KPMG

Electricity Market Design Principles

Identifying long-term market design principles to support a sustainable energy future for Australia

Executive Summary

19 April 2018

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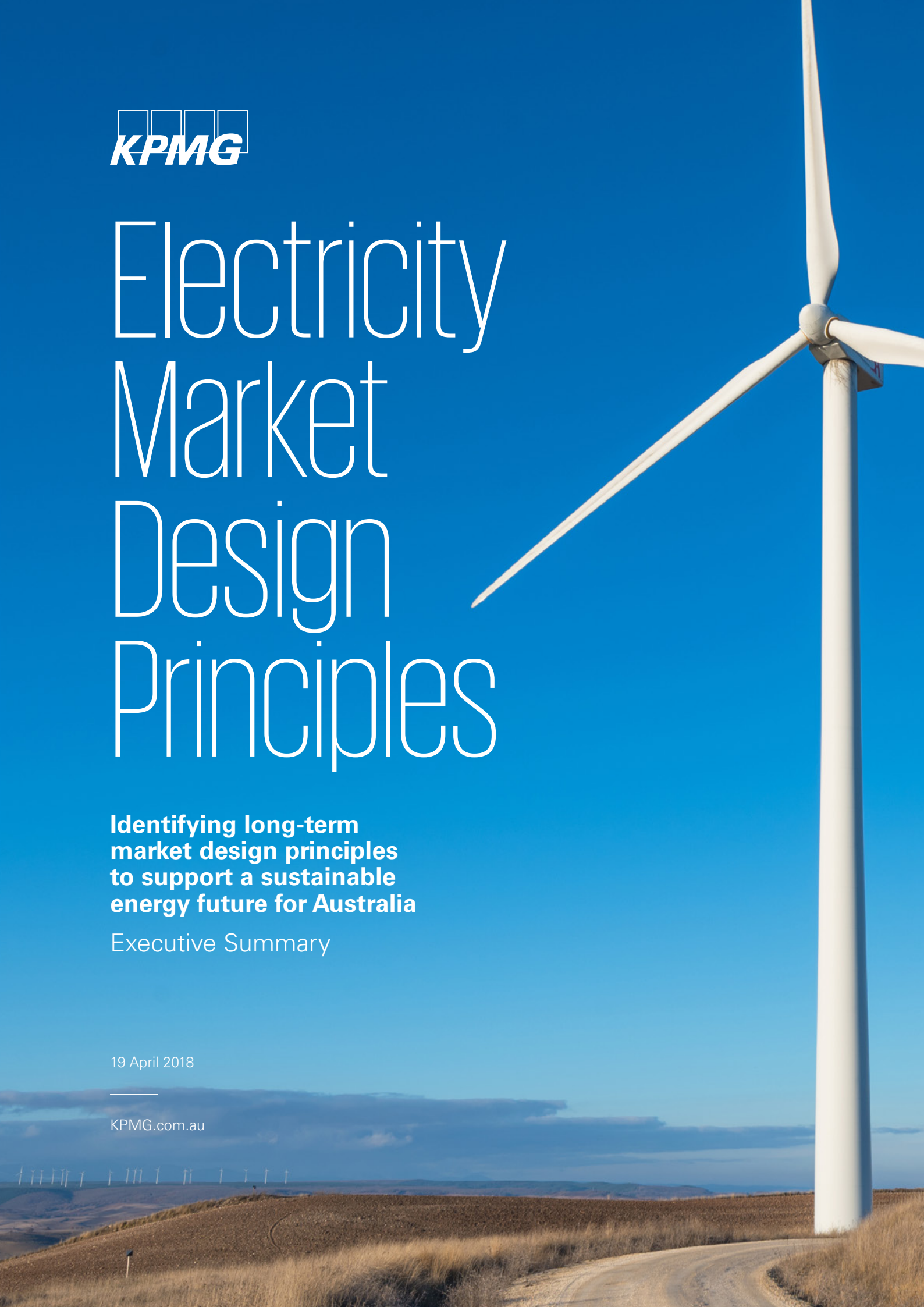

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The Australian Energy Council (AEC) has asked KPMG to provide advice on long-term market design principles that support a sustainable energy future for Australia and allow for the assessment of potential market design changes.[1] We have also been asked to examine various market mechanisms intended to improve power system security and reliability and undertake a high level review of these against the principles.

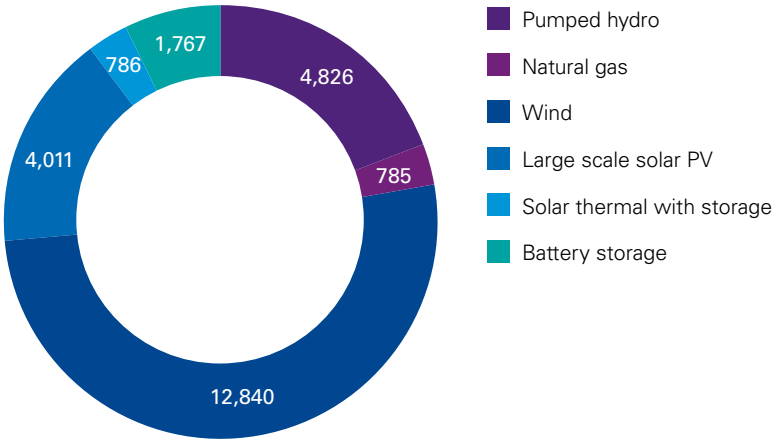
This summary document sets out our key findings and recommendations.

The nature of the challenge

Decreasing wind and solar technology costs, along with government emissions reduction policies, are driving the transformation of the Australian electricity sector. The sheer scale of new investment required through this transition to 2030 is shown in *Figure 1*. Around $23 billion of capital expenditure in generation resources alone is expected to be required in the east coast National Electricity Market and $2 billion in the Western Australian Wholesale Electricity Market.

Investors, including customers investing in demand-response, require confidence in the market framework to underpin their decisions. Without confidence, capital for new investment will require higher returns or not be readily available. Policy uncertainty affects affordability – an increase in the cost of capital by 1 percent is estimated to increase the required annual revenue sought by investors by 10 percent.[2]

Figure 1: New generation investment requirement ($m)[3]



Change in any market is inevitable. What is important is this occurs in a way that's well understood and provides investors with confidence to make long term decisions.

Market design principles

How do we evolve the current electricity market design to meet these challenges? As the electricity system incorporates new technologies with different physical and technical properties, we need to consider how to evolve the market design to reflect these changes and meet the National Electricity Objective.[4]

Change in any market is inevitable. What is important is this occurs in a way that is well understood and provides both investors and customers with confidence to make long term decisions. A robust market design framework with established and accepted principles is a necessary part of this.

Our recommended principles for wholesale electricity market design are shown in *Table 1*.

1 The AEC represents major electricity and downstream natural gas businesses operating in competitive wholesale and retail energy markets.

2 Based on the difference between a 10% and 11% required return over a 25 year asset life, adjusted for inflation.

3 Australian Energy Council website.

4 The National Electricity Objective 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, reliability, and security of supply of electricity; and the reliability, safety and security of the national electricity system.

Table 1: Market design principles

Market design principles		
Principle 1	Competition and market signals	Participants responding to market signals in a competitive environment tends to promote better outcomes for consumers than centralised planning.
Principle 2	Risk allocation	Markets that allocate risk, costs and accountability for decisions to those best placed to manage them promote efficient outcomes.
Principle 3	Competitive neutrality	Markets that are technology neutral and do not favour one technology or business model over another encourage consumer needs to be met at the lowest cost and promote innovation.
Principle 4	Clear and durable rules	Markets that are durable across a range of credible future scenarios, and establish a clear and consistent set of rules, provide participants with the confidence to make decisions.
Principle 5	Information asymmetries	For competitive markets to work as intended, market participants need accurate and timely information to make decisions. Without this, they will not be confident they are competing on a level playing field.
Principle 6	Cross-market integration	Costs to consumers will be minimised when markets complementary to energy, such as ancillary services and emissions, are designed in a way that is consistent with the price discovery mechanism for electricity.

These principles reflect the view that an effectively competitive wholesale electricity market, where participants make investment and operational decisions based on market signals, will provide consumers with the energy services they demand at the lowest possible cost.

A useful way of applying the principles is to break down a market mechanism or policy into components. Design choices for each component can then be assessed against the principles. To do this it can be beneficial to start by framing the analysis as questions, such as:

- What services is the mechanism valuing and pricing?[5]
- Is the design of the mechanism clear and easily understood?
- What is the role of non-market facing entities and when does decision making pass from the investor and participant to the market operator?[6]
- What is the role of forecasting in the operation of the mechanism and who is exposed to the risk of inaccurate forecasts?
- How will the mechanism affect the hedge contract market?

Market design principles should endure through time and guide market development as the electricity sector evolves.

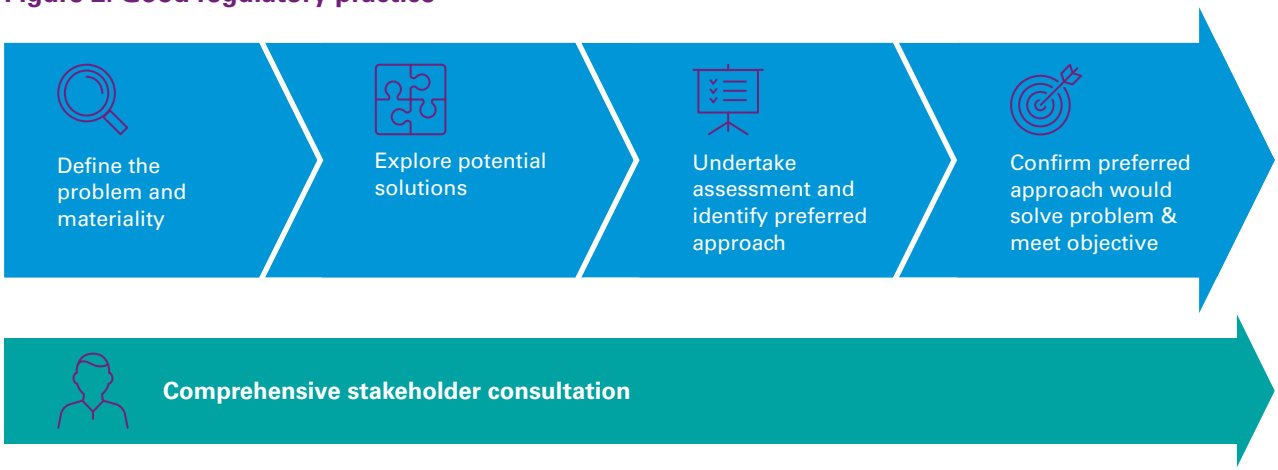
5 Services could include, inertia, fast frequency response, generator ramping capability, system restart and network control ancillary services.

6 Non-market facing entities include transmission and distribution networks, and the services they could provide to the wholesale electricity market, such as inertia through synchronous condensers.

Good outcomes for consumers requires good regulatory practice

Principles are one aspect to market design – how the principles are applied is equally important. Fundamental electricity market reform requires an integrated and well-structured policy development process, as illustrated in *Figure 2*.

Figure 2: Good regulatory practice



Electricity is a vital input to the Australian economy. Wholesale electricity market rules can have a material impact on the efficiency of the electricity sector, as they are the 'goal-posts' within which market participants make investment and operational decisions.

Prior to considering potential solutions and applying an assessment framework, it is critical to understand the problem to be solved and whether it is likely to persist. Not doing so risks solving the wrong problem or a non-existent problem.

An effective process involves comprehensive stakeholder consultation. Facilitating industry participation in market reform processes creates a sense of ownership, which is essential for successful outcomes. Ultimately, the outcomes for consumers from market reforms will be enhanced when participants understand, adapt their behaviour and embrace the change.

Understanding the problem

Variable renewable energy is creating new challenges for a power system designed around coal, natural gas and hydro. Events in South Australia and New South Wales in 2016 and 2017 have raised the public profile of electricity supply and focussed attention on the functioning of the National Electricity Market.

The wholesale electricity market design must deliver a secure, reliable and affordable supply of electricity with a decreasing emissions intensity. To do this it needs to ensure that the right investments are made across the supply chain, at the right time and at least cost.

There are two factors under the current National Electricity Market design that could impede this outcome:

- Lack of integration of emissions reduction policy into the wholesale electricity market, which is delaying new investment due to policy uncertainty.
- Not identifying and pricing all services necessary to incorporate increased variable renewable energy into the power system, such that market participants can respond to these price signals and provide services like inertia, ramping and fast frequency response.

Prior to considering potential solutions and applying an assessment framework, it is critical to understand the problem to be solved.

Reliability is different to security

While the public commentary has sometimes indicated otherwise, the National Electricity Market has performed well in terms of the **reliability of wholesale electricity**. In 2016/17, the market achieved a reliability level of 99.9996 percent – above the standard of 99.998 percent.[7]

Notwithstanding this, recent events have resulted in a **public perception** that there is a reliability problem or that one will emerge with the growing penetration of variable renewable energy. This needs to be addressed by all stakeholders to **regain customer trust** and investor confidence.

Maintaining system security – or the ability to operate the system within defined technical limits – appears to be the current challenge facing the market. In 2016/17 there were 11 instances of the system being operated outside its secure limits for greater than the maximum allowable time of 30 minutes.[8]

Maintaining system security elements, such as frequency and voltage, has become more complex as renewables form a greater proportion of the energy mix, and are currently being addressed through a range of initiatives.[9]

Governments and industry stakeholders need to work together to regain public trust and investor confidence in the electricity sector.

7 AEMC Reliability Panel, Annual Market Performance Review 2017 (2018)

8 AEMC Reliability Panel, Annual Market Performance Review 2017 (2018)

9 Over the past 12 months, a lot of work has been undertaken on security issues, culminating in a number of rule changes around managing power system security, fault levels and inertia that have recently been finalised and are being implemented.

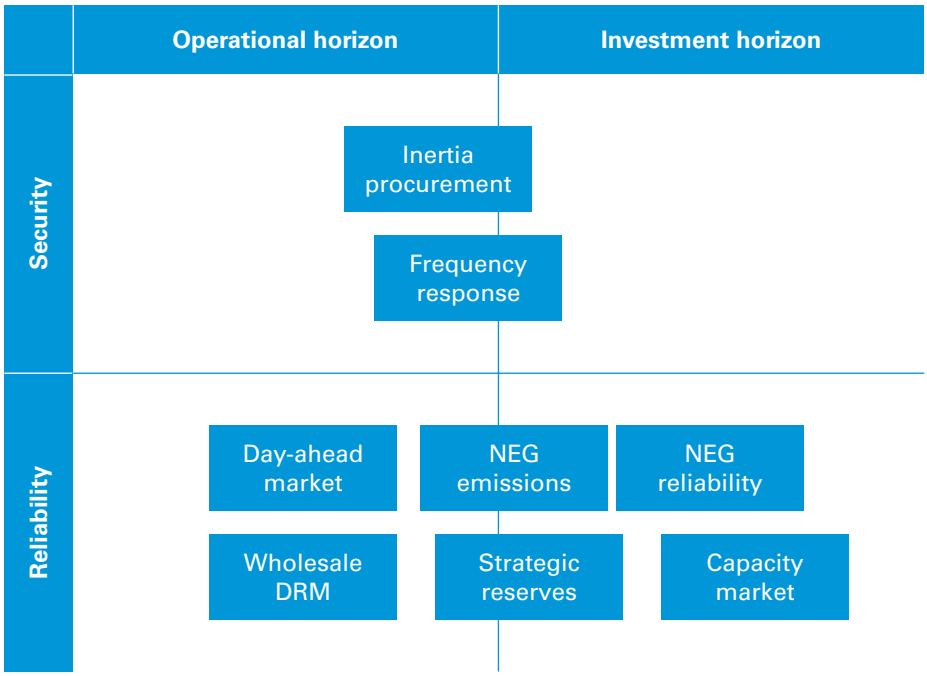
The policy landscape is complex

By our count there are a total of 46 policies or initiatives being considered, with 16 focussed on reliability, eight on security, 16 on emissions reduction and six on affordability. Responsibility for these is spread across the Energy Security Board, the Australian Energy Market Commission, the Australian Energy Market Operator, the Commonwealth Government and four state governments.

Governments and energy market institutions will pursue initiatives and changes to the market framework in line with their respective functions and responsibilities. To minimise cost and complexity it is important for all bodies to identify and evaluate the multiple interactions and interdependencies, and provide a coherent and consistent market reform pathway.

To assist in framing the role of proposed market reforms, *Figure 3* places eight market mechanisms currently under consideration on a matrix categorised by the time horizon over which they act – operational or investment – and whether the mechanism primarily acts to address system security or reliability.[10] It shows the mechanisms that have been topical recently generally have reliability as their key objective.

Figure 3: Categorisation of wholesale market mechanisms



10 Decisions on the operational horizon support day-to-day operation of the market, while those on the investment horizon are related to major capital investments.

Preliminary review of market mechanisms against the principles

Our preliminary review of the above market mechanisms against the principles is summarised in Table 2, which also includes the constrained access reforms in the WEM. We note where development work is being undertaken on these mechanisms, the design process is generally at an early stage and therefore our findings could change.

Table 2: High-level review of policies against the principles

Market Mechanism	Primary objective	Summary of review
NEG emissions guarantee	Reduce emissions/ enhance reliability	The emissions guarantee is still at an early stage, but could be developed in a way that is consistent with the market design principles. Key uncertainties include the impact on ASX hedge contracts and increased transaction and compliance costs, which can be expected to increase barriers and reduce competition.
NEG reliability guarantee	Enhance system reliability	Similar to the emissions guarantee, the reliability component is still at an early stage of development. It could be designed to flag to participants the types of services required and allow a market response. Long trigger times will result in a proxy capacity market and may undermine private investment.
Capacity market	Enhance system reliability	Subject to the specific design a capacity market is unlikely to be consistent with the market design principles because investment risk is generally transferred from market participants to consumers through a central decision making body. Consumers are not best placed to manage this risk.
Day-ahead market	Enhance system reliability	There are many different types of day-ahead market designs. Subject to the problem definition, a voluntary exchange-traded market could be developed in a way that adds value to participants if it facilitates more flexible hedge contracting.
Strategic reserve	Enhance system reliability	For an energy-only market design to be sustainable in the current environment, a credible 'safety net' is required. However, a strategic reserve with long lead times undermines a market response and transfers risk to consumers. Any design needs to be well considered, including whether adjustments to the existing Reliability and Emergency Reserve Trader framework would meet the policy objective.
Wholesale Demand Response Mechanism (DRM)	Enhance system reliability	A wholesale DRM has been considered multiple times since the start of the NEM. A wholesale DRM that makes payments for demand reduction is theoretically sound but complex to implement in practice. The high price cap in the NEM should provide a strong incentive for participants to develop demand response capability.
Inertia and frequency response	Enhance system security	The changing energy mix in the NEM is driving the need for the market to explicitly procure new services to support system security. As variable renewable energy generators displace thermal plants in the energy mix, inertia drops and the system becomes more vulnerable to contingencies. Markets to price inertia and faster frequency response will support the efficient supply of these services.
WEM constrained access	Reliability	Constrained access supports an efficient allocation of network congestion and will likely provide better opportunities for generators to connect to the network. Transitional arrangements may be implemented to recognise existing network access rights.

Contact us

Sabine Schleicher
Partner, KPMG
T: +61 (7) 3233 3233
E: sschleicher@kpmg.com.au

Eamonn Corrigan
Director, KPMG
T: + 61 (2) 9335 8555
E: ecorrigan1@kpmg.com.au

Daniel Hamel
Associate Director, KPMG
T: + 61 (7) 3233 9607
E: dhamel1@kpmg.com.au

KPMG.com.au

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