TRANSMISSION ACCESS REFORM DIRECTIONS PAPER

TECHNICAL FORUM

5 December 2022

ACKNOWLEDGEMENT OF COUNTRY

THE ENERGY SECURITY BOARD ACKNOWLEDGES AND PAYS RESPECT TO THE PAST, PRESENT AND FUTURE TRADITIONAL CUSTODIANS AND ELDERS OF THIS NATION, AND THE CONTINUATION OF CULTURAL, SPIRITUAL AND EDUCATIONAL PRACTICES OF ABORIGINAL AND TORRES STRAIT ISLANDER PEOPLES.

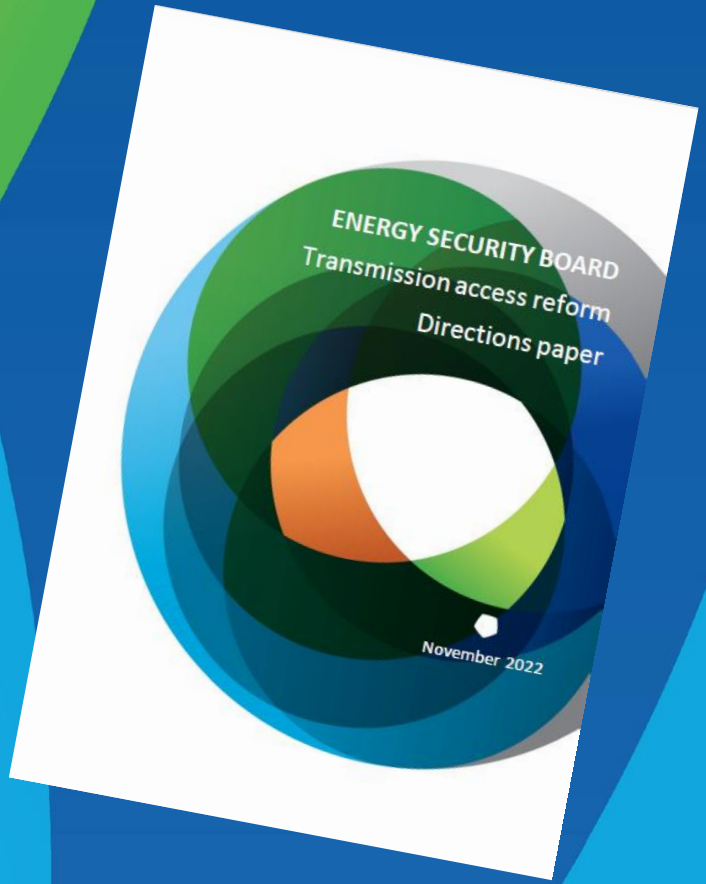
WELCOME

Purpose of session

- Provide an overview of the Directions Paper
- Describe process going forward
- Give stakeholders the opportunity to ask questions/ provide initial views

Agenda

- Context
- Key design choices - operational timeframes
- Key design choices - Investment timeframes
- Next steps



CONSEQUENCES OF FAILING TO ACT ON ACCESS REFORM

Unnecessary investment in generators and storage that are poorly located to be dispatched. Subsequent connections can render neighbouring projects unviable.

Investments are poorly targeted

Investment is more expensive than it should be because the additional risk and uncertainty adds to the cost of capital faced by generation investors.

Investments are more expensive due to systemic risks

Storage can help to reduce congestion costs, but it is not paid to do so. Storage providers lose a potential value stream, and the NEM loses an important tool to manage congestion.

Lost opportunity to benefit from storage

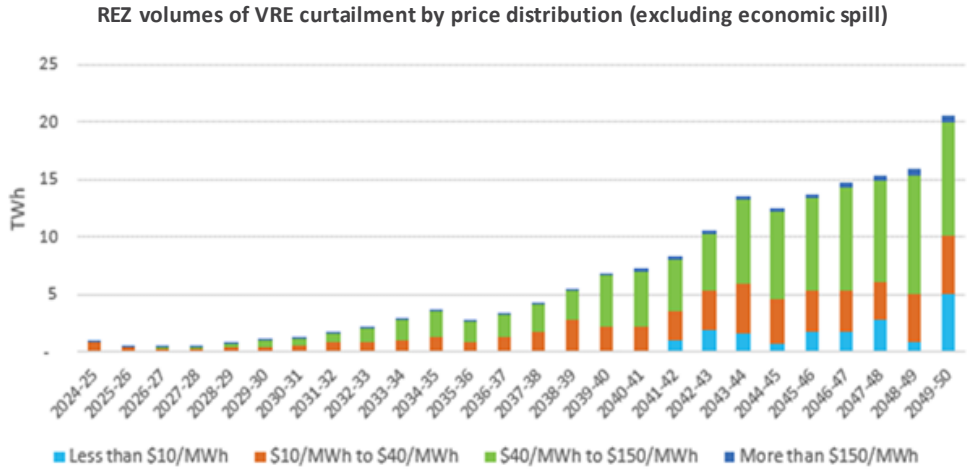
If generators and storage locate in the wrong place, a larger transmission system is needed to transport energy from sources of supply to load.

Additional transmission expenditure

In operational timeframes, more expensive combinations of generation and storage are being used to meet demand than is necessary.

More expensive dispatch outcomes

WE NEED TO GET GOOD AT MANAGING CONGESTION



Source: ESB analysisof 2022 ISP data

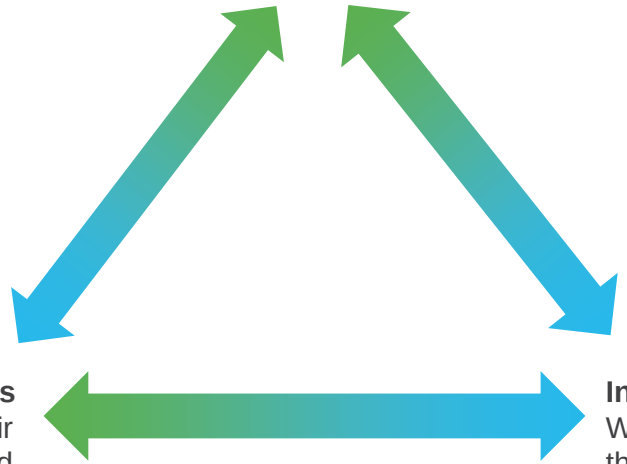
- Current market design leads to curtailment above efficient levels
- Congestion management reform aims to deliver efficient level of curtailment

- At the same time, efficient level of curtailment is going up.
- Even with reform, both the level and cost of congestion is likely to increase.
  - Costs will be even higher if we don't act.

DIVERGENT INTERESTS PREVENTS CONSENSUS

- Transmission capacity is a scarce resource
  - Building transmission is expensive and impacts communities
  - Congestion is a normal feature of a high VRE power system
- How do we decide which generator gets access when there is not enough transmission to go around?

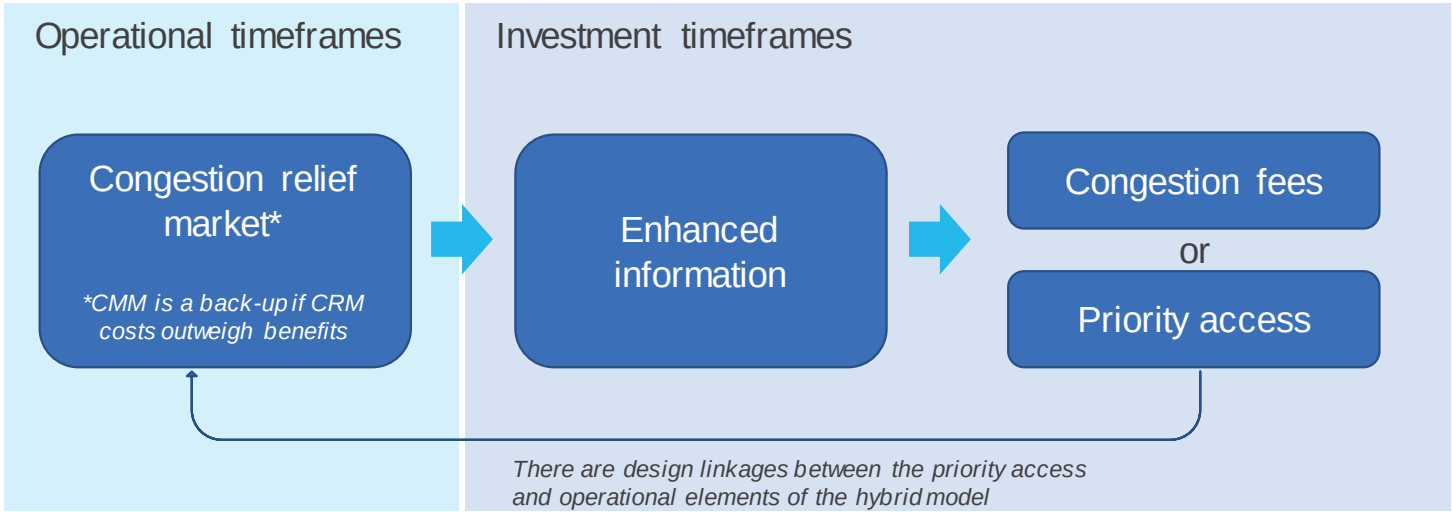
Customers
Currently pay for transmission, so they would prefer that access is given to the generators that are prepared to pay the most.



New entrants
Want to connect their projects to the grid and get access, but they don't want to pay.

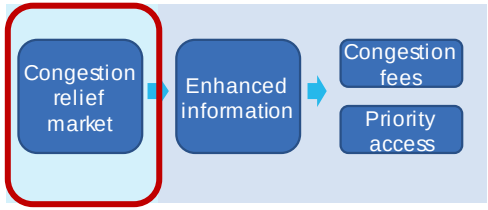
Incumbents
Want assurance that their projects will not be curtailed, but they don't want to pay.

CORE ELEMENTS OF HYBRID MODEL

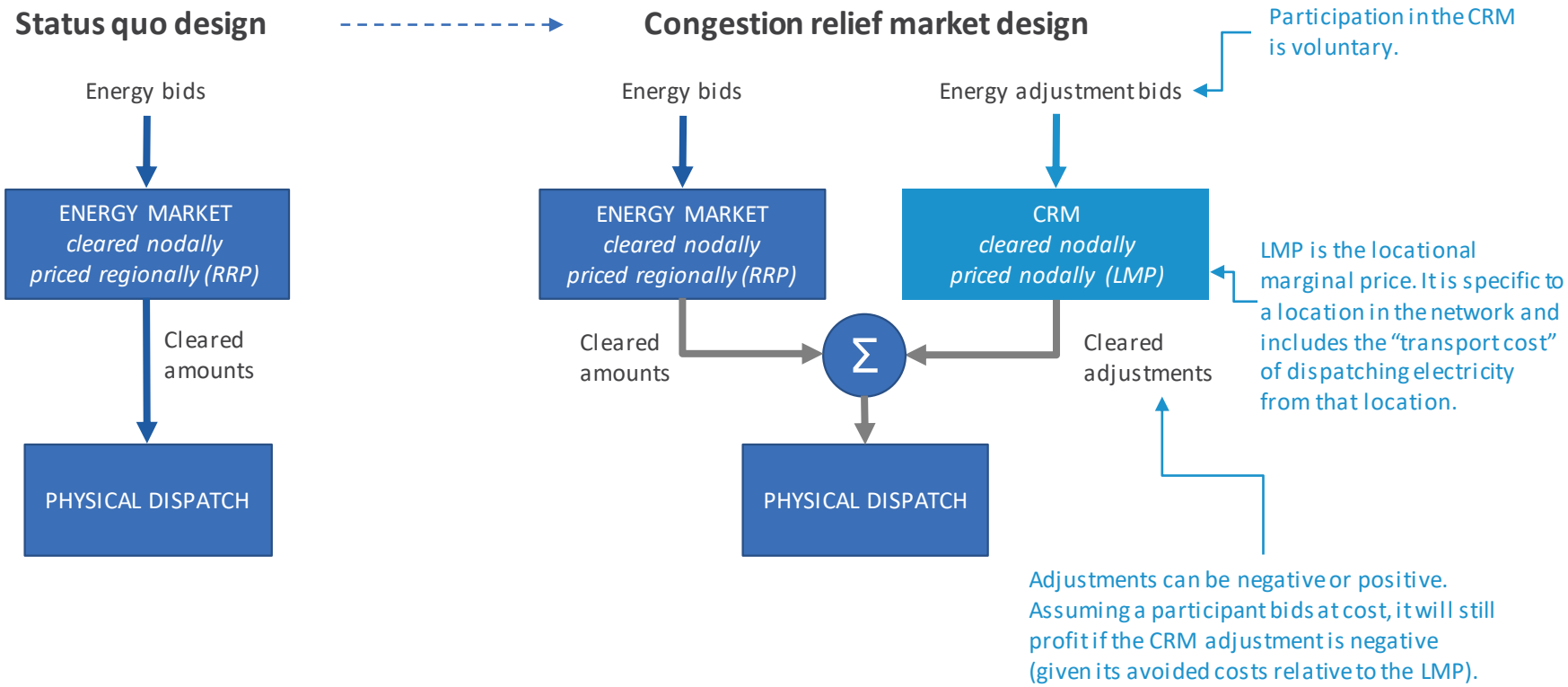


- Final package needs to deliver a coherent approach to meeting access reform objectives and result in implementable systems with secure and economic dispatch.

OPERATIONAL TIMEFRAMES



CONGESTION RELIEF MARKET



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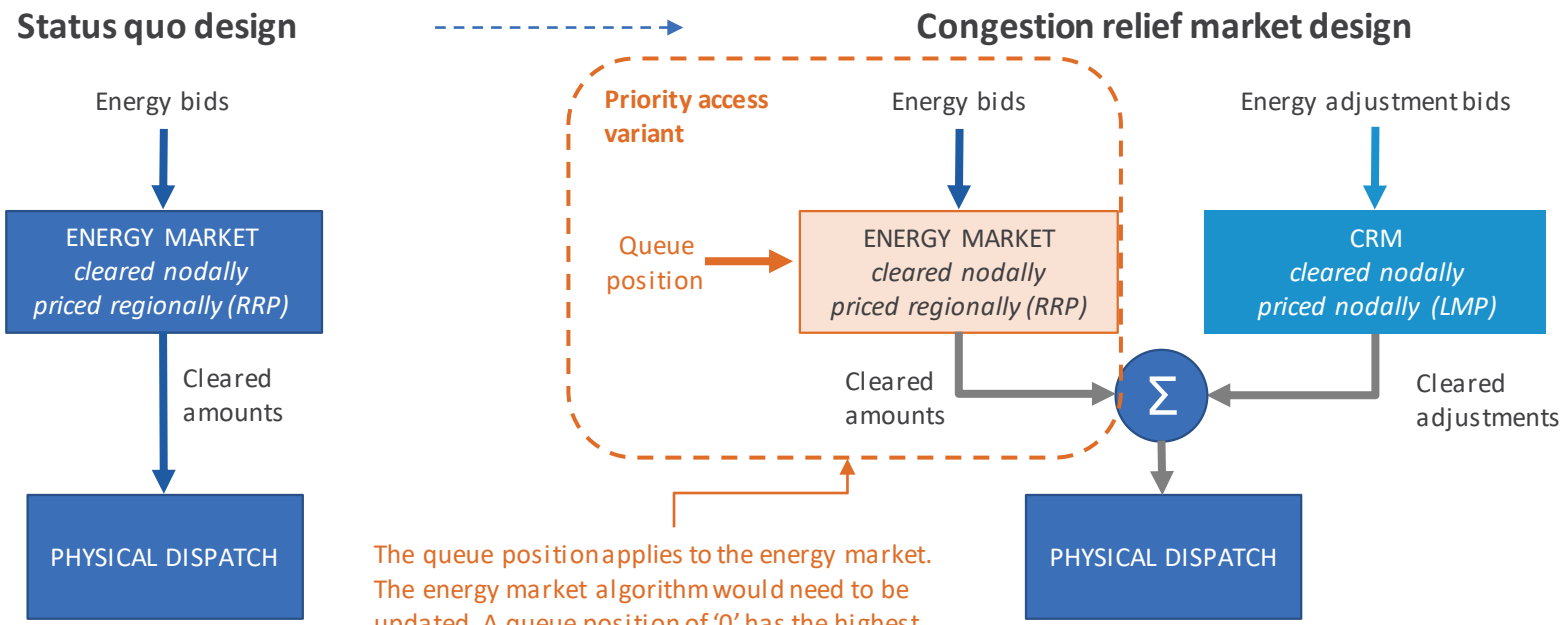


The queue position applies to the energy market. The energy market algorithm would need to be updated. A queue position of '0' has the highest priority. Subsequent queue numbers have lower levels of priority.

Priority access only applies if bids are tied at the market floor price (-$1000/MWh).

KEY DESIGN CHOICES

Do we pursue additional ways of redistributing congestion risk?

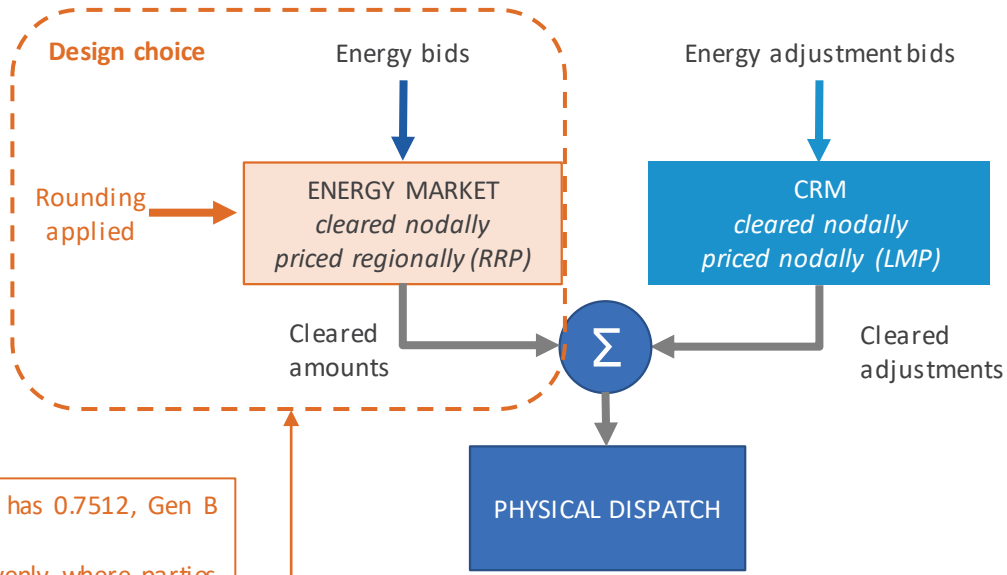
In today's energy market, marginal differences in constraint coefficients can lead to revenue volatility and investor uncertainty.

Design options (in addition to or instead of priority access)

Keep the existing energy market dispatch.

Round the constraint coefficients in the energy market. It does not apply to the CRM.

CRM design choice to round constraint coefficients



- Say Gen A has a coefficient of 0.7935 and Gen B has 0.7512, Gen B would be dispatched first (if bid prices were similar).
- With rounding, revenues could distribute more evenly where parties share a similar contribution to the constraint e.g. Gen A and Gen B could share the same coefficient of 0.8 (rounded to 1 d.p.)

If priority access is introduced, it helps to address the residual congestion risk for participants within the same band of queue positions.

KEY DESIGN CHOICES

Do we modify the energy market design in response to the new bidding incentives?

When the CRM is introduced, the bidding incentives for the existing energy market change.

Participants can bid into the energy market to gain profits, and then make adjustments in the CRM with no intent to physically dispatch.

This results in wealth transfers to out-of-merit generators that would not be incentivised in today's energy market.

Do we introduce additional rules for storage?

For storage located behind a binding constraint, the objective is to create incentives to:

- relieve congestion by acting as a load i.e. charging
- avoid exacerbating congestion when acting as a generator i.e. discharging.

Under the CRM design, storage can strategically bid into the energy market and CRM for monetary profit without improving the dispatch efficiency. It can achieve this both as a generator and as a load. The automated rules discussed previously may not be adequate for battery storage given its smart bidding algorithms and fast ramp rates.

Spectrum of design choices in response to potential wealth transfers to out of merit generators

- Keep the existing market design
- Modify the bidding guidelines
- Introduce automated rules into the energy market to exclude 'out of merit' bids i.e. if CRM bid > energy market bid.

Additional design choices for storage

- Apply the same rules to storage as a generator as to other generators (see above)
- When storage is acting as a generator, exclude 'out of merit' bids i.e. if energy market bid > assigned strike price (+ availability profile).
- Apply the same rules to storage as load as to storage as a generator (see above)
- When storage is acting as load, only settle storage at the LMP.

KEY DESIGN CHOICES

How do we calculate RRP?

RRP could be calculated based on the marginal cost of an additional unit of load at the regional reference node in the energy market or the CRM.

The RRPs may differ as a result of:

- changes in bidding behaviour between the energy market and CRM
- changes in demand from storage/flexible load relieving congestion in the CRM
- changes in interconnector flows.

Arbitrage opportunities for unconstrained generators (choosing to dispatch in the energy market or CRM to capture the higher 'RRP') may lead to a convergence between these RRPs.

How do we settle metered output?

In today's energy market, participants' metered energy (adjusted for losses) is settled at the RRP.

The CRM design introduces two different prices into the settlement equation (RRP and LMP). The principle remains true that the energy market dispatch is priced at the RRP and CRM adjustments at the LMP. But the design choice affects the settlement of differences between metered output and dispatch targets (at RRP or LMP).

Design choice for the calculation of the RRP

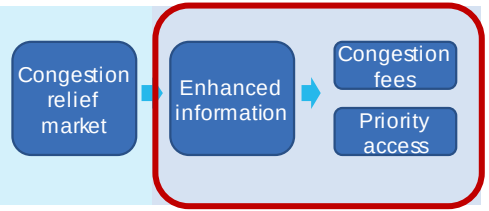
- RRP_{NEM} - calculate the RRP based on the energy market (as per status quo)
- RRP_{CRM} - calculate the RRP based on the final dispatch including CRM adjustments

Design choice for settling differences between metered output and dispatch targets

- Differences (metered output vs dispatch targets) are priced at RRP
- Differences (metered output vs dispatch targets) are priced at LMP

Q&A

INVESTMENT TIMEFRAMES

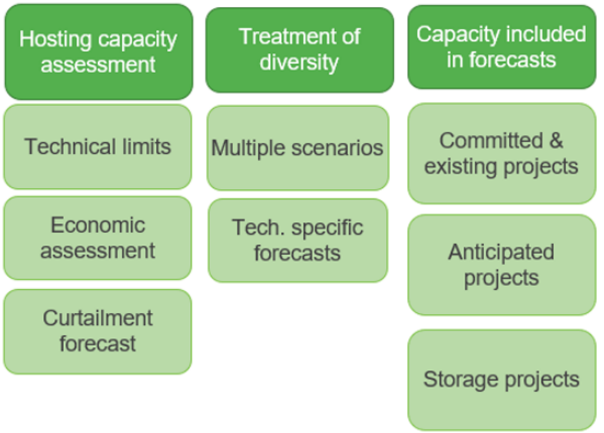


ENHANCED INFORMATION

- "No regrets" design choice, but not standalone solution
- Aim is to provide investors **consistent, useful and accessible** information about network congestion in different locations of the transmission network, for example:
    1. publication by network planners of (simplified) metrics around network congestion or
    2. improve access for proponents (and their consultants) to information needed to carry out their own detailed network access and market impact assessments.
- We seek stakeholders' feedback on the most valuable information across existing resources and how it can be presented to facilitate siting decisions.

ENHANCED INFORMATION – KEY DESIGN CHOICES

- Options for simplified metrics to provide investors with initial screening of the level of congestion in different areas of the network are:
  - indicative hosting capacity values
  - curtailment forecasts.
- To calculate indicative hosting capacity values, must consider:
  1. how to define "zones" of the network
  2. how to capture diverse network conditions
  3. which future network, generation and load investments to capture
- Also considerations around appropriate **form** of information and **governance arrangements** (e.g. who sets the methodology for the calculations and who undertakes the calculations)



PRIORITY ACCESS

- Generators are assigned (or purchase) a queue position that determines their level of priority in the energy market dispatch
- Market systems are redesigned to differentiate between generators (or classes of generators) to establish a priority ranking that decides who gets access when there is not enough transmission to go around.
- Investors can be confident that their access will not be eroded by subsequent connections. This should help to reduce the cost of capital.
- Efficient dispatch outcomes preserved by combining priority access with congestion relief market
    - Market participants can trade to an efficient solution
- **Market participants** value future congestion via a market process

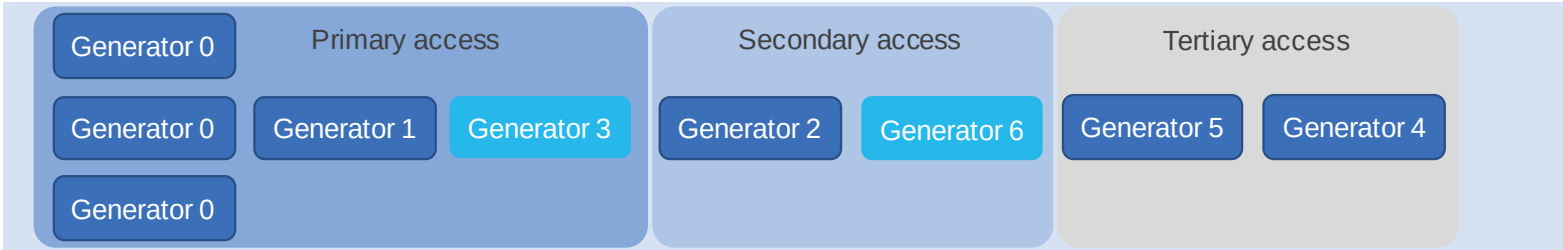
Much improved certainty for investors regarding future curtailment risk Investment decisions based on commercial view of future congestion costs	Requires careful design to support investment through all stages of the energy transition Introduces further complexity to AEMO's system in addition to that associated with the CRM.

DESIGN CHOICE – FORM OF QUEUE RIGHT

Order in which generators connect to the system

1. Unique number*
Each new generator is assigned their own queue number
**Implementation challenges*

3. Tiered access
Small number of queue positions that correspond to different levels of "firmness".
Planners allocate generators to tiers.



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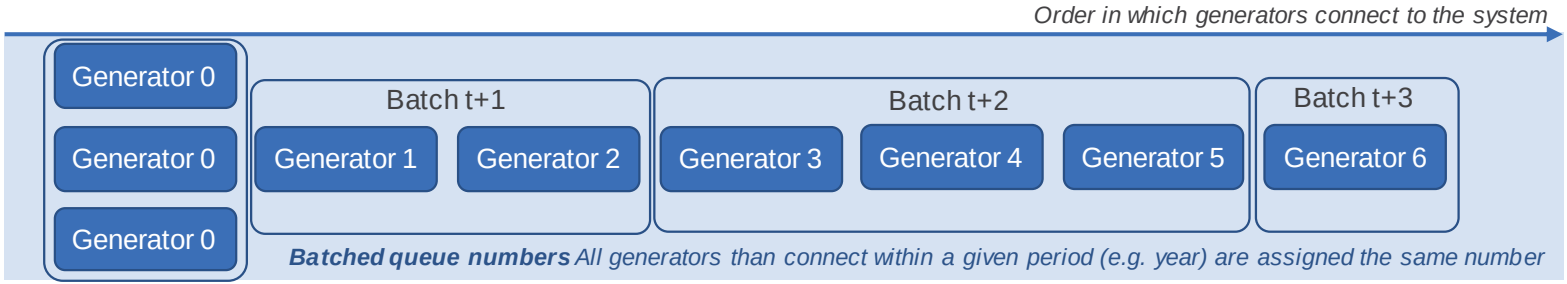

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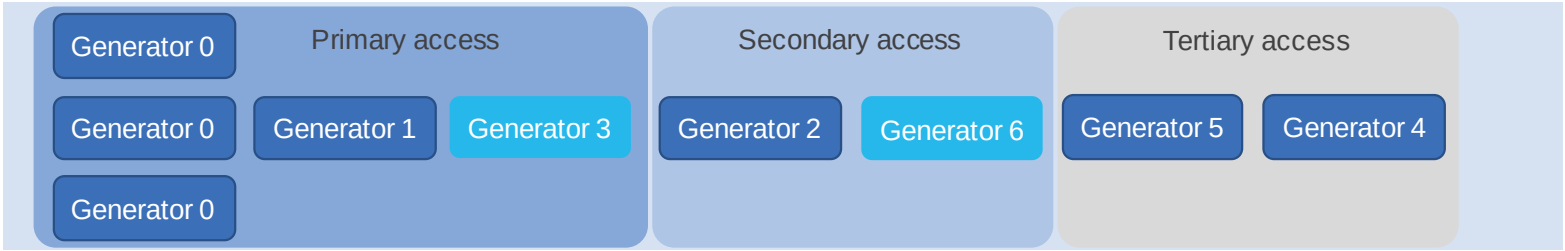
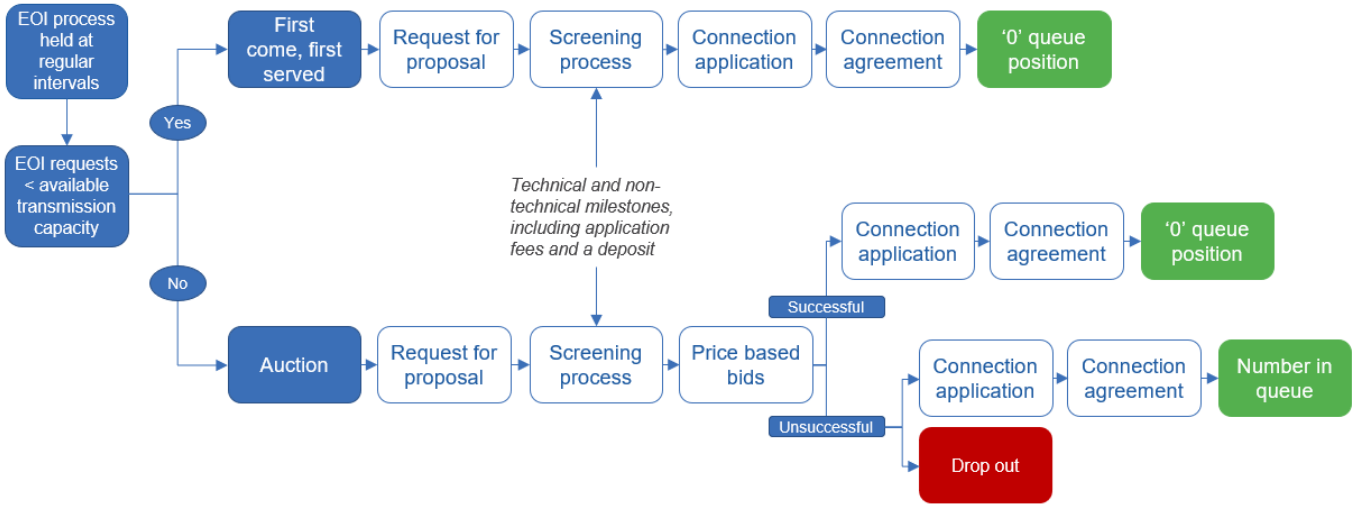


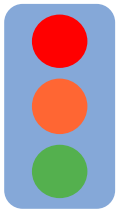
ALLOCATION OF QUEUE RIGHTS

- How do we decide who receives queue rights?
  - First come first served, auction, or a combination (or some other option)
  - Queue rights within REZs to be allocated in accordance jurisdictional REZ scheme

Example of an approach that combines first come first served and auctions



CONGESTION FEES



- **Planning authorities** value future congestion via an administrative process
- New entrants are charged a fee that is designed to encourage investors to choose uncongested locations
- A project's access may still be eroded by a deep pocketed successor who is willing to pay the fee.
- Metric used to calculate the fee is key (as it will determine size of fee):
  - Forecast value of access
  - Forecast congestion impact on system
  - Long run incremental cost of transmission.
- Need to strike a balance between accuracy and simplicity.

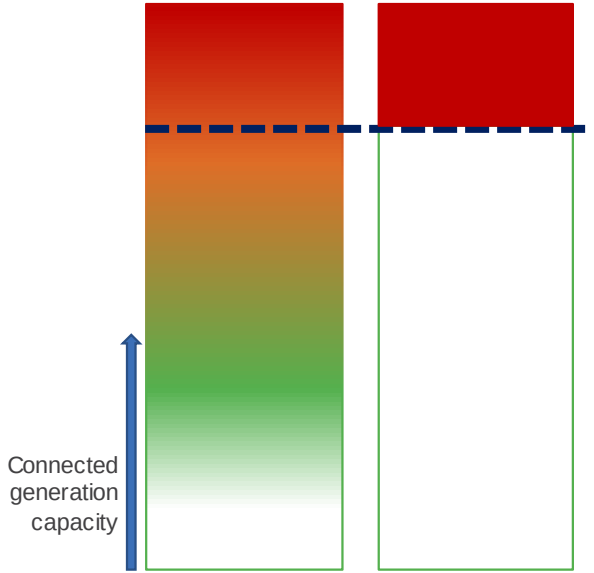
Fees are clearly known in advance.	Diminishes, but does not remove subsequent entry risk
Less complicated to implement in terms of market systems.	Relies on central body to value future congestion costs for individual projects
Improved certainty for investors regarding future curtailment risk.	Ongoing administrative costs.

KEY DESIGN CHOICE – METHOD USED TO CALCULATE CONGESTION FEES

- ESB's focus is on how to set fees outside REZs
  - Governments determine arrangements inside REZs
  - In States with no REZ schemes, ESB framework can apply across system.
- In selecting a method to calculate fees, a core underlying question is whether the fees should:

Option 1
Provide an efficient signal to all connection applicants, including those who are connecting in line with ISP/State plans.

Option 2
Only apply fees to projects that wish to connect in excess of planned levels for a given location.



DESIGN CHOICES TO GET THE BALANCE RIGHT

- Range of tools to calibrate the balance between the interests of customers, new entrants and incumbents

Congestion fees

- Size of fees ($$ at stake)
- Prevalence of fees - fees could be designed to apply everywhere, or only in most congested locations
- Treatment of end of life generators in process used to calculate fees

Priority access

- Role of grandfathering
- Duration of priority access rights
- Access dilution - congestion faced by highest priority generators could increase in line with efficient levels over time

Q&A

NEXT STEPS

NEXT STEPS

28 October Energy Ministers' meeting

Ministers committed to resolving congestion management as a key near term priority. Ministers noted that the ESB will issue a Direction Paper on a subset of the options under consideration. Ministers tasked Senior Officials to jointly undertake stakeholder consultations with the ESB on the full range of options, with recommendations to be considered at the first Energy Ministers' Meeting in 2023.

5 December	Technical Workshop
21 December	Deadline for submissions
25 January	Joint ESB/Senior Officials public forum

PROCESS FOR REFINING MODELS

Initiation paper
November 2021

Opportunity for stakeholders to propose alternative options

- Model
- Model
- Model
- Model
- Model
- Model
- Model

Consultation paper
May 2022

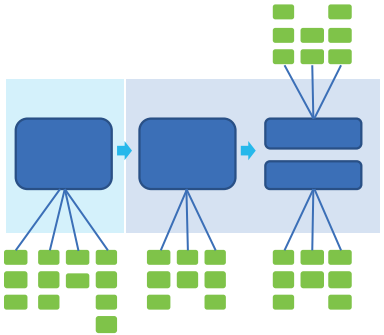
Refine options

Investment
- Model
- Model

Operational
- Model
- Model

Directions paper
November 2022

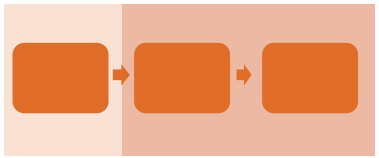
Outline hybrid model & consult on design choices



Draft recommendations
March 2023

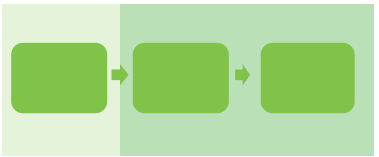
Draft recommendations based on stakeholder feedback, objectives & assessment criteria

ESB will prepare a cost benefit analysis for inclusion in draft report.



Final recommendations
June 2023

Final recommendations based on stakeholder feedback, objectives & assessment criteria



Thank you

If you have any further questions, please contact info@esb.org.au