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Executive Summary

The COAG Energy Council requested the Energy Security Board to advise on a long-term, fit-for-purpose market framework to support reliability, modifying the National Electricity Market as necessary to meet the needs of future diverse sources of non-dispatchable generation and flexible resources including demand side response, storage and distributed energy resource participation.

The paper explains the proposed analytic approach to the project and proposes five key challenges that will be material to market design in 2025:

- Driving innovation to benefit the consumer
- Investment signals to ensure reliability
- Integration of DER into the electricity market
- System security services and resilience
- Integration of variable renewable energy into the power system.

This paper seek feedback on:
- the possible future scenarios that will be used when assessing options for change,
- the assessment framework for evaluating market design options
- the opportunities, challenges and risks that need to be considered as the project looks to identify market design options; and
- the implications for market design resulting from these opportunities, challenges and risk.
1. The post-2025 market design project

The COAG Energy Council requested the Energy Security Board to advise on a long-term, fit-for-purpose market framework to support reliability, modifying the National Electricity Market (NEM) as necessary to meet the needs of future diverse sources of non-dispatchable generation and flexible resources including demand side response, storage and distributed energy resource participation.

This advice was sought because, while the basic framework for the NEM has remained relatively unchanged since the market started in the late 1990s, the mix of generation technologies, patterns of energy use and government energy policies have changed significantly.

Furthermore, over the last ten years household electricity costs rose by 56% in real terms. NEM spot prices moved from record lows in 2012 to record highs in 2017. Concerns about reliability have emerged. In short, the market has struggled to meet the expectations of consumers and the community.

The pace of change is not expected to slow down and the need to consider whether the overall market and regulatory design is fit for the future must be evaluated. At a minimum, the post-2025 project will put in place a holistic view of the future development of the market and avoid the risk of simply layering incremental changes and potentially producing an inefficient outcome.

1.1 Post 2025 market design contributes to the Strategic Energy Plan Outcomes

The National Electricity Objective (NEO) is stated in the National Electricity Law (NEL): "to promote efficient investment in, and efficient operation and use of, electricity services for the long-term interests of consumers of electricity with respect to:

- price, quality, safety and reliability and security of supply of electricity
- the reliability, safety and security of the national electricity system."

As a basic principle, the post-2025 project must satisfy the NEO. It must also contribute to the outcomes of the COAG Energy Council’s Strategic Energy Plan, including the central outcome- delivering more affordable energy and satisfied energy consumers, see Figure 1.

Figure 1: Strategic Energy Plan outcomes
1.2 What the project will deliver and by when

By early 2020, the project will identify potential fit-for-purpose market frameworks for evaluation against each other and the NEM design. Each option will describe how financial and physical markets interact and how risk is allocated to consumers, taxpayers and market participants. Each option will demonstrate how decisions are made within the market framework and explain how investments are or are not incentivised.

The chosen options will be evaluated throughout 2020. At the end of 2020, the ESB will either recommend a package of measures to adapt the existing market design or recommend alternative market designs. These designs will provide the full range of services to customers and deliver a secure, reliable and lower emissions electricity system at least-cost.
1.3 Scope of the post 2025 project

A project scope was published on the COAG EC website in March 2019. The scope is very broad:

- all aspects of the energy supply chain will be considered – the interface with consumers, small scale and utility scale generation, distribution, and transmission.
- all service procurement models are under consideration
- risk allocation, risk management and cost recovery arrangements will be examined
- investment signals and the interaction of physical and financial markets
- the impact and opportunities presented by related markets – transport, fuel, hydrogen, etc… - will be investigated.
- the role of governments.

Any significant changes to market design will be telegraphed well in advance following extensive stakeholder consultation to ensure there is minimal disruption to the forward contract markets for electricity. If changes are required to the market framework by the mid-2020s, then consideration of any required changes should be concluded by the end of 2020 to enable sufficient time for the market to transition.

Wholesale electricity prices are currently at record highs in some jurisdictions. As such, it is important that a supply side response not be delayed as a result of this project. Investors will need to continue to invest today to facilitate a competitive, reliable and secure system. To this end, investors should feel confident that any changes made as a result of this process will be flagged well in advance, take full account of any impacts on the wholesale market and be subject to extensive consultation.
1.4 Relationship to other initiatives

There are a range of projects and initiatives being pursued by the Australian Energy Market Commission (AEMC), Australian Energy Market Operator (AEMO), the Australian Energy Regulator (AER) and other agencies and organisation that seek to address some of the challenges we identify in this paper. Annex B provides a list of projects that have implications for market design beyond 2025.

The market bodies will necessarily continue to change the market and regulatory arrangements in parallel with the post-2025 market project. These important reforms will solve immediate and pressing problems that the NEM currently faces. In doing so, these initiatives will enable additional market reform that tackles future challenges.

It is critical that stakeholders continue to engage in these more immediate reform projects. They are essential to the performance of the market now and are fundamental building blocks of the post-2025 market design project.

The Energy Security Board has oversight of all reform initiatives that relate to the NEM rules and design and will ensure that all related reform initiatives are coordinated.
2. Purpose and objectives of the issues paper

The purpose of this paper is to seek feedback on

- the possible future scenarios that will be used when assessing options for change
- the assessment framework for evaluating market design options
- the opportunities, challenges and risks that need to be considered as the project looks to identify market design options; and
- the implications for market design resulting from these opportunities, challenges and risk.

The reason we are seeking this feedback is to ensure that the post-2025 project

- scopes out the possible futures (and shocks) against which market design options should be tested
- achieves broad consensus on the challenges and risks that must be addressed by market design now and into the future.

This paper does not propose specific potential reforms to market design. This is the task of a consultation paper due later in 2019. Where relevant we have highlighted possible reform directions – such as considering changing how ancillary services are procured – and pointed to examples of how other countries have responded.
3. Analytic approach

The post 2025 market design project represents an opportunity to examine all components of the overall market design.

3.1 Consultation

The ESB will consult extensively with stakeholders. This will include, at a minimum, consultation on the issues that should be considered by the project, the evaluation framework, the development of alternative market designs and the approach to their detailed evaluation.

3.2 Analysis of overseas markets

This project will comprehensively review the experience of relevant overseas markets to understand what worked and what did not. This is particularly valuable in understanding the system wide implication for a change to one market segment.

Australia’s NEM has a number of unique features. Australian electricity markets have historically been reliant upon fossil fuels (84% in 2017) but are transforming at one of the most rapid rates through the adoption of renewables.

Critically, Australia is an island – with no cost-effective opportunity to import electricity from our neighbouring countries to balance the network or enhance its stability. And the NEM encompasses such a large part of this island that the network is the longest in the world.

However, many jurisdictions are facing related issues and there is strong growth in variable, renewable generation internationally. Many jurisdictions have responded and substantially reformed their energy market designs in recent years (or are looking to do so) in response to changing energy mix and usage. The post-2025 market project seeks to learn from international experience, especially where particular components of the market design are identified as deserving consideration. While international experience will be valuable, some Australian regions such as South Australia are at the forefront of this transition, with the IEA stating that only South Australia, Ireland and Denmark are in the most advanced stages of renewables integration.

3.3 Scenarios

The ability of a particular market design to efficiently meet customer needs will depend upon the context within which it is to operate – to drive efficient investment in the right mix of resources and efficiently dispatch and price those resources to meet consumers’ needs.

Understanding the relative ability of any particular market design to deliver on the NEO will require an understanding of the range of future worlds that are likely to exist. These
worlds would reflect a variety of technologies and locations of resources that are likely to be required to meet the demand for electricity and support its delivery.

The most comprehensive future scenarios of the NEM are set out in the Integrated System Plan (ISP). It is likely that the post-2025 project will use the ISP scenarios as the starting point for investigating possible future market designs across different technological scenarios.

The 2019-20 AEMO ISP Scenarios provide a foundation for defining a range of potential future worlds that could exist, and the context in which the efficacy of a market design should be considered.

The 2019-20 AEMO ISP scenarios provide an approach that builds on what was adopted by AEMO in 2018 to identify the optimal development of the power system under a range of different future worlds. There are five 2019-20 AEMO ISP Scenarios:

- **Slow Change:** Challenging global and local economic conditions, slower capital cost reductions, higher financing costs, industry closure, low distributed energy resources (DER), limited electric vehicle (EV) uptake, a slow transition and higher temperatures and more extreme weather conditions.

- **Central Scenario:** Neutral global growth, moderate improvements in technology, gradual uptake of EV, moderate DER penetration, gradual closure of existing thermal power stations and a transition to renewables based on their relative costs and state renewable energy targets.

- **High DER:** Neutral global growth, accelerated improvements in technology and uptake of EV and DER penetration, higher temperatures with more extreme weather conditions.

- **Fast Change:** Neutral global growth, accelerated improvements in technology and uptake of EV and DER penetration, a commitment to increased decarbonisation.

- **Step Change:** High global growth, rapid improvements in technology and uptake of EV and DER penetration, global coordination on climate action and a rapid delivery of renewable generation and cleaner energy solutions.

The sensitivity of each market design option to some key unknowns will also be addressed. These will include consideration of a wider range of outcomes in terms of sector coupling, such as the electrification of transport and potentially other sectors of the economy, and the rate of rollout of distributed energy resources. The sensitivity analysis may also include consideration of market shocks such as the unplanned outage or exit of some thermal generation capacity.

However, this context alone is not sufficient to assess potential future market designs. In addition to the context and framing that is provided by these scenarios, it is also important to evaluate the impact that differing market designs have on the cost of providing the resources to meet demand from consumers. This entails a consideration of how different designs will ensure that both short- and long-term efficiency is delivered.

As a result, the project may examine various scenarios for the performance of relevant financial markets and other economic factors that are exogenous to the market design but nonetheless impact on investment and hence market performance.
3.4 Modelling

The post 2025 market design project represents an opportunity to examine all components of the overall market design.

The project will not rely on a single complex model to provide the answer, rather:

- The ESB will consult extensively with all stakeholders.
- Seek specific input from stakeholders and experts
- Closely evaluate international experience
- Undertake a range of modelling and analysis where it is instructive to do so.

Modelling and analysis will be conducted at various stages of the project where it would be useful to support decision making. Modelling approaches will be mixed and may include:

- Market modelling
- Economic modelling and analysis
- Statistical and probabilistic analysis
- Power system analysis

We expect to model an energy only market – with real-world bidding and appropriate price caps to build an understanding of how such a market would work. Examine the price caps and volatility of prices eventuating, investment/dis-investment drivers for various participant types within the market, sensitivity of returns to market uncertainty etc.

- Serve as a baseline and comparator for evaluating the alternate market design options. Formulate and analyse modifications to such a design.
- Model ancillary service markets to again understand market dynamics and investment drivers
- Analyse in-day and future day variability using statistical techniques to understand how current and future mechanisms will manage volatility and uncertainty in demand and supply.
- Analyse impact of volatility and uncertainty of cashflow streams on investment and required returns
- Examine linkages between market design options and potential financial markets and traded products

3.5 Assessment framework

A critical element of the project is the development of an appropriate assessment framework through which to evaluate the different market design options, including the application of key principles.

An overarching principle is that the outcome should be in the long-term interests of consumers, consistent with the National Electricity Objective.

In this light, some potential principles for consideration are (see Annex A for more detail):
A. Efficiency – productive, allocative and dynamic as well as capital efficiency in order to be able to demonstrate least-cost outcomes are delivered by the market design
B. Practicality of implementation
C. Effective entry and exit of generating capacity
D. Costs are allocated to those best placed to respond to them
E. Risks are allocated to those best placed to manage them
F. Transparency and simplicity
G. Consumer empowerment
H. Resilience to external shocks such as critical asset failure, climate and technology change
I. Robust to possible future government policy changes
J. Technology neutrality
K. Competitive neutrality
L. Supportive of innovation

There are trade-offs between the potential principles listed. It should be noted, however, that it is not intended that these principles will be subject to a hierarchy as a means of resolving conflicts between them.

There are also a number of contextual factors that will inform the evaluation but may not be suited to an objective assessment. These include distributional impacts of any market reform and how the projected outcomes influence international competitiveness of Australian industry.

Questions for stakeholders:

- What scenarios and shocks should be used? How should these be used to test market design?
- How can market and economic modelling best be used to evaluate individual components of market design or the end-to-end market design?
- Is the assessment framework appropriate to evaluate the effectiveness of future market designs? What else should be considered for inclusion in the assessment framework?
4. Australia’s energy transition and implications for market design

This section outlines five key opportunities and challenges with significant implications for future market design that the project will need to consider:

- Driving innovation to benefit the consumer
- Investment signals to ensure reliability
- Integration of DER into the electricity market
- System security services and resilience
- Integration of variable renewable energy into the power system.

It is well understood that the energy sector is in transition, with the mix of generation technology changing rapidly – from conventional synchronous generators to inverter connected, variable renewable energy and from utility scale to distributed.

For example, the uptake of small-scale solar rooftop systems has consistently exceeded expectations and increasingly these types of systems are now being installed with battery storage. Similarly, utility scale variable renewable energy is being constructed at the same time as older synchronous generators are approaching the end of their serviceable life.

Figure 2. Entry and exit of generation capacity

This transition has been driven by a mix of changing consumer preferences, falling technology costs and state and federal government policies and programs.
The energy transition is unlikely to slow as the cost of new generation technology falls further, utility scale storage is constructed, and energy use patterns change. The electricity demand profile could be further changed by digitalisation of energy consuming devices, the uptake of electric vehicles and the installation of storage at customers' premises.

For each issue identified in this section we consider how well suited the current market and present reform initiatives are to meeting the challenges and realise opportunities, the range of future risks that may stand in the way of the current market design and initiatives and possible market design implications.

4.1 Driving innovation to benefit the consumer

4.1.1 Key challenges

Perhaps the biggest challenge and greatest opportunity for this project is to consider how market design can allow fundamentally different service offerings to emerge that are currently not accessible but may be in the future. This is essential to empowering consumers to engage with the electricity system on the terms that suit their needs and circumstances.

The overall market design and regulatory settings need to ensure these new service offering emerge in a way that ensures security and reliability are maintained through the transition and that consumers have the protections they need.

The market design will need to meet the needs of a diverse mix of consumers, from large, energy intensive commercial and industrial consumers to households and from those who wish to actively engage in the market to those who prefer to be less 'hands on'.

4.1.2 Current market arrangements and reform initiatives

In the NEM, the role of the retailer and energy service provider is to take the complicated (i.e. price risk management, billing, load management etc) and make it simple.

The traditional retail model, which continues to be the dominant model, has the retailer supplying electricity and undertaking risk management on their customers' behalf drawing on a portfolio of financial derivative contracts backed by generation or a portfolio of physical investments through vertical integration.

Current regulatory arrangements and consumer protections are generally built around the traditional retail model. There are a range of government reform initiatives aimed at ensuring retail consumers (particularly households) can access competitively priced retail offerings. These follow the Finkel Blueprint and a major review by the ACCC which proposed the establishment of a Default Market Offer, for example.

In addition to the traditional retail model, up to half a million consumers are connected to the grid via embedded networks and so their primary relationship is with their embedded network provider. These private networks have historically provided consumers with lower levels of protection. However, a recently completed review by the AEMC proposes amendments to the Law and changes to the Rules to correct this.
Other retail models are starting to emerge to service more engaged consumers, often those that have purchased solar or other distributed energy resources. One allows consumers to buy electricity from the wholesale market via a retailer on a cost pass-through basis, enabling them to play a greater role in managing their own price risk by changing their consumption or feed-in patterns. There has been strong growth in the number of ‘exempt retailers’, or non-traditional retailers, not well covered by the existing regulatory regime.

The retail markets for commercial and industrial customers have also been changing. The growth in retail power purchase agreements (PPAs) has introduced an opportunity to secure renewable energy by directly supporting investment in new generation.

There are a range of trials underway testing new approaches to support demand response and better integrate distributed energy resources including peer to peer trading. The AEMC is considering a rule change to allow specialist companies, demand response service providers, to offer consumers demand response services and products.

As connectivity and storage technology advances, we may see the development of subscription services for passive consumers, who see the convenience of paying a subscription to a third party to manage their devices remotely and in a way that minimises their energy costs. Complementing that, advances in artificial intelligence could support decision making tailored to consumers’ priorities without needing their active involvement.

The Consumer Data Right, recently passed by Parliament, establishes a framework to enable customers (individuals and businesses) to access and transfer data that is related to them to accredited third parties. It will be applied to energy following its initial application to banking. This scheme may enable innovative business models and service offerings in the retail sector along the lines discussed above, in addition to price comparisons.

In the future, greater connectivity may enable consumers to make more active decisions about the value they place of the services they receive from retailers and the trade-offs they are prepared to make. For example, cheaper electricity in exchange for a different (lower) reliability standard. Digitalisation of energy consuming devices provides significant opportunities for lowering energy costs to consumers.

4.1.3 Risks that current and planned market arrangements will not meet the challenge

Market and regulatory arrangements need to adapt to change in the retail sector and support that change where it can enhance choice and deliver efficiencies. The key risk is that regulations aimed at ensuring consistency in approach to consumer protections and ensuring consumers can access competitively priced retail offerings come at the expense of future innovation, potentially undermining initiatives such as the CDR.

A related but converse risk is that, should innovative business models emerge, they benefit a small group of consumers at the expense of overall system efficiency and other consumers who are unable to access these benefits due to reasons of technology or
price. This raises complex questions around equity as well as the terms and conditions applied to those looking to leave or access grid services.

4.1.4 Market design implications

The ability to support the emergence of innovative retail models that enhance outcomes for consumers is an important consideration in the development of future market arrangements. The prospect of innovation, new and better service offerings should be encouraged. This will include the entry of new firms and the exit of underperforming businesses.

However, any market design needs to recognise that electricity is an essential service and that there are and always will be a spectrum of consumers with different economic capacities, risk tolerances and who demand a range of services.

4.2 Investment signals to ensure reliability

4.2.1 Key challenges

Whether or not the market will provide sufficient incentives for investment is one key challenge to reliability. A number of important variables are changing rapidly and the uncertainty they add to the market influences investment decisions. These variables include:

- the mix of generation technologies;
- government energy policies;
- the future level of electricity demand, and
- patterns of energy use.

To maintain reliability and affordability for consumers, it is also essential that market arrangements enable an orderly exit of coal fired generators and incentivise timely replacement by firm, dispatchable generation. The timing of the closure of coal fired generating units is critical to ensuring an orderly transition to a low emission generation mix.

The future level of demand, and the shape of demand, is unclear due to increasing penetration of distributed energy resources and energy efficiency, the potential for new sources of demand such as electric vehicles, the prospect of more active demand participation and uncertainty about the future requirements of large commercial and industrial customers.

Despite the need for flexible and dispatchable capacity to ensure reliable supply under a range of conditions, the market is currently attracting only limited investment of this nature. As a result, AEMO has activated the reliability and emergency reserve trader (RERT) function over the past two summers.

Generally, resources to meet peak demand are called on rarely and sit idle waiting for extreme demand conditions or generator outages. As solar PV is reducing daytime demand, the period when the system demand peaks has narrowed, reducing the opportunity for these resources to earn a return.
4.2.2 Current market arrangements and reform initiatives

The NEM is designed to provide revenues (through a mix of spot and contract markets, ancillary services markets and direct procurement) to ensure plant is retained until there is sufficient investment in new capacity. The RERT is there as a backstop should the market fail to deliver. Efficient prices are the cornerstone of the current design and are central to achieving efficient outcomes. However, as an essential service, some demand for electricity may be quite inelastic and policymakers are not willing for the price of electricity to simply increase to the market clearing price.

A number of changes have or are being made to the NEM and several initiatives are likely to lead to further action. The following are expected to have an influence on the maintenance of reliability in the NEM:

- New minimum ‘notice of closure’ rules for generators are designed to provide greater planning visibility and encourage more timely investment behaviour.
- The RRO should provide further incentives for participants to enter into contracts for dispatchable capacity and support new investment when there are forecast breaches of the reliability standard.
- Five-minute pricing and settlement should also improve the financial viability of responsive plant.
- In time, the Snowy 2.0 pumped hydro project will provide an increase in firming capacity. However, the question remains as to whether this will supress further commercial investment in the near term, or if incentives are strong enough for commercial investment in additional flexible capacity without some other form of government support.
- The proposed changes to locational marginal pricing envisaged by the AEMC’s coordination of generation and transmission (COGATI) could contribute to reliability by delivering local signals for investment.
- The demand response measures currently being considered by the AEMC also offer the opportunity for customer demand response to be harnessed in ways that can reduce the peak energy needs of the system. Effective use of demand response mechanisms could supplant some of the need for investment in generation capacity that would otherwise be required.

4.2.3 Risks that current and planned market arrangements will not meet the challenge

There is a risk that governments may not allow relatively high and volatile wholesale prices (scarcity pricing) for sustained periods of time sufficient to retain and attract plant and support a smooth transition. The lack of policy confidence and market interventions (like price caps and the cumulative price threshold, or the use of the RERT) could work against investment in flexible generation that rely on relatively short periods of very high wholesale prices to make their required return.

More generally, other government policy interventions (like the Underwriting of New Generation Investment initiative and various government Contracts for Difference payments) that deliver additional storage or generation capacity outside of market arrangements; evolving storage technologies; or non-market interventions that promise to
lower price volatility in the wholesale market, may act to increase the risk associated with investing in flexible generation that is needed now and in the medium term.

The cost to industry of managing this policy risk along with large customer demand risk and technology risk may lead to a much higher cost of capital for new investment which will lead to higher prices for consumers.

The short-term nature of the NEM (both spot and contract markets) may mean revenues are not sufficiently secure and predictable over the medium to long-term to enable efficient levels of capex maintenance on existing plant and support efficient investment in new plant. On the other hand, without efficient use of demand response, the overall investment in generation capacity could be larger than required.

There is a risk that generation plant breaks unexpectedly with results that cannot be managed by the RERT due to insufficient resilience in the system.

A lack of confidence in, or visibility of, physical resources ahead of dispatch may not support AEMO to dispatch the market according to merit order and without directions, preserving the signals for investment.

A further risk is that the growing use of purely financial insurance products and customers increasing their spot exposure will mitigate the risk of high prices for the retailer but will reduce investment in resources that maintain reliability of supply. These arrangements may have the potential to break the link between prices and investment, which is assumed by the current market framework.

4.2.4 Market design implications

The key question for future market design is therefore how the market can deliver efficient price signals to deliver the optimal level of investment and consumption. This implies examining if current market arrangements provide the required long-term price signals for future investment in flexible resources, if recent initiatives are sufficient to avoid disorderly exit of existing coal-fired generation capacity and bring on investment in flexible resources. Are other market design elements needed to incentivise such investment?

The future market design will need to provide sufficient incentives for efficient investment in firm, dispatchable generation or storage throughout this transition. Design options such as raising or eliminating the market price cap or cumulative price threshold are one such mechanism that may incentivise greater investment in readily dispatchable generation and storage. International markets have introduced other measures to ensure sufficient flexible, dispatchable generation is available.

4.3 Integration of DER into the electricity market

4.3.1 Key challenges

Distributed energy resources (DER) – rooftop solar, battery storage, electric vehicles and other resources embedded in the distribution system that generate or store electricity – now represent a significant proportion of the NEM’s supply mix in some regions, and this proportion is expected to continue growing strongly. In addition, DER has a potentially
large role in demand management and demand response. As such, DER is an increasingly important part of the overall power system.

The most important challenge and opportunity for DER is to optimise the benefits of DER investment for all Australians. The market needs to enable DER to contribute to overall system efficiency, reliability and security, while continuing or enhancing the value of DER to their owners. This requires a range of pricing, technical and operational challenges to be addressed (see also section 4.4).

4.3.2 Current market arrangements and reform initiatives

The level and rate of installation of rooftop photovoltaic solar (PV) is prompting much of the urgency for DER integration improvements. Australia has the highest small-scale PV penetration per capita of any country in the world. Battery storage is currently growing quickly, albeit off a low base. Under all AEMO's integrated system plan scenarios, DER will continue to grow strongly. For example, the 2019 ISP forecasts 3GW of distributed storage by 2040 in the central case and 33GW in the high DER scenario.

The falling capital costs and increasing variety of DER offer choice to consumers. DER provides consumers with greater control over their electricity use and provides alternative sources of production and consumption that can be traded. From a system perspective, there are opportunities to realise additional benefits for both the owner and all customers from the growth of DER. DER has the potential to contribute additional supply to the market, to support reliability, lower the costs of network augmentation and provide services required for system security.

The current and potential values DER provides to consumers, the distribution system, the bulk power system, and society is outlined in Figure 3. The values highlighted in yellow are the values that are being captured today. The values highlighted in green are those that are not yet being fully captured and are important to capture in the near term while those in blue represent longer term opportunities.

To more fully capture these benefits, there needs to be mechanisms to compensate producers/consumers, or prosumers, for the use of their DER which reflects its value. This would increase the value of DER to owners, spurring further deployment, while also lowering overall system costs.

Current regulatory and market arrangements are not optimised to do this – presently, the market has a mix of price incentives for energy generated by DER, usually applicable to rooftop PV generation only through feed-in tariffs (FiT). Across the NEM there is a mix of legacy premium FiTs, market and regulated. Almost all are single rate, except Victoria which requires retailers to offer a time-of-day FiT.

Australia is considered to be at the cutting edge of DER deployment, and there are multiple projects and reform processes examining the best way to integrate DER. Particularly relevant to market design are initiatives that seek to improve pricing/tariff arrangements and lift the capacity of distribution networks to handle two-way flows.

The AEMC’s Electricity Networks Regulatory Framework Review is considering important questions around how the regulatory framework should develop to address increasing penetration of DER and multi-directional energy flows. Issues being considered include:
• How the regulatory framework can deliver an optimal level of investment in distribution networks and DER enabling initiatives (for example network monitoring systems) to maximise net benefits to consumers.

• Pricing or administrative arrangements for how DER users can access distribution networks, particularly in areas where there is limited network capacity to support the take up of DER, where this is for household/business usage or export, or both.

Figure 3. DER values collated with the stakeholder extracting those values

<table>
<thead>
<tr>
<th>Customer values</th>
<th>Distribution system values</th>
<th>Bulk system values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce bills</td>
<td>Increase hosting capacity</td>
<td>Provide low-cost energy</td>
</tr>
<tr>
<td>Provide energy choice</td>
<td>Increase planning flexibility</td>
<td>Provide low-cost capacity</td>
</tr>
<tr>
<td>Provide backup generation</td>
<td>Support voltage and frequency</td>
<td>Provide low-cost ancillary services</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Relieve transmission congestion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Defer or obviate infrastructure investment needs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduce system losses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provide system security and resilience</td>
</tr>
</tbody>
</table>

Source: RMI for ESB

Developing effective regulatory arrangements in these areas is also important to optimise the benefits of DER. For example, inefficient levels of network investment may create inefficient constraints on exports of DER to the grid or limit the ability of DER owners to install DER. To support prudent and efficient investment the AER is developing a good practice guideline, setting out the AER’s expectations of how network businesses should be developing proposals for DER-related investment.

Further improvements in the regulatory arrangements and utilisation of DER could also ensure distribution networks realise the benefits of DER from a system operation and investment perspective in circumstances where DER offers an efficient alternative to more expensive poles and wires investment.

Separately, distribution networks across a number of jurisdictions in the NEM are rolling out more cost reflective tariffs that should help drive efficient and optimised deployment of DER that may help to smooth demand peaks and reduce the need for expensive poles and wires investment. The AER is supporting this process through approvals of network tariff structure statements which are aimed at promoting more cost reflective pricing.

The implementation of tariff reform is being supported by a series of roundtables hosted by the AER with networks, retailers and consumer representatives. These roundtables
consider how networks should engage with retailers to develop cost reflective tariffs, and the management of distributional impacts associated with these reforms.

4.3.3 Risks that current and planned market arrangements will not meet the challenge

The incentives and technical challenges to enable DER to offer system security services is becoming an increasingly urgent gap to fill - AEMO’s report of April 2019 outlines challenges with the Technical Integration of Distributed Energy Resources for system operation and distribution network management. These include the ability of inverters to ‘ride through’ system disturbances and the potential impacts of DER on voltage and frequency in the distribution network.

While there are many programs and trials underway to understand how to maximise the benefits to customers of DER, there is a risk of a lack of coordination across the range of policies, rules and regulatory initiatives and a need for timely progress. The challenge for future market design will be to integrate the lessons from these various initiatives into a coherent approach. Key programs underway include:

- The Distributed Energy Integration Program (DEIP), an initiative of the Australian Renewable Energy Agency, that brings together energy peak bodies, market authorities, industry associations and consumer associations to maximise the value of customers’ distributed energy resources for all energy users.
- The Open Energy Networks project – to develop a model for distribution markets – jointly between AEMO and the Energy Networks Association (ENA).

It is important that the market arrangements relevant to DER are able to accommodate the pace of change and innovation in technologies and business models that are likely to emerge. For the post 2025 market design it is also important that the arrangements for DER are integrated into the overall market design.

4.3.4 Market design implications

Significant market design considerations related to DER include:

- Establishing regulation and markets that provide incentives for efficient investment in and operation of DER. These could include:
  - methods or markets to procure the deferment of network capital expenditure through DER use
  - markets or other methods for system operators to procure ancillary services, or
  - markets for retailers or aggregators to procure energy services through the aggregation of DER.
- Ensuring markets or other arrangements for DER are integrated with wholesale markets, allowing DER to compete with utility-scale resources for the supply of capacity energy and ancillary services.
- Establishing new processes and systems to ensure the safe and secure operation of the electricity system in a DER future with a high level of DER.
• Ensuring that DER owners are empowered to choose how – and if – they want to participate in these markets and maintaining a flexible regulations and markets that allows for innovative approaches to arise in how DER are to drive efficiencies.

4.4 System security and resilience

4.4.1 Key challenge

The key challenges for system security (ancillary) services is to:

• Identify which additional services may be required given the changing mix of supply with more asynchronous generation
• Determine how the market can efficiently procure the system services needed, valuing those services in ways which drive both the investment needed and their efficient delivery
• Provide incentives to minimise the cost of those services and provide for innovation and new technology in their provision.

A closely related challenge is that of system resilience – defined by the AEMC as the ability of the power system to avoid, survive and recover from high impact, low probability events.¹ The provision of adequate resources to fulfil existing power system security standards will not necessarily provide the same level of resilience experienced in the past due to the changing character of the power system; and the potential for climate change to expose the system to more extreme events.

4.4.2 Current market arrangements and reform initiatives

The provision of a range of system security services has always been a key feature of power system operation and an important part of market design. With the changing supply mix, some services, which were supplied as a by-product of the operation of conventional generators in the past, will need to be appropriately valued and procured. This may require additional investment or impose different operating regimes on some plant.

AEMO has primary responsibility for ensuring the power system is secure through a framework of measures that include:

• Implementing security standards and provisions in the Rules including through developing guidelines and operating procedures
• Imposing technical standards on plant seeking to connect to the power system
• Ensuring appropriate design of the network and provision of network support services
• Constraining plant in dispatch to ensure the pattern of dispatch and resulting power flows on the grid lie within the secure operating range

• Real time monitoring and online analysis
• Direct procurement of a range of ancillary services.

AEMO’s focus is managing system security issues that have arisen as a result of changes in the technical character of the power system with a very high proportion of asynchronous, variable generation. Specific examples of system security challenges include:

• The frequency of the power system is now at risk of not meeting the standard and, more importantly, is not showing inadequate response to disturbances that would normally be expected.

• The minimum level of inertia online is falling at times, exacerbating the need for frequency control resources. Low inertia also leads to a higher rate of change of frequency during disturbances and reduces the ability of the system to ride through disturbances.

• Voltage control is coming under pressure in parts of the grid as embedded generation and new generation in different areas change power flows. In some areas of the transmission grid, low power flows at times are driving the need for resources to lower voltages. In areas of the distribution networks, power flows are more variable than in the past and can even reverse direction. This is driving the need for better monitoring and control of the distribution system and the need for more dynamic reactive resources.

• System strength is a new issue to be managed and one which has seriously impacted on the SA region and is impacting on other regions in different forms. In SA, it has required frequent system operator intervention to keep online synchronous generation that the market is not valuing. In all regions, the impact of this issue has been felt by new connecting generation needing to develop mitigating measures. The solution being implemented by ElectraNet in South Australia aims to provide inertia as well as system strength with the use of synchronous condensers.

A range of rule changes and initiatives have been implemented to support AEMO to continue to manage system security.

While not defined in the Rules, the resilience of the system is also relevant given the nature of the security risks in the system. These issues require the assessment and mitigation of a broader scope of issues than that required traditionally to deliver ‘security’.

The power system now has different technical characteristics, with which there is little operational experience to draw upon in understanding all behaviours through real world extreme events. New (digital) technologies used throughout the electricity supply chain are also different in that they rely upon programmed active responses to maintain security.

The market framework is evolving to capture the changing nature of risk in the system. Resilience concepts are already beginning to be integrated within the NEM rules framework through rules such as the protected events designation, which allows for pre-
emptive action, as well as special protection schemes to deal with a class of events beyond credible contingencies.

The potential impacts of climate change on the performance of the system heighten these risks, potentially exposing the system to more severe and more prevalent heatwaves, bushfires and storms. There is a Commonwealth-funded program, which AEMO is involved in, considering this issue. The AEMC has recently clarified how climate change manifests through the NEO as mitigation and adaptation risk.

And recent recognition of forecast uncertainty in the assessment of system adequacy was an important first step in broadening the concept of a ‘credible contingency’. The introduction of the concept of ‘protected events’ was another step in that direction.

4.4.3 Risks that current and planned market arrangements will not meet the challenge

In a number of respects, regions within the NEM are at the international forefront of integrating variable renewable energy and distributed energy resources. It is important that the planning, market and regulatory arrangements keep pace with the evolution of the power system and the security challenges it brings.

The key risk for system security going forward is that the pace of reform in the market and regulatory arrangements does not match the pace of change in the power system and customers bear the risk of security failures or the higher costs and disruption caused by the need for excessive intervention.

This could be exacerbated if government initiatives, market rules and design changes are pursued without adequate consideration of the implications for system security. A key aspect of that needs to be consideration of what services will be required and how they should be valued, procured and delivered to the system.

4.4.4 Market design implications

System security and, potentially, resilience will need to be a focus of any initiative that impacts on the NEM.

The market and regulatory arrangements need to provide incentives to deploy innovative measures to both reduce the need for system security services and to supply them more efficiently. The potential for the competitive market to deliver dynamic efficiency benefits needs to be realised as the NEM, and power systems globally, change.

Within each overall market design option, a range of options for the procurement and dispatch of system security services is possible. Expanding the number of spot markets as currently used for frequency control ancillary services could provide the services needed while maintaining efficient dispatch including co-optimisation between services and between services and energy. However, they may not drive efficient investment needed because of their relatively small scale and volatility of returns over a year.

An appropriate design will also provide adequate levels of resilience against unexpected but reasonably possible events to avoid disproportionate consequences.
International jurisdictions may provide useful lessons, while few jurisdictions face the growth in distributed generation seen in the NEM or the issues on areas within the grid with the scale of new VRE connecting, many have ambitious targets and are actively pursuing better integration of VRE and adapting existing and implementing new ancillary service markets.

The UK has recently completed a trial of enhanced frequency control services, PJM has implemented a pay for performance approach to frequency control services and seen batteries and flywheels implemented to take advantage of these arrangements. The Californian market is introducing a flexible ramping product to complement other frequency control services. A range of other options which are being, or have been, developed and implemented in some international markets, warrant consideration.

4.5 Integration of variable renewable energy into the power system

4.5.1 Key challenge
Variable renewable energy (VRE) generators differ from typical baseload generation in several key ways: they have no fuel costs, so their marginal costs of operation are lower; they are dependent on weather conditions for operation, so they can’t always produce at capacity and the volume of energy they generate can change quickly; and they do not offer the same system security services as synchronous generators.

The dependence of VRE on the natural resources at their location (e.g. high wind or plentiful sunshine), the fact that many of these optimal locations have not been near existing network infrastructure, and the rapid pace of investment in VRE over recent years have also prompted concerns about how to efficiently connect that generation and upgrade the transmission system to allow those generators to access the market.

Key challenges associated with integrating large scale renewable generators into the network include:

- How to provide market access to the greater installed capacity of supply required to meet customer demand
- How to coordinate investment in transmission and generation.
- How to operate the market and effectively manage the commitment and dispatch of generation with a much greater proportion of VRE
- How to maintain reliable energy supply as variable generation capacity grows, including ensuring investment in flexible generation, storage and responsive load needed
- How to maintain system security as more asynchronous generation enters (see Section 4.4).

4.5.2 Current market arrangements and reform initiatives

Access and coordination of investment
The wholesale market has been changing over recent years with older coal fired generation exiting and being replaced predominantly by large scale VRE generation. That transition is expected to continue as highlighted in AEMO’s ISP where in the ‘neutral with storage’ modelling scenario, by 2030 over 6,000 MW of existing generation is expected to close and be replaced by approximately 22,000 MW of renewable generation
and 6,000 MW of storage. By 2040 the amount of expected closure increases to approximately 16,000 MW, which is projected to be replaced by 50,000 MW of renewable generation and 20,000 MW of storage.

If a faster and bigger transformation occurs then these values will increase and occur sooner. The ISP forecasts that peak demand is expected to be just over 36,500 MW and installed generation 90,000 MW by 2040, compared to today where peak demand is 35,500 MW and installed generation is 50,500 MW.

The connection of new generation is creating significant pressures on the transmission system in the NEM both from a planning and operational perspective. Through its COGATI review the AEMC has found that due to the current limited locational signals in the transmission frameworks, as well as the speed and scale of connections of new generation capacity, investors are planning to connect where the network has limited or no capacity for additional generation to be dispatched.

The key challenge is therefore to find an efficient mechanism to coordinate generation and transmission investment in a way that takes into account the benefits of a generation location from a fuel source point of view and the cost of extensions or upgrades to the transmission network to serve that location. Efficient coordination of generation and transmission investment should help provide investment and operational certainty for generators as well as lower system costs for consumers.

The current approach to coordinating investment in transmission and generation is multilayered:

- The AEMO Integrated System Plan and ESOO identify opportunities for future investment (including identifying renewable energy zones)
- Marginal loss factors (MLFs), which account for the losses of energy between the point of generation and the customer, provide some locational signals
- Transmission network service providers identify where new investment may be required, with proposal subject to regulatory approval (through the RIT-T process).

MLFs in areas where new renewable generation is connecting are falling and having an increasing impact on generator finances. They are becoming more difficult to forecast and to manage as locational decisions of one generator can be impacted by the locational decisions of subsequent generation projects. While these are representative of actual marginal losses, they may not reflect efficient losses with some network augmentation.

For these reasons there are a range of initiatives underway to improve locational investment signals, most notably the COGATI review. The AEMC released its COGATI directions paper on 27 June 2019. The Commission noted that it was of the view that change is need at the present time so that regulatory frameworks evolve to match the transition in the NEM.

Specifically, the Commission has proposed that generators receive a dynamic regional price that more accurately reflects the marginal cost of supplying electricity at their location in the network and enabling generators to purchase transmission hedges to allow generators to rely on a particular revenue flow regardless of other generators’
locational decisions. The Commission also noted that it considers renewable energy zones can be used as a transitional measure before a full access model is implemented.

The ESB has been coordinating activities between the market bodies to make the ISP actionable and to deliver the transmission investments recommended in the ISP referred to as immediate priorities – the Group 1 projects. Ongoing work is required to establish the role of planning through future ISPs with provisions for market driven investment in transmission.

Operations

As generation from variable energy resources increases as a proportion of NEM capacity, the method of dispatch into the transmission network will need to be considered. The NEM has mature systems for forecasting renewable energy and individual generators are now moving to provide their own, more advanced short-term forecasting. ARENA has assisted by funding developments and trials to support these improvements. However, the gains now available through better forecasting are limited, and the market will need to operate in the context of greater variability and uncertainty.

The NEM has successfully relied upon self-commitment and self-dispatch since commencement, aided by the provision of market information and driven by market incentives. With greater variability in supply and demand, traditional measures of adequate reserves would not reflect the full range of risks and the probability of running out of capacity. The Rules were changed, modifying the framework for the declaration of lack of reserve (LOR) conditions to incorporate a probabilistic measure of the uncertainty in forecasting the adequacy of the balancing of demand and supply. These provisions only apply to capacity and, while they reflect the volume of reserves required, they do not identify the characteristics needed of that reserve plant. In particular, they do not necessarily identify the responsiveness or flexibility that might be required in that capacity to meet rapid changes in the supply-demand balance. It also does not address whether enough system services are likely to be available.

4.5.3 Risks that current and planned market arrangements will not meet the challenges

The approach to investment decisions is of prime importance to consumers who ultimately bear most of the risk, and the associated costs, of incorrect or poorly coordinated investment decisions across generation and transmission.

While this points to the possible benefits of improved coordination between generation and transmission investment, it also points to the importance of continuing to rigorously test network investments to ensure that consumers are protected.

A number of governments have policies designed to intervene in the market and influence the generation mix. The impact of these interventions on future market arrangements for coordinating generation and transmission presents a key risk. It will be critically important that any initiatives designed to drive more efficient, coordinated investment in generation, storage and transmission are robust to emerging and future government policies.
The commitment and dispatch of plant with sufficient flexibility to manage the level of volatility and unpredictability in supply and demand will become more complex in the future. It is not clear that individual generators managing their own position will continue to be adequate to maintain overall operational reliability in the future.

### 4.5.4 Implications for future market design

#### Access and coordination of investment

There is a spectrum of approaches to dealing with congestion, providing locational price signals and for driving efficient coordination of investment across transmission and generation:

- An approach using more ‘granular’ price signals with tradeable transmission rights. These issues are being explored by the AEMC in its Coordination of Generation and Transmission Investment Directions Paper; or
- A planned approach consistent with the work underway to make the Integrated System Plan (ISP) implementable and proposals to create specific arrangements around identified renewable energy zones.
- Hybrid approaches involving combinations or elements of both broad approaches. For example, the AEMC in its COGATI Directions paper proposes that transmission planning is informed by a generator’s purchase of transmission hedges known as financial transmission rights (FTRs) with the ISP potentially continuing to play a role in guiding investment decisions.

The COGATI review will determine where on the spectrum of approach the future market design will lie. Any recommendations the post-2025 project makes will be consistent with the COGATI review and look to build upon the proposals.

Other jurisdictions have addressed these challenges in a variety of ways. New Zealand and PJM, for example, have utilised a combination financial transmission rights and system planning mechanisms to assist with coordination of transmission and generation. Texas had a concentrated program of transmission construction to enable the connection of wind generation in a zone with a good resource but limited access.

#### Operations

The future market design needs to operate in the context of greater variability and uncertainty in supply and demand. Participants need to make commitment decisions in this more uncertain environment and AEMO needs to ensure that the power system has the capability to deliver reliable and secure supply within the range of likely outcomes. Additional measures and new or changed markets may be required to meet these challenges.

Consideration needs to be given to a range of approaches to integrate higher proportions of variable renewable energy into market operations. In some international markets flexible, ramping markets have been introduced to incentivise the provision of the flexible resources needed and dispatch them to ensure that supply and demand can be matched in real time. Many international markets pay for operating reserves and have day ahead
commitment markets. Several markets provide a day ahead assessment or "reliability unit commitment" analysis to assess the capability of the system and have available a range of measures for the operator to act if further resources need to be committed.

Questions for stakeholders:

- Have we identified all of the potential challenges and risks to the current market? If not, what would you add?
- Which of these challenges and risks will be most material when considering future market designs and why?
- Which (if any) overseas electricity markets offer useful examples of how to, or how not to, respond to the challenges outlined in this paper?
5. Summary of issues for consultation

Stakeholders are invited to make submissions on the issues raised in this consultation paper. In particular, the ESB invites stakeholders to provide comments on:

- What scenarios and shocks should be used? How should these be used to test market design?
- How can market and economic modelling best be used to evaluate individual components of market design or the end-to-end market design?
- Is the assessment framework appropriate to evaluate the effectiveness of future market designs? What else should be considered for inclusion in the assessment framework?
- Have we identified all of the potential challenges and risks to the current market? If not, what would you add?
- Which of these challenges and risks will be most material when considering future market designs and why?
- Which (if any) overseas electricity markets offer useful examples of how to, or how not to, respond to the challenges outlined in this paper?

### Detailed information on making a submission

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<tr>
<td>Publication</td>
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6. ANNEX A: Assessment Framework

An overarching principle is that the outcome should satisfy the National Electricity Objective.

The National Electricity Objective as stated in the National Electricity Law (NEL) is: "to promote efficient investment in, and efficient operation and use of, electricity services for the long-term interests of consumers of electricity with respect to:

- price, quality, safety and reliability and security of supply of electricity
- the reliability, safety and security of the national electricity system."

As a threshold test, any market design under serious consideration needs to be capable of delivering a safe, secure and reliable electricity system over time that is affordable.

Having met this baseline, some potential principles for evaluating market designs are:

A. Efficiency – productive, allocative and dynamic as well as capital efficiency in order to be able to demonstrate least-cost outcomes are delivered by the market design
B. Practicality of implementations
C. Effective entry and exit of generating capacity
D. Costs are allocated to those best placed to respond to them
E. Risks are allocated to those best placed to manage them
F. Transparency and simplicity
G. Consumer empowerment
H. Resilience to external shocks
I. Robust to possible future government policy changes
J. Technology neutrality
K. Competitive neutrality
L. Supportive of innovation

These are expanded upon further below.

These principles will not be subject to a hierarchy as a means of resolving conflicts between them.

Efficiency

- Prices tend to reflect the marginal cost of supply or value of demand
- Potential exercise of market power is minimised
- Overabundance and scarcity of generation is effectively managed
- All services the power system needs are valued and procured using methods designed to keep costs to an efficient level
- The market is structured in a way that seeks to maximise capital efficiency. This will include mechanisms to orchestrate efficient scale or capital allocation that may be beyond the ability of individual market participants to deliver acting alone.
- High quality of information is available to participants in a timely fashion
- Avoidance of unnecessary costs (transaction, regulatory, administrative). Unwarranted administrative and regulatory costs are a deadweight cost in economic terms.
• Secondary markets, where present, are characterised by high levels of transparency
• High levels of innovation in service offerings and service provision

**Practicality of implementation**

Given the deterioration in system outcomes in security, reliability and affordability, market design must be put in place quickly to deliver the market and regulatory frameworks necessary to deliver the outcomes consumers expect.

To do this, market designs under consideration must promote timely change and decision making.

To assess this, it will be important to articulate the range of outcomes required and identify, for each market design or aspect of market design, what needs to be done by whom and by when to ensure the market design can be practically implemented and outcomes achieved.

To ensure a smoother transition to the future electricity system, the assessment framework will have a bias towards market designs or aspects of market designs that provide confidence that each actor is appropriately incentivised to take the action required of them to deliver the agreed market outcomes rather than a “wait and see” approach.

**Effective entry and exit of generating capacity**

• The market minimises the risk of unplanned exit of generating capacity
• The market incentivises the timely entry of efficient replacement generating capacity and ancillary services

**Cost allocation**

• Costs are typically allocated to the party best placed to respond to them.
• This generally manifests as a user pays or causer pays approach to cost allocation. In turn, this provides price signals that help to drive efficient use and/or investment decisions.
• Alternatively, it may manifest in a cost-reflective approach to shared cost allocation, such as network tariffs. It may also inform the issue of to whom the cost-reflectivity is aimed.

Where the application of this principle results in a departure from the status quo, distributional concerns will likely arise. It will be important to understand the nature of such distributional effects and consider whether they can be addressed through complementary policy.

**Risk allocation**

• Risk is typically allocated to the party best placed to manage that risk
• Where risk is allocated to another party, it is because of a material trade-off that benefits the risk-bearer (e.g. lower cost of services).
• The risk-bearer has options for managing some or all of the risks they face (for example, futures markets offer a mechanism for mitigating price risk).
Transparency and simplicity

- System actors (suppliers, consumers, market operator, etc.) are able to make effective, timely and efficient decisions in response to the information and signals available to them. This allows for complex decision-making, provided algorithms to resolve the complexity are available to the relevant actors and can operate in the required timeframes.
- System and market information is widely accessible, subject to commercial confidence and customer privacy issues as well as cost and feasibility.
- Information asymmetries are minimised.

Consumer empowerment

- Consumers are able to engage with the energy sector on the terms that suit their needs and circumstances. The energy market is flexible and responsive to changing consumer preferences.
- Market design recognises that energy is an essential service and increasingly enables other essential services.
- Customers are able to make effective choices in the way they procure electricity, including their preferred mix of distributed energy resources (DER) and grid electricity. In practice most customers will use agents and platforms to assist them in making these choices.
- Customers retain control over their own load/generation/storage (or at least over the decision to allow another party some load control rights in return for appropriate consideration).
- Customers can make a meaningful choice to lower their own emissions profile if they wish to.

This does not mean that customer action is not subject to constraints. It may be appropriate to impose minimum inverter requirements on customers who wish to export energy, for example.

Resilience to external shocks

The market design is not reliant on the participation or cost-effectiveness of any one technology or asset for its success

- The market is resilient to changing environmental factors.

This principle may be tested through the use of scenarios that contain external shocks.

Robust to possible future government policy changes

- The market design is effective in delivering the required services at efficient cost even in the context of changing government policy and possible future market interventions.

Technology neutrality

- Services provision is defined as widely as possible to allow the maximum range of resources to participate.
- Service provision is defined in a way that does not discriminate between technologies (except on the basis of their ability to provide the service).
• Technologies are valued for their ability to provide services rather than some presupposition of their utility or desirability.

**Competitive neutrality**

• Public and privately-owned entities are treated the same under the market design framework

This does not mean that the role of government in the market will remain unchanged, rather that government policies directed at achieving an outcome in the market should apply to all entities where they compete regardless of ownership.

**Supportive of innovation**

• The market should incentivise and enable value creation through the efficient adoption of new technology
• Increased uptake of service provision from DSR & DER
• Increased transparency of information and knowledge sharing from proof of concept trials
## 7. ANNEX B: Related initiatives

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<tr>
<th>Process/Initiative</th>
<th>Description</th>
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| Coordination of Generation and Transmission (COGATI)         | Progresses recommendations from the 2018 CoGaTi to implement reforms  
|                                                             |  
|                                                             | • charging arrangements which enable transmission businesses to recover the costs of transmission infrastructure, within and between regions.  
|                                                             | • to the way generators access and use the transmission network “ |
| Integrated System Plan                                       | "AEMO is updating the scenarios that were first published in the inaugural 2018 Integrated System Plan (ISP). The ISP is a cost-based engineering optimisation plan by the Australian Energy Market Operator (AEMO) that forecasts the overall transmission system requirements for the National Electricity Market (NEM) over the next 20 years. The ISP models/outlines targeted investment portfolios that can minimise total resource costs, support consumer value, and provide system access to the least-cost supply resources over the next 20 years to facilitate the smooth transition of Australia’s evolving power system."
| Distributed Energy Integration Program                       | The Distributed Energy Integration Program (DEIP) is a collaboration aimed at maximising the value of customers’ distributed energy resources (DER) for all energy users. DEIP has four workstreams:  
|                                                             | -Customer – Capturing and sharing customers’ preferences to inform the future  
|                                                             | -Markets – Enabling multi-party exchange of value in markets within physical network constraints  
|                                                             | -Frameworks – Optimising investment in and operation of network and non-network DER infrastructure  
|                                                             | -Interoperability – Standardising the physical operation, visibility and resilience of the distributed energy systems |
| Electricity network economic regulatory framework review     | The AEMC’s annual Economic regulatory framework review is conducted under a standing terms of reference from the COAG Energy Council. This review considers whether the economic regulatory framework for network service providers is robust and flexible enough to support the long term interest of consumers in a future environment of increased decentralised energy supply. For the 2019 review, a major area of consideration is how the increasing uptake of distributed energy resources (DER) is changing the use of the electricity networks, and how the regulatory framework can facilitate consumers’ use of DER while keeping the total cost of the electricity system to the minimum. The Commission has been consulting extensively with stakeholders on both current and emerging issues, and on the extent to which reforms to areas such as distribution access, connections and pricing could improve outcomes for consumers. The 2019 Review report is due to be published by the end of September 2019. |
| Rocky Mountain Institute - ESB DER project | This project will offer a shared vision for what value DERs can provide today and in the future, and what specific strategies will maximize that value”. And in particular: 1. Understand the differences and commonalities in perspectives around DER integration among electricity industry decision-makers and stakeholders. 2. Identify and explore opportunities and barriers to achieving a shared view of a successful high-DER future. 3. Collaboratively prioritize near-term steps to address opportunities and barriers and support the system’s transition. |
| Frequency Control Work Plan | AEMO to assess long-term frequency needs Development of mechanism for the provision of primary regulating services for frequency |
| Wholesale Demand Response Mechanism | Rule change considering how/if to recognise demand response providers on equal footing with generators in the wholesale market and as such, being able to more readily offer wholesale demand response in a transparent manner. |
| Short term forward market review | Rule change request from the Australian Energy Market Operator (AEMO) proposes to introduce a voluntary short-term forward market to enable participants to contract for electricity in the week leading up to dispatch. Proposal for an exchange platform to trade anonymous, standardised electricity contracts up to one day ahead. Recommended by AEMC in Reliability Frameworks Review Rule change request pending. |
| Intervention mechanisms and system strength project | The AEMC is reviewing the interventions framework in light of the growing number of directions being issued by AEMO to maintain system strength. This investigation is also considering the experience to date with the current framework for managing system strength, and whether any refinements are warranted to that framework to support system security in the most efficient manner possible. |
| Open Energy Networks | A joint AEMO-ENA project examining possible changes to how distribution networks might engage with consumers and DER, options under consideration include: dynamic management of DER. |
| Consumer Data Right | Framework legislation to give consumers (individuals and businesses) and their nominated, accredited third parties the right to access data that is related to them - legislation currently before Parliament |
| Transparency of new projects | This rule change request from the Australian Energy Council seeks to enhance publicly available information about new generation projects. It would also allow developers of these projects to register with AEMO to get access to key technical information such as network modelling data. |
| Underwriting new generation investments | Government program to underwrite new generation investment. The program’s primary objective is to reduce wholesale electricity prices through increased competition and supply in a manner that: assists commercial and industrial customers access affordable energy supply |
arrangements; improves reliability and security by increasing the level of firm and firmed capacity in the system; minimises costs to electricity consumers and taxpayers. Following an ROI process the government has established a shortlist of 12 projects, which includes: 6 renewable pumped hydro projects, 5 gas projects, 1 coal upgrade project.
Contact details:
Energy Security Board
E: info@esb.org.au