind developers to commit to a project in circumstances where the associated transmission will not be ready for many years.

²³ Information relating to the SENE framework is available on the AEMC's website at <https://www.aemc.gov.au/rule-changes/scale-efficient-network-extensions>

However, due to the iterative nature of the transmission planning process, there is still likely to be scope to refine the plans, particularly with respect to generator connection assets and system security infrastructure. The tender process would build on previous work undertaken as part of the transmission planning process in order to coordinate the network and supply side elements of the REZ.

Generators would have visibility up front regarding the technical requirements they need to meet in order to connect to the REZ as this would be established via the tender process. This would make the connection application process with the TNSP and AEMO straightforward and quick compared to the status quo. Generators may also have the opportunity to purchase a connection within a shared substation rather than having to each negotiate with the TNSP.

System security needs would be met on a centralised basis as part of the infrastructure associated with the REZ. This arrangement would align with framework set out in the AEMC's system strength investigation, with REZs being treated as a 'system strength zone' and being designed to accommodate a certain amount of generation.

The REZ itself is selected and planned using a process that involves significant community engagement. Hence, there would be clarity surrounding community needs and the matters that a developer would need to address to achieve social licence. If they wished, State and local governments could further enhance the benefits of a coordinated process by streamlining the environmental and planning approval process for certain REZs.

A key benefit of participating in a REZ tender process is that successful tender participants could be entitled to an allocation of access rights within the REZ which will mitigate congestion and constraint risk for developers. This is important because increased congestion risk and constraints placed on operational projects is a leading concern of energy investors.

Chapter 5 outlines a series of options for access rights that would give REZ participants confidence that their investment will not be undermined because of the REZ being overfilled.

Box 3 REZ coordinator

The ESB envisages a role for a body that has responsibility for coordinating the development of the REZ in accordance with a framework set out in the Rules (the REZ coordinator). A REZ coordinator may oversee cost and cashflows, hold a generator auction, allocate capacity to successful generators, and manage the access rights.

Given the benefits of a coordinated approach, the ESB proposes that the decision with respect to the identity of the REZ coordinator should lie with State governments.²⁴ In this case, the REZ coordinator could be defined in the Rules as the entity nominated by the relevant Minister. Governments could choose a different REZ coordinator for each REZ, depending on the circumstances. There are a range of bodies that a State government could nominate, each of which has advantages and disadvantages. Some examples are set out below.

Table 2 Options for REZ coordinator

REZ coordinator	Advantage	Disadvantage
TNSP (or JPB)	Enables close coordination with the development of the shared transmission network Local knowledge of the transmission network	Potential for conflict of interest.
AEMO	Financially independent party Transmission planning expertise	Less well placed to assess the local network and community impacts
Specialist government entity	Could be designed to have both expertise and independence	Cost of establishing a new entity.

The Minister might choose to appoint a jurisdictional entity to perform the role of REZ coordinator. For instance, this is the model adopted by the NSW government in its Energy Package, where the Consumer Trustee performs a role that is similar to that of the REZ coordinator.

The REZ coordinator would work with the relevant TNSP to develop plans for scale efficient connection assets and any associated system security infrastructure, having regard to the plans for shared transmission infrastructure set out in the REZ design report.

A key function of the REZ coordinator would be to undertake a selection process, preferably incorporating an auction, to decide which generators connect to the REZ. This selection process would be used to allocate access rights within the REZ to REZ participants (see Chapter 5). Depending on which access model is adopted, the REZ coordinator could also be responsible for managing the terms on which subsequent generators connect to the REZ (such as a financial access protection scheme – see section 5.2).

²⁴ The Rules already adopt this approach with respect to the identity of the Jurisdictional Planning Body.

4.2 Framework for selecting REZ participants

Objective 2

Ensure that the group of projects that become part of the REZ (the REZ participants) is selected on a basis that aligns with the long term interests of consumers

The ESB's initial view is that the REZ coordinator could be required to:

- establish minimum requirements for parties participating in the REZ process;
- select the successful tenderers based on certain criteria.

We are interested in stakeholder views on these requirements.

4.2.1 Minimum requirements to apply to REZ participants

In order to ensure that the coordinated process results in successful REZ developments that maximise the long-term benefits to consumers, the REZ coordinator may be required to establish certain minimum requirements that developers must meet in order to be eligible to participate in a REZ tender process. They would in any event be required to meet any obligations of the jurisdictional project development approvals process including any environmental and land use provisions. Project developers could be required to meet specified qualification criteria with respect to:

- geographic location – to provide clarity to potential project developers
- project finance – to ensure only genuine projects are awarded REZ participant status.
- technical performance – to maximise the REZ hosting capacity and minimise the risk of REZ participants experiencing technical problems during the connections process.

The REZ coordinator may need to establish a pre-qualifying round or multi-round auction to assess which combinations of development proposals could deliver the most efficient results. For instance, a cluster of generators may be able to share a single substation to deliver the new generation capacity at lower cost (and lower community impact) than a series of distant generators that each require a long, dedicated transmission line to connect to the transmission network. Conversely, the REZ coordinator may find it necessary to select generators that are a certain distance apart for system security reasons.

4.2.2 Select successful tenderers based on certain criteria

The Rules could specify the objective that the REZ coordinator should seek to achieve when selecting successful tenderer. The high-level objective could be that the REZ coordinator selects the suite of projects that promotes the long-term interests of customers, having regard to the combined costs and benefits of the generation, storage and network elements of the project.

One issue that would need to be resolved as part of the assessment process is the mix of generation technologies associated with the REZ. This issue will affect the extent to which the REZ aligns with the optimal development path set out in the ISP, since REZs are selected based on the quality of their wind and/or solar resources.

It also affects the hosting capacity of the REZ. The hosting capacity of REZ is higher if generators within the REZ have diverse output profiles compared to a set of generators who all seek to produce simultaneously. This has consequences for the allocation of access rights, as discussed in Chapter 5. The quantity of access rights made available as part of the tender process should align with the hosting capacity of the REZ.

Given these issues, it may be appropriate to establish a framework to ensure that the REZ delivers an optimal supply mix.

It would also be necessary to resolve the treatment of storage within a REZ. Storage differs from generation in that it can reduce congestion, so long as it receives the right market signals. Hence, there is a question as to whether the hosting capacity of the REZ should include storage, and the treatment of storage within an access regime. Under some access models, storage providers could potentially find it more profitable to connect on a non-firm basis. This issue is discussed further in section 5.2.

4.3 Measures to reduce cost and risk borne by customers

Objective 3

Reduce the level of risk and cost borne by customers.

Customers representatives have challenged the notion that they should bear all the costs of transmission investment, particularly where the purpose of the investment is to connect new generation.^{25,26} The ESB's initial view is that the REZ coordinator could be required to:

- provide information to transmission planners to enable them to assess whether the transmission investment associated with future REZ stages should proceed
- return net auction revenue to customers.

The effect of these proposals is that generators would make a competitively determined contribution toward the cost of REZ transmission assets, but customers would bear the residual risk of underutilisation within a REZ stage.

There will be a cost of administering the REZ – new roles for a new body, running auctions, managing access rights over time etc. How will these costs be funded will need to be considered.

4.3.1 Assessing the need for further REZ stages

The REZ Planning Rules²⁷ mitigate the risk of asset stranding by requiring the Jurisdictional Planning Body (typically the local TNSP) to consider options for the staging of REZ developments. Rather than constructing an entire REZ as one project, the development could be split up into more flexible stages that can be deferred or brought forward, depending on circumstances.

The REZ framework could further protect against the risk of asset stranding by linking the success or otherwise of preceding REZ stages to the development of subsequent REZ stages. This approach shares parallels with the approach applied to gas transmission investment. It would not change who funds the REZ, but it would mitigate the stranded asset risk borne by customers.

If a tender process associated with a REZ stage fails to generate anticipated revenues, then future stages of the REZ would be reassessed and potentially modified or ceased. This approach would protect against further expansion of an underutilised REZ, but it would not prevent underutilisation within the REZ stages that do proceed.

²⁵ Energy Users Association of Australia, Submission to ESB consultation on the draft REZ Planning Rules, September 2020. Available at: <http://www.coagenergycouncil.gov.au/publications/energy-security-board-renewable-energy-zones-planning-consultation>

²⁶ Major Energy Users, Submission to ESB consultation on the draft REZ Planning Rules, September 2020. Available at: <http://www.coagenergycouncil.gov.au/publications/energy-security-board-renewable-energy-zones-planning-consultation>

²⁷ See <http://www.coagenergycouncil.gov.au/publications/energy-security-board-renewable-energy-zones-planning-consultation>

This could be achieved by using the results of the tender process to recalibrate the inputs and assumptions in the ISP and RIT-T modelling, which could impact whether the next REZ stage progresses in accordance with the actionable ISP framework.

4.3.2 Auction revenue to be returned to customers

The ESB proposes that the REZ coordinator should be required to return surplus auction proceeds to TNSPs, who would be then be required to make a commensurate reduction in the TUOS charges paid by customers. In this context, “surplus” revenue means revenue in excess of the costs which are already borne by generators under the current regulatory framework, such as connection costs and the costs of system strength remediation.

This approach would offset the costs that consumers pay for to develop the REZ. The tender process would incentivise generators to submit offers that reflect the value that they place on being part of the REZ.

From a customer’s perspective, this approach may be a substantial improvement on the status quo because customers currently bear all the costs of prescribed transmission services. However, it would not provide certainty regarding the proportion or quantum of costs to be allocated to generators. If the REZ tender process yielded lower than expected revenues, then customers would receive a smaller discount on their TUOS.

The ESB considers that it is necessary for customers to bear some residual risk due to the mismatch in investment lead times between transmission and variable renewable generation infrastructure. This issue is discussed in section 4.1.

4.3.3 Alternative options for reallocating risk and cost

The ESB also seeks stakeholder views on whether there is merit in exploring models that potentially go further in terms of reallocating risk away from customers and allowing generators to drive transmission investment decisions, such as the one put forward by the Public Interest Advocacy Centre (PIAC).

Box 4 Overview of PIAC REZ model

Under the PIAC model, the cost and risk of investment in new and existing transmission for REZs could be shared between consumers, generators, transmission network service providers, and other investors. The amount apportioned to generators could be determined by the regulator or by government, and be based on a combination of:

- The value of access to the REZ for connecting generators, compared to the costs and risks incurred with the same investments being made under the current access arrangements at the time;
- The market benefits to consumers of the REZ being built, compared with the same investments being made under the current access arrangements at the time;
- Where the REZ is part of an interconnector or other transmission investment, the portion attributable to consumer or generator benefits; and
- Other policy objectives.

Direct recovery of capex up to the ‘efficient’ capacity (as specified in the ISP) would be apportioned between generators and consumers. If a speculative transmission investor considers that interest in a REZ may be more than the prescribed ‘efficient’ capacity level determined, then the transmission investor may fund this additional capacity and negotiate with generators as unregulated revenue. They could seek higher returns for this portion to compensate for the additional risk of investing in capacity without guaranteed cost-recovery.

For convenience, the relevant section of PIAC's submission to the Post 2025 Market Design Consultation Paper is extracted in Appendix C.

A key characteristic of the PIAC model is that it provides clarity up front regarding the allocation of costs. If investors were unwilling to fund their portion of the costs of the 'efficient' capacity level, then the investment would not proceed. In contrast, under the regulated model outlined in section 3.1, the contribution of generators is determined via a competitive process, with the remainder to be contributed by customers.

The ESB is considering whether there is merit in exploring hybrid funding models such as the one outlined by PIAC both in terms of who funds the investment, and how the decision on what to build is made. Our initial thinking on the advantages and disadvantages are set out below.

Advantages	Disadvantages
Better allocates the stranded asset risk associated with shared transmission assets	Increased complexity
Supports meshed network configurations for commercially funded assets	Promotes shift away from optimal development path set out in ISP
Integrates market drivers with transmission planning framework	Generator/speculative investor costs could be passed through to customers via wholesale market.
Reduces TUOS borne by customers	Creates disincentive to invest in the REZ relative to the rest of the NEM

The ESB notes that AEMC's discussion paper on REZs did not recommend the PIAC model on grounds that it would be susceptible to the current problems arising from the open access regime.²⁸ To mitigate this issue, the PIAC model could be applied in conjunction with one of the REZ access options outlined in the Chapter 4.

The PIAC model would involve significant changes to the existing regulatory framework. In particular, we would need to consider the potential impact of speculative investments to efficiency of market outcomes, and the economic regulatory assessments this may necessitate. If supported by stakeholders, the ESB would need to undertake further detailed design work and stakeholder engagement to develop the model.

The ESB notes that for radial REZ the AEMC has provided a framework for generators to drive and bear the risk of transmission investment through the dedicated connections asset (DCA) rule change. The discussion and potential changes discussed above may therefore only be necessary for meshed REZ. Further detail on the DCA framework is set out in section 2.3.

4.4 Treatment of pre-existing developments

The REZ framework would need to include provisions to describe what happens to developers who are already progressing developments within a REZ chosen for development before the new regulatory arrangements come into effect. There is also a question as to whether an existing generator could become part of a REZ.

The ESB's preliminary view is that the arrangements should aim to avoid disrupting genuine projects, while also ensuring that they do not incentivise gaming behaviour, such as the

²⁸ AEMC, Renewable Energy Zones Discussion Paper, October 2019. Available at: <https://www.aemc.gov.au/sites/default/files/2019-10/EPR0073%20-%20Renewable%20Energy%20Zones%20Discussion%20Paper.pdf>

premature submission of connection applications in order to gain preferential treatment. In practice, only a small proportion of prospective developments proceed.

The ESB's initial thinking is that pre-existing connection applicants should be subject to the open access regime unless they are selected to be part of the REZ in accordance with the REZ implementation framework (eg a tender process). Generators that have already reached a certain level of certainty (for instance, they are a committed project) at the time that the decision to proceed with a REZ stage is made would be treated as if they are already there for the purposes of the REZ planning framework, in which case the REZ coordinator would develop the REZ taking their project into account.

Generators that submit their connection application after the REZ design process has commenced would be taking a commercial risk. The ESB seeks views on how best accommodate pre-existing developments and options for setting a threshold to differentiate between pre-existing developments and developments that are expected to participate in the REZ process.

While the REZ framework is primarily envisaged as a way to coordinate new investment, there could potentially be circumstances where aspects of the REZ framework could be used as a mechanism to resolve problems on the established network.

If a group of generators are being constrained due to network limitations in their area, it may be economic to undertake network investment to alleviate the constraints. Subject to the relevant network configurations, generators who are willing to make a contribution their share of the costs required to the alleviate the constraints could get the benefit of the upgrade.

If the asset that needs to be upgraded forms part of the shared transmission network, generators currently rely on the transmission planning framework to deliver investments that meet their needs. This framework creates winners and losers among project developers, with little ability to manage the risk.

Questions for consultation

3. Do stakeholders agree with the proposed objectives for a regulated REZ development model?
4. Are there alternative, preferable options for deciding which generators become part of the REZ?
5. Which party is best placed to perform the role of REZ coordinator where the REZ is being developed in accordance with the regulatory framework? Should the decision regarding the identity of the REZ coordinator lie with the State government?
6. Are the functions to be undertaken by the REZ coordinator in the regulated model appropriate?
7. What, if any, qualification criteria should the REZ coordinator apply to prospective REZ participants?
8. What objective or objectives should the REZ coordinator should seek to achieve when selecting successful tenderer?
9. Should the Rules establish a framework to ensure that the REZ delivers an optimal supply mix?
10. Should regulated REZ developments be subject to a requirement that they may only proceed if a certain proportion of the planned capacity of the preceding REZ stage is subscribed?
11. Should the REZ coordinator return any surplus auction proceeds to customers in the form of a reduction in TUOS charges?

12. Should the ESB consider REZ models that allow for speculative investment that departs from the ISP, in order to reallocate risk away from customers, such as the one put forward by the Public Interest Advocacy Centre (PIAC)?
13. How should pre-existing developments be treated within a REZ framework? At what stage of development should a project be considered a pre-existing development?
14. Should the REZ framework contemplate brownfields developments? If so, should developers have the ability to influence the location and configuration of the REZ transmission assets within a brownfields REZ?

5. Options for access within a REZ

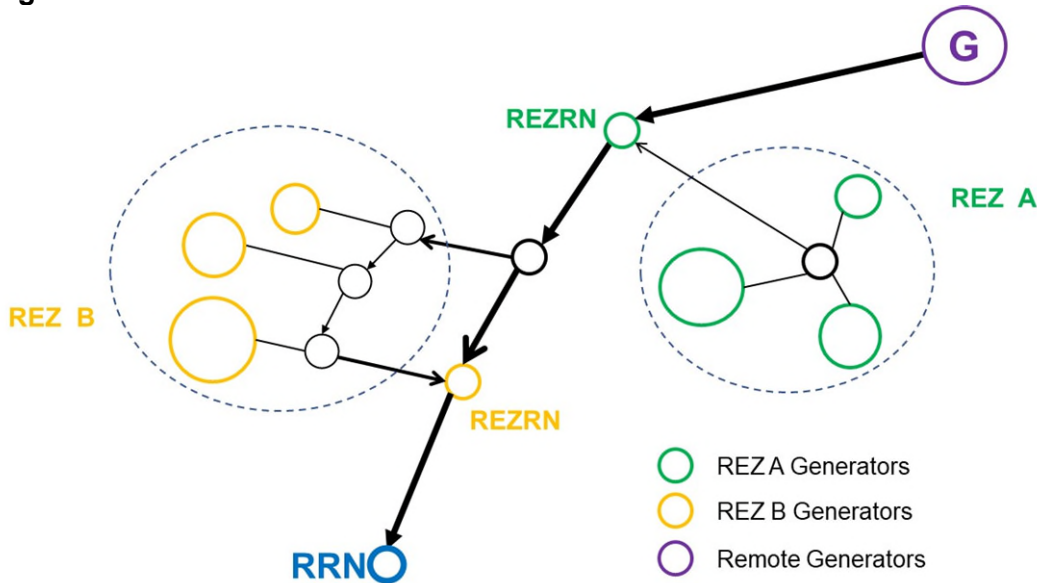
Key points

- Having set and filled the cap on capacity in a REZ, there is a need to maintain that cap in the future. It is therefore proposed that successful participants in the REZ tender process would acquire some type of access right. These rights would provide protection to REZ generators due to subsequent entry by new generators.
- This chapter describes four options for access within a REZ which leverage access rights:
 - Connection access protection model – New connection requirements could apply to subsequent connecting generators to maintain a defined level of power transfer capability for generators that participate in a REZ.
 - Financial access protection model – the REZ generator would be financially compensated for not being dispatched during periods of congestion by subsequent entrant generators within the REZ who were dispatched
 - REZ as a region – The REZ could be established as a separate NEM region, either using the status quo access and pricing arrangements, or with locational marginal pricing and financial transmission rights.
 - Early allocation of financial transmission rights – A congestion hedging mechanism would be made available exclusively to REZ generators. This model is dependent on the introduction of LMPs and FTRs at a known point in the future.
- An important consideration is whether the proposed access option creates incentives for efficient investment in, and operation of, storage.
- These options are designed to protect the access of REZ generators between their connection point and the point where the REZ connects to the main transmission network (the REZ reference node). It does not resolve issues arising between the REZ reference node and the regional reference node. As such, REZs provide only a localised solution to the problems associated with an open access regime.

The previous chapter describes how investors would bid in a REZ tender process to participate in a REZ. The type of access right and hence degree of access protection offered would need to be clear as a part of that auction. The access protections described in this chapter would be of value to successful developers as they would limit the extent to which they may be constrained over time due to subsequent generation entry causing worsening congestion or loss factors. Such constraints could occur due to additional generation entry either within the REZ or outside the REZ.

Access to the regional reference node can be thought of in two stages: from a generator's connection point to a REZ reference node, being the point at which the REZ interconnects to the main network; and from the REZ reference point to the regional reference node (RRN).

Figure 3 REZs and REZ reference nodes



Access between the REZ reference node and the regional reference node will primarily be affected by new generation locating within the REZ but will also be somewhat affected by new generation locating outside the REZ. The relative degrees of impact will depend upon the topology of the REZ and of the main transmission network.

This chapter outlines options to protect the access of REZ generators between their connection point and the REZ reference node. It does not resolve issues arising between the REZ reference node and the regional reference node. As such, REZs provide only a partial solution to the problems associated with an open access regime.

This document refers to generators that were successful in the REZ auction and acquired access protection will be referred to as REZ generators. Other generators, entering in the REZ without access protection, are referred to as subsequent entrants or new generators. As discussed section 4.4, there may also be pre-existing legacy generators in a declared REZ.

The purpose of establishing an access protection framework within a REZ is to improve the efficient use of the consumers' assets invested in the REZ, lower risks and incentivise generators to allocate resources into the REZ as opposed to other locations. The fundamental principle guiding the access protection is that subsequent entrants to a REZ should "do no harm" to REZ generators which have bid and acquired access rights, in the sense of degrading their access to the regional reference price: i.e. leading to poorer access to the regional reference price for the generators which have purchased access than they would have enjoyed had the new generator not entered in the REZ. Logically, this protection could be applied at the connection, dispatch or settlement stages. There are significant differences between these options in terms of their ease of implementation and impact on the market.

This chapter describes four options for access protections to be conferred on REZ generators that successfully compete in the tender process discussed in the previous chapter:

- Connection access protection model
- Financial access protection model
- REZ as a region
- Early allocation of financial transmission rights.

In evaluating these options, the ESB will consider:

- The extent to which the various models are likely to promote efficient power system operation, investment, and risk allocation.
- The practicality and deliverability of the options. As the interim solution to broader access reform, REZ solutions need to be able to be implemented in the short term and the associated costs.
- The impact of the option on efficient investment in, and use of, storage. Given its versatility and its ability to either relieve or worsen congestion, REZ frameworks need to be designed in a way that rewards storage for contributing to efficient overall outcomes.
- The extent to which the REZ option is consistent with actioning the ISP and the long term move towards an enduring access reform solution.
- The ability of the model to deal with potential complexities in some REZs including network loops and legacy generators.

The ESB seeks stakeholder views on the appropriateness of these evaluation criteria.

5.1 Connection access protection model

Under this option, subsequent connection risk could be addressed via an obligation on the network service provider to maintain a defined level of power transfer capability for generators that participate in a REZ. Local access protections would not affect dispatch or operation of the market but rather operate at the planning and new connection stage to ensure a defined level of transfer capability is available from the generator to a defined connection point on the backbone of national grid and close to the REZ.

The defined level of capacity for a REZ stage would be allocated as part of the REZ tender process (see Chapter 4). The local access protections would then be maintained through ensuring future connections elsewhere to the grid do not prejudice the ability of the network service provider to meet its obligations to REZ generators.

All applications for new or modified connections that were not one of the foundation REZ generators would need to be analysed to ensure that they do not impact significantly on transfer capability of REZ generators across the REZ. If they did, the applicant would need to fund remediation works to maintain that capacity or otherwise compensate generators who held rights to the capacity. These protections could apply for a pre-determined period, e.g. 15 years.

A “do no harm” arrangement at the connections stage already operates in the NEM in relation to system strength impacts. There are three key elements to this arrangement and, generally, to any such arrangement applied at the connection stage:

- Specifying in power planning terms, the level of transfer capacity to be provided and the specified conditions under which that is to be evaluated. The potential for a new generator seeking connection to do “harm” would be assessed in term of its impact on the specified transfer capacity under those conditions,
- Undertaking analysis relating to the connecting generator to see what harm, if any, it would cause. If it was determined to have a material impact, an assessment would be made of the remediation measures needed, and
- Requiring that the generator fund such remediation before it is permitted to connect.

Local access protections would be designed to apply only in the vicinity of the REZ in order to prevent egregious instances of free riding. The protections would therefore be limited (in that they would not guarantee that there would be no future impingement on the REZ generator’s access from generators connecting outside of the REZ) in recognition of their potential to impose

significant costs on subsequent connecting generators which could create a barrier to entry. As they are closely related to the physical network, it is also difficult to apply this method in broader areas or over longer time periods where the topology of the network might change.

Essentially, the mechanism would be designed to give investors in a REZ confidence that the REZ will not be overfilled. It would not provide a complete substitute for access rights, and a REZ generator's ability to access the regional price could still be affected by new generation developments beyond the outside the REZ and/or broader changes in network flows (for instance those arising due to changes in load or network configurations outside the REZ).

Assessment of the model

This model confers access protections on REZ generators by erecting substantial barriers to entry for subsequent generators within the REZ. As the access rights are physical in nature, they could, though, drive inefficient transmission investment,

Once the REZ auction connection process has occurred, any generator seeking to connect within the REZ, or in the vicinity of the REZ, that causes even small amounts of harm to the original REZ generators will be forced to pay the cost of the network expenditure required to prevent such harm. Due to the lumpy and costly nature of transmission infrastructure, this could result in significant expense to prospective generators.

Implicitly, once the subsequent generator has cleared this connection hurdle, it is free to bid and be dispatched how it wants and be paid in accordance with the status quo arrangements. So, the specification of the conditions under which 'do no harm' is assessed would either need to be comprehensive and consider a wide range of possible dispatch outcomes and network conditions or the REZ generator would need to accept some residual risk of congestion. The more conditions under which harm was assessed, the greater the limitations on any new generators connecting.

As has been seen with the system strength "do no harm" framework, there are significant problems around defining and analysing "harm" and developing and costing remediation options. These would likely arise in the REZ context too. In addition, the difficulties and administrative effort required to undertake such analysis would likely lead to significant delays in connections of new generators wishing to connect within a REZ. This model may involve high ongoing administrative costs, depending on how many subsequent entrants choose to locate within a REZ.

As this option is given effect via the connections regime, the operational incentives on storage would be the same as the status quo. In the absence of other local arrangements, this will limit investment in storage which would otherwise be efficient.

This option could coexist with long term access reform to LMPs and FTRs. The proposed local access protections are quite different to financial transmission rights. Rather, the local access protections model uses the connections regime to ensure that a defined amount of physical capacity is available as far as the REZ reference node.

As with the other options in this chapter, this option would only provide limited access to the regional reference node. REZ generators with access protection rights would still compete with generators outside of the REZ for limited capacity between the REZ and the regional reference node.

5.2 Financial access protection model

This option is also a “do no harm” model for REZ but implemented via changes to settlements (or via an ex post financial compensation mechanism).

In this option, the REZ generator would be financially compensated for not being dispatched due to congestion by subsequent entrant generators within the REZ that do not have access rights but who were dispatched. While this model could be given effect by changes to AEMO's settlements process, it would be possible to establish an offline compensation scheme that applies between generators connected to REZ. In this case, payments between parties would be calculated having regard to the outcome of the NEM settlements process. The compensation scheme could be managed by AEMO or by the REZ coordinator.

In the event of congestion, the compensation paid by the subsequent entrant generators to REZ generators would be equal to the regional reference price. Accordingly, subsequent entrant generators would be paid as follows:

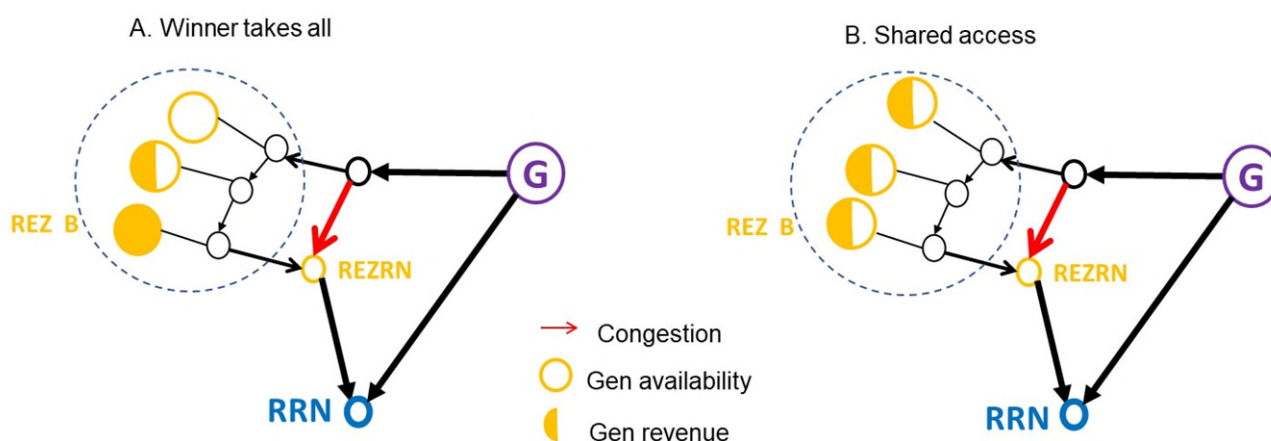
- *Regional reference price*: when no REZ generators are constrained off due to congestion
- *Zero*: when one or more REZ generators are constrained off due to congestion.

The compensation paid by the subsequent entrant generators to REZ generators would be equal to the regional reference price of the region in which the REZ is located – so that in total, they would receive nothing through settlement when there is congestion.

The ESB proposes a further innovation under this model in that REZ generators would share the revenue received through settlement in proportion to their availability (taking into account the availability of wind and solar resources). This revenue is made up of both the revenue received by those generators with access rights that were not constrained off, and the compensation paid by generators without access rights. This revenue would equal the regional reference price multiplied by the total quantity of generation dispatched from the REZ.

This avoids a problem under the status quo arrangements. On a loop, dispatch outcomes have a winner-takes-all characteristic, whereby the impact of congestion is felt entirely by the generator, or generators, on the “worst” part of the loop. Under this model, generators with access rights at locations that would otherwise be “winning” positions may actually get less total revenue than they would have under the status quo arrangements, because the revenue they receive from dispatch plus the compensation from generators without access is pooled and then shared in proportion to availability. Conversely, generators at positions that would previously been “losing” positions and that hold access rights would not be disadvantaged.

Figure 4 Outcomes on a loop flow during congestion – winner takes all vs shared access



Storage is a unique case in that it can function as both load and a generator. For this reason, it may be advantageous for it to choose not to have access rights. In the presence of congestion, when it charges, it can partially alleviate the congestion and allows additional generators to generate. In this case, it would be entitled to compensation, equal to the regional reference price, funded by the additional revenue received collectively by the additional generation from the REZ. In effect, it would be able to charge for free in the presence of congestion. In the absence of congestion, it would receive the regional reference price. The options for the treatment of storage under a settlements-based approach are discussed in more detail in the boxed text (next page).

In summary, under the financial access protection model:

- When there is no congestion, everyone within the REZ (storage and generators) would be settled at the regional reference price
- In the presence of congestion:
 - Storage within the REZ without access rights would pay zero to charge (and receive nothing when discharging – if they chose to for whatever reason)
 - Generators within the REZ without access rights that were dispatched would receive zero for any generation
 - Generators within the REZ with access rights (regardless of whether they were dispatched or not) would receive a share of the total revenue received (ie, the RRP of the region in which the REZ is located multiplied by all dispatched generation from the REZ). This share would be in proportion to their available capacity or some other metric.
- Generators and storage outside of the REZ would be unaffected. They would continue to be settled at the RRP on their dispatched quantity.

Box 5 Treatment of storage

Storage impacts on the network like a generator when it is discharging, and like a load when it is charging. Access arrangements need to be specified for both modes.

As a subsequent entrant generator, storage could be treated exactly as any other generator. For instance, under the settlement do no harm option, storage could simply avoid compensation by not discharging during periods of congestion. This is efficient for the market as a whole: it would be unnecessary and inefficient for storage to be discharging, and using up its valuable stored energy, if this just causes a variable renewable generator with zero operating cost to be constrained off.

It would also, in general, be suitable for the storage owner itself, because the REZ congestion will typically occur during periods of high renewable output and so low regional prices. Only in unusual conditions – eg transmission outages – would REZ congestion coincide with high prices. So, a storage owner would see little detriment from being non-firm as a generator; only missing out on high prices in those rare circumstances.

If storage *charges* during a period of REZ congestion, this helps – rather than harms – REZ generators, by allowing their dispatch to be increased and their RRP revenue to be increased accordingly. For example, consider a REZ whose output is constrained to 1000MW in aggregate due to congestion. If a REZ-located storage charges at 100MW, this is likely to allow aggregate generation to be increased to 1100MW.

In this scenario, it would make commercial sense for REZ generators that receive the benefit to share some of it with the storage owner, to encourage them to charge when they might otherwise not. For example, the RRP might be \$50 at the time, too high for the storage owner to want to charge. If the REZ generator agreed to pass on \$40 of the benefit to the storage – effectively allowing it to charge up at a price of \$10 – that might encourage it to charge up, providing a win-win.

The question, then, is how this effective storage charging price should be set. One option is that storage could be treated the same as a subsequent entrant generator:

- If there is congestion, the storage owner faces a price of zero, whether it is charging or discharging.
- If there is *no* congestion, the storage owner faces a price of RRP, whether it is charging or discharging;

This approach reduces uncertainty for REZ generators, by leaving them financially indifferent to whether storage charging is dispatched or not. This would be particularly significant at the REZ tender stage, when generators would be uncertain whether storage might enter the REZ and would prefer not to have to factor storage assumptions into their bids.

The opportunity to charge at zero during congestion might provide a substantial commercial benefit. It is plausible – albeit not certain – that any storage operator would *prefer* non-firm access to firm access. If this can be assumed – that there is no firm storage – this simplifies the access arrangements, because there is no need to consider how much a firm storage owner should be compensated if they are constrained off.

Assessment of the model

This model would protect foundation REZ generators from the financial impact of subsequent generators within the REZ. As the rights conferred are financial in nature, it does not give rise to inefficient transmission investment or the risk of volatile operational outcomes.

In the presence of congestion, generators without access rights would be indifferent to being dispatched or not. They would face a risk that has similarities to the volume risk that generators face under the status quo; i.e. during periods of congestion, they may not get paid. The rule that REZ generators are paid zero during periods of congestion is a simplifying assumption. It seems a reasonable assumption to make given that affected generators are likely to be variable renewable generators, and hence all sharing low-to-zero marginal costs. While there may be some efficiencies to be gained by an approach that more accurately reflects the marginal costs of generators within the REZ, the additional complexity could outweigh the benefits.

Foundation REZ generators would still be incentivised to disorderly bid during periods of congestion as they would be competing with other generators outside the REZ.

The model provides good operational signals to storage. Storage operators would be incentivised to charge when it is efficient to do so in the presence of congestion, and hence allow more cheap and renewable energy to ultimately get to market once the congestion is alleviated and the storage is able to discharge and be paid the regional reference price.

While these access rights would entitle REZ generators to compensation from subsequent entrants, it would not compensate them for being constrained off because of generators being dispatched outside of the REZ (whose access rights remain unchanged). The limited nature of the access protections would be reflected in the price that REZ generators are willing to pay for those protections as part of the REZ tender process.

The risk and cost of congestion caused by subsequent connecting generators within a REZ would primarily be borne by the new generator. They would either have to purchase access rights or compensate generators within the REZ that hold access rights for being constrained off.

This model could be given effect via an offline compensation scheme that reallocates funds between generators within a REZ. While the ESB has not yet undertaken a detailed assessment of the cost and timing of implementing the model, it seems likely it would be relatively straightforward, and able to be implemented in the short term as part of an interim solution.

5.3 REZ as a region

This model for REZ pricing and access utilises the existing process for changing the regional boundaries in the NEM for wholesale settlement to create REZ regions. As per section 2A of the NER, a region change may be made by region change application to the AEMC by a registered participant or AEMO. Upon the determination to proceed with a REZ, a specific region would be created encompassing the REZ area. Locational marginal pricing would apply within the region and REZ generators would hold financial transmission rights within the REZ region to the REZ regional reference node. These would apply in the REZ region in advance of the wider introduction of locational marginal prices and financial transmission rights elsewhere across the NEM.

While a new NEM region could be established for each REZ, in accordance with the framework set out in Chapter 2 of the National Electricity Rules without locational pricing, this would not provide any rights to REZ generators or a process to fill the capped capacity of the REZ. Generators in the REZ would also receive the local REZ reference node price which is likely to be lower than the current regional reference price which all other generators would receive. Hence, this approach would be likely to deter rather than attract generators from participating in a REZ and the ESB does not consider it further.

The 'REZ as a region' model would introduce new access and pricing arrangements to the new REZ region. All scheduled and semi-scheduled participants within the new region would face their LMP, with all non-scheduled participants facing their regional reference price determined to be either the locational marginal price at the newly determined regional reference node, or the volume-weighted average price within the region. Participants in the new region would also be able to purchase FTRs to hedge basis risk between their locational marginal price and the regional reference price of the new region they are located in. The existing settlement residue auctions would continue to be used to manage inter-regional (i.e., between REZ and the rest of the NEM) congestion risk.

Under this model, generators that successfully participate in the REZ tender process would receive FTRs to hedge intra-regional price risk that occurs in the presence of congestion. These FTRs would be available to hedge price risk between the LMP of a generator located in the REZ and the regional reference price for their region, which would be either the LMP at the regional reference node, or the volume weighted average price. This would incentivise generators to connect early within the REZ to acquire the FTRs for sale, rather than connecting later and having to buy FTRs through secondary trade.

Inter-regional risk management would continue to be conducted through the existing settlement residue auction framework, as it is very difficult to implement inter-regional FTRs between one region that has implemented LMPs/FTRs and one that hasn't.

Assessment of the model

While foundation REZ generators receive the benefit of FTRs under this model, this is unlikely to be sufficient to attract generators to a REZ.

In the presence of congestion, prices within the new REZ region are likely to be lower than the regional reference price in the surrounding region given the likely outcome that REZs would generally be exporting to the surrounding region, and due to the continued incentives for disorderly bidding outside of the REZ. This would incentivise generators to locate outside the REZ, seemingly undermining the purpose of the REZ.

This option would also be difficult to implement within the required timeframes for it to be useful as an interim solution. It is likely to involve substantial implementation costs as it would require the elements of an LMP/FTR model to be applied within the REZ region and would require reconfiguring the whole NEM model in dispatch and settlements.

5.4 Early allocation of financial transmission rights

This model proposes the introduction of a congestion hedging mechanism exclusively for new entrants that locate inside a REZ.

Central to this model is the pre-determined introduction of LMP and FTRs for all scheduled and semi-scheduled market participants, both inside and outside of the REZ, at a specified future date as part of the enduring access reform model. Under this model, REZ FTRs would be sold as part of the REZ tender process, ahead of the introduction of LMP. These auctions would take place in advance of the proposed enduring access reforms (i.e. earlier than the 'standard' auctions for financial transmission rights). While the FTRs provided would have no effect initially, pre-selling REZ FTRs in this way would provide certainty for investors knowing these had been locked in. The REZ FTRs would start operating after the introduction of LMP and after the associated new REZ infrastructure is built and operational.

A REZ FTR would entitle the holder to receive the price difference²⁹ between the LMP at their connection point and the LMP at the REZ reference node. The FTRs would be backed by the congestion settlements residue (i.e. the difference between what load pays and generators are paid for the same energy that arises as a result of this price separation).

Accordingly, a REZ FTR will effectively hedge congestion within the REZ, but not congestion between the REZ and other parts of the NEM. This is because this option is intended to resolve REZ-specific access issues, by allowing connecting participants to better manage their risk within the REZ. This model is not intended to resolve broader access issues.³⁰

The REZ FTRs would be financial, not physical (such as the connection access protection model), which is preferential from an efficiency point of view. New generators would have a right to connect to the transmission network within the REZ, (subject to meeting connection requirements) but would be exposed to local prices when congested and have no FTRs to manage that risk.

This approach would require the number of FTRs available within the REZ to be linked to the capped capacity to be auctioned as part of the REZ implementation process. This option requires that the design of the ultimate access regime needs to be known including the definition of an FTR and how the volume of FTRs is calculated so that it can be applied albeit within the targeted and geographically limited context of a REZ. Implementation timelines will need to be further tested with AEMO and market participants.

The term of the REZ FTRs is to be determined, but it is expected that they would be long-term rights (e.g. 15 years). As the REZ infrastructure will be clearly defined and 'known' at the time the auction is held, and the FTRs will relate only to congestion within the REZ, this may support longer term FTRs than could feasibly be made available for the remainder of the network.

²⁹ The access right could be an obligation instrument, which would entitle the holder to receive payment for any positive price difference, but also entitle the holder to make a payment for any negative price difference. Alternatively, the instrument could be an option, which pays out only on positive price differences (i.e. the holder would never be required to pay into settlement).

³⁰ REZ generators would be able to manage congestion between the REZ reference node and other parts of the shared network through the standard purchase of FTRs, as described in the AEMC's interim report of transmission access reform (September 2020). Available at: <https://www.aemc.gov.au/market-reviews-advice/coordination-generation-and-transmission-investment-implementation-access-and>

Assessment of the model

This model is dependent on the introduction of LMPs and FTRs at a known point in the future. As such it has the potential to promote efficient operation and investment, and risk allocation within the REZ.

The ESB recognises that many stakeholders are opposed to the LMP/FTR model due to complexity, uncertainty, and increased risk for generators. To the extent that there is uncertainty regarding the nature, timing and value of FTRs under the long term access model, this would flow through into the REZ framework, making it difficult for tenderers to value the rights they expect to receive. This model would be more complex to introduce than the other models discussed in this section.

5.5 Conclusions

The successful implementation of REZs will require the setting of a capped capacity for the REZ, a process to allocate that capacity to interested parties and some form of access right or protection to protect those participants in the REZ from future connections eroding their access. Four options have been set out to provide an access right to REZs established in the near future. None of the options for access rights outlined in this chapter compensate REZ generators for being constrained off as a consequence of generators being dispatched outside of the REZ (whose access rights remain unchanged).

Generators that choose to connect outside the REZ would avoid the cost of the access rights or the compensation payments that would be required if they connected within the REZ. In turn, this would reduce the benefits to the REZ generators of holding the rights.

The limited nature of the access protections would be reflected in the price that REZ generators are willing to pay for those protections as part of the REZ tender process. This limitation could reduce the perceived value of participating in the REZ, and hence the value of the REZ model in providing locational signals to generators.

Given the difficulties associated with a localised solution, the ESB is considering how to transition in the longer-term towards an enduring access solution as discussed in Chapter 6.

Questions for consultation

15. Are the evaluation criteria set out in the introduction to Chapter 5 appropriate?
16. Which option for access within a REZ is preferable?
17. Are there alternative options that the ESB should consider?
18. Are there potential improvements to the options that the ESB should consider?
19. If the ESB were to adopt one of the access options outlined in this chapter, would it be necessary to restrict connections outside of REZs?
20. If the ESB were to adopt the financial access protection model, should it also adopt measures to avoid winner takes all outcomes?
21. If the ESB were to adopt the financial access protection model, should subsequent connecting generators be required to provide compensation that reflects the regional reference price?
22. If the ESB were to adopt the financial access protection model, how should financial compensation be allocated between REZ generators? Is generator availability an appropriate metric?

6. Transition to a whole of system solution

Key points

- A stand-alone REZ model that applies only on a localised basis will not be fit for the future.
- It will be particularly important to establish a mechanism that can efficiently manage congestion across the grid, as periods of congestion are a permanent feature of a high variable renewable energy power system.
- The ESB is developing a set of reforms that could build on the REZ model to provide a stepping-stone towards the long-term, whole of system access solution. These reforms will be designed to mitigate the concerns raised by stakeholders.
- The ESB will consider these reforms in early 2021. Ideally, the transitional solution could be implemented on a timetable that is designed to be compatible with the other post 2025 market design reforms.

The access options outlined in the preceding chapter provide a localised solution to the problem of network congestion. However, the access of generators within the REZ will also be affected by events outside the REZ. While REZ generators would have rights that give them precedence over subsequent connecting generators within the REZ, they may still face constraints between the REZ reference node, their regional reference node and other regions. As the power system evolves and more REZs are implemented, congestion outside the REZ can be expected to become more common and impact on dispatch outcomes of generators within the REZ. The ESB considers that a stand-alone REZ model, without additional reform, will not be fit for the future.

The introduction of a REZ framework may help to incentivise generators to invest in locations regarded as efficient from a whole of system perspective, which is a key objective of access reform. However, in the absence of further measures, REZs will not help to resolve the efficient management of congestion in operational timeframes. The transmission network recommended by the ISP is an efficient grid, not an uncongested grid. The efficient level of network congestion increases in line with the increasing penetration of variable renewable energy. As a result, costs associated with race to the floor bidding and counter-price flows across interconnectors can be expected to increase.

For these reasons, the ESB is considering how to build on the REZ model in order to provide a stepping-stone towards the long-term, whole of system access solution. This work is designed to mitigate the elements of the LMP/FTR model that stakeholders found concerning, namely, the risks in transition and the impact on existing contracts. It would also be applied across the NEM, thus overcoming the problems associated with the localised nature of REZs.

The ESB will consider the transition to a whole of system access solution in early 2021. Ideally, the transitional solution could be implemented on a timetable that is designed to be compatible with the other post 2025 market design reforms. Alignment with the longer-term direction would also be important in choosing the preferred option for REZ implementation. However, the interim REZ option chosen would be designed to be able to be implemented in the near future on a stand-alone basis.

A Summary of consultation questions

No.	Issue
Question 1	Are REZs an appropriate interim solution to the challenges associated with open access?
Question 2	What are the likely consequences of a framework that addresses these challenges on a localised rather than a system wide basis?
Question 3	Do stakeholders agree with the proposed objectives for a regulated REZ development model??
Question 4	Are there alternative, preferable options for deciding which generators become part of the REZ?
Question 5	Which party is best placed to perform the role of REZ coordinator where the REZ is being developed in accordance with the regulatory framework? Should the decision regarding the identity of the REZ coordinator lie with the State government?
Question 6	Are the functions to be undertaken by the REZ coordinator in the regulated model appropriate?
Question 7	What, if any, qualification criteria should the REZ coordinator apply to prospective REZ participants?
Question 8	What objective or objectives should the REZ coordinator should seek to achieve when selecting successful tenderer?
Question 9	Should the Rules establish a framework to ensure that the REZ delivers an optimal supply mix?
Question 10	Should REZ developments be subject to a requirement that they may only proceed if a certain proportion of the planned capacity of the preceding REZ stage is subscribed?
Question 11	Should the REZ coordinator return any surplus auction proceeds to customers in the form of a reduction in TUOS charges?
Question 12	Should the ESB consider REZ models that allow for speculative investment that departs from the ISP, in order to reallocate risk away from customers, such as the one put forward by the Public Interest Advocacy Centre (PIAC)?
Question 13	How should pre-existing developments be treated within a REZ framework? At what stage of development should a project be considered a pre-existing development?
Question 14	Should the interim REZ framework contemplate brownfields developments? If so, should developers have the ability to influence the location and configuration of the REZ transmission assets within a brownfields REZ?

Question 15	Are the evaluation criteria set out in the introduction to Chapter 5 appropriate?
Question 16	Which option for access within a REZ is preferable?
Question 17	Are there alternative options that the ESB should consider?
Question 18	Are there potential improvements to the options that the ESB should consider?
Question 19	If the ESB were to adopt one of the access options outlined in this chapter, would it be necessary to restrict connections outside of REZs?
Question 20	If the ESB were to adopt the financial access protection model, should it also adopt measures to avoid winner takes all outcomes?
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B Abbreviations and Technical Terms







AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
CBA	Cost Benefit Analysis
COAG EC	Council of Australian Governments Energy Council
COGATI	Coordination of Generation and Transmission Investment
ECA	Energy Consumers Australia
ESB	Energy Security Board
FTR	Financial Transmission Right
JPB	Jurisdictional Planning Body
LMP	Locational Marginal Prices
NEL	National Electricity Law
NEM	National Electricity Market
NER	National Electricity Rules
NSCAS	Network Support and Control Ancillary Services
NTNDP	National Transmission Network Develop Plan
PIAC	Public Interest Advisory Centre
REZ	Renewable Energy Zone
RIT-T	Regulatory Investment Test for Transmission
TNSP	Transmission Network Service Providers
TUOS	Transmission Use of Service

C PIAC model for REZ funding

The following text is an extract from PIAC's submission³¹ to the ESB's Post 2025 consultation paper, which was also endorsed by the signatories to the joint ACOSS submission³². It is presented for convenience and does not represent the views of the ESB.

PIAC has developed a model for how the cost and risk of investment in new and existing transmission for Renewable Energy Zones (REZ) could be shared between consumers, generators, transmission network service providers, and other investors. It is summarised in Figure 4 and described in more detail below.

Figure 4 Summary of the PIAC risk sharing mode for Renewable Energy Zones

 Identify REZ	<ul style="list-style-type: none"> • Initiated by AEMO, government or industry • Indicative capacity and location/s determined • Network options for design determined
 Design transmission	<ul style="list-style-type: none"> • Market testing of prospective generators • Planning and approval processes commence • Specify prescribed capacity • Apportion capex to generators and consumers
 Choose investor	<ul style="list-style-type: none"> • Contestable tender or reverse auction process • One or more transmission options • Lowest bid rate of return selected • Develop revenue and access proposal
 Determine revenues	<ul style="list-style-type: none"> • Capex for TNSP and speculative investor • Opex for TNSP • Connection charge cap for generation
 Build and operate	<ul style="list-style-type: none"> • TNSP builds and operates network • Generators build and operate generation
 Connect generation	<ul style="list-style-type: none"> • Generators pay connection charge • Charge per MW paid to speculative investor • Earlier payment reduces charge

³¹ PIAC submission to the Post 2025 Market Design Consultation Paper, September 20205. Available at: <http://www.coagenergycouncil.gov.au/sites/prod.energycouncil/files/publications/documents/PIAC%20Response%20to%20P2025%20Market%20Design%20Consultation%20Paper.pdf>

³² Joint ACOSS submission to the Post 2025 Market Design Consultation Paper, September 20205. Available at: <http://www.coagenergycouncil.gov.au/sites/prod.energycouncil/files/publications/documents/Joint%20ACOSS%20Response%20to%20P2025%20Market%20Design%20Consultation%20Paper.pdf>

Core to the PIAC model is that the recovery of capex is split between generators and consumers, rather than just borne by consumers, with the amount apportioned to generators funded by a speculative investor. This amount could be determined by the regulator or by government, and be based on a combination of:

- The value of access to the REZ for connecting generators, compared to the costs and risks incurred with the same investments being made under the current access arrangements at the time;
- The market benefits to consumers of the REZ being built, compared with the same investments being made under the current access arrangements at the time;
- Where the REZ is part of an interconnector or other transmission investment, the portion attributable to consumer or generator benefits; and
- Other policy objectives.

Under PIAC's model, feasible prospective REZs, including any necessary supporting network investments, are identified through the existing ISP process by AEMO, industry or government. A detailed design stage, incorporating a RIT-T or equivalent process, determines the optimal attributes for a given REZ, and selects one or more network design options that are best suited to support efficient investment and market outcomes. This stage includes market testing with prospective generators, investigation of planning approvals, and estimation of capex for different network options. A variety of sources of information should be considered to minimise the risk associated with speculative investment.

A key attribute determined in the detailed design stage is a prescribed 'efficient' capacity level, expressed as the firm/maximum physical capacity of new generation supported by the REZ. This attribute will reflect a number of factors, including:

- The level and certainty of current generation market interest in and near the proposed REZ, and the current state of the generation investment market more broadly.
- The potential future investor interest in and around the REZ, considering the nature of the energy resource, planning opportunities and constraints, government energy and planning policy, and anticipated energy market conditions.

The function of the efficient/nominal capacity level is described in the following section on risk and cost sharing.

During the design stage, direct recovery of capex up to the 'efficient' capacity is apportioned between generators and consumers. The risk sharing basis for this apportioning is described in the following section on risk and cost sharing.

A contestable process, such as a tender or reverse auction, is conducted to choose an investor to fund the speculative portion of the capital spend associated with the REZ. The successful bidder is chosen on the basis of the lowest rate of return offered. This portion is ultimately recovered from connecting generators via connection charges. The remaining capex, and all opex, is rolled into the RAB of the incumbent TNSP and recovered from consumers via conventional TOUS charges.

The AER approves all revenue up to the 'efficient' capacity, including the cap on generator connection charges, before the REZ is built.

The TNSP builds and operate the new and augmented transmission network assets required for the REZ. Assets may be built in stages to manage costs and finance impacts.

New generators that connect to the REZ pay a connection charge to recover the costs of the speculative investor. This could be paid at any time between when the REZ revenue is

determined and the generator is connected. By avoiding some of the speculative rate of return, earlier payment of connection charges could lower connection costs for the generator.

For ease and feasibility of implementation, the model should use elements of current arrangements as far as practicable. These include:

- the generator connection process and charge structure;
- mechanisms to allocate transmission use of service (TUOS) charges to consumers; and
- regulatory processes and governance measures.

Cost and risk sharing

Under PIAC's REZ model, risks and costs are shared between multiple parties based on the principles that beneficiaries should pay and risks should be allocated to those best placed to manage them.

The costs allowed to be recovered for investment up to the prescribed 'efficient' capacity would be regulated. Their recovery apportioned between:

- Generators. This portion is funded by a speculative investor and recovered directly from connecting generators via connection charges; and
- Consumers. This portion is rolled into the RAB of the incumbent TNSP and recovered directly from consumers via conventional TOUS charges.

If the generation and transmission investments enabled through the speculative investment prove to be efficient and prudent, these costs will ultimately be passed through to consumers as well. The revenue from this investment up to the prescribed 'efficient' capacity would be shared between:

- The incumbent transmission network service provider. This portion of the cost of investment would be recovered from consumers in a manner similar to how transmission network service providers currently recover shared network costs.
- The speculative transmission investor. This portion would be recovered from generators who would pay a connection charge to connect to the renewable energy zone. The connection charge would be proportional to the generator's capacity and how early they connected. That is, at any given point in time, the cost for generators to access prescribed capacity would be a fixed rate in terms of \$/MVA. The rate paid by generators would increase with time according to a speculative rate of return escalation factor.

If a speculative transmission investor considers that interest in a REZ may be more than the prescribed 'efficient' capacity level determined, then the transmission investor may fund this additional capacity and negotiate with generators as unregulated revenue. They could seek higher returns for this portion to compensate for the additional risk of investing in capacity without guaranteed cost-recovery.

Value proposition

Under the PIAC model, generators are protected from the risk of REZ underutilisation and timing misalignment between different generation projects. In lieu of bearing these risks, generators effectively pay a rate of return premium to TNSPs, who bear some of the timing risk. Generators are incentivised to reduce this risk by connecting, or at least paying to connect, earlier.

Speculative transmission investors thereby voluntarily take on underutilisation risk for their portion of investment costs, and receive an uplift in their rate of return for doing so.

The incumbent TNSP is protected from the risk of asset stranding as their costs are recovered from consumers under normal arrangements, but they are free to bid for the contestable speculative investment.

At the same time, the PIAC model reflects consumers have little or no ability to manage the risk of underutilisation or asset stranding in REZs and are not direct beneficiaries of generator connection assets. The speculative investment represents value for consumers because it prevents inefficient transmission investment and a less competitive wholesale market from being fully socialised to consumers.

Consumer exposure to the risk of underutilisation is capped at a fixed, limited portion of the investment value. This limits their liability, relative to current arrangements, under the 'worst case' where utilisation is low. If the generation and transmission investments enabled through the speculative investment prove to be efficient and prudent, then consumers will benefit and these costs will effectively be passed through to them through the wholesale market.

Government has the option of taking on some underutilisation risk by underwriting some portion of the capex for prescribed capacity.

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