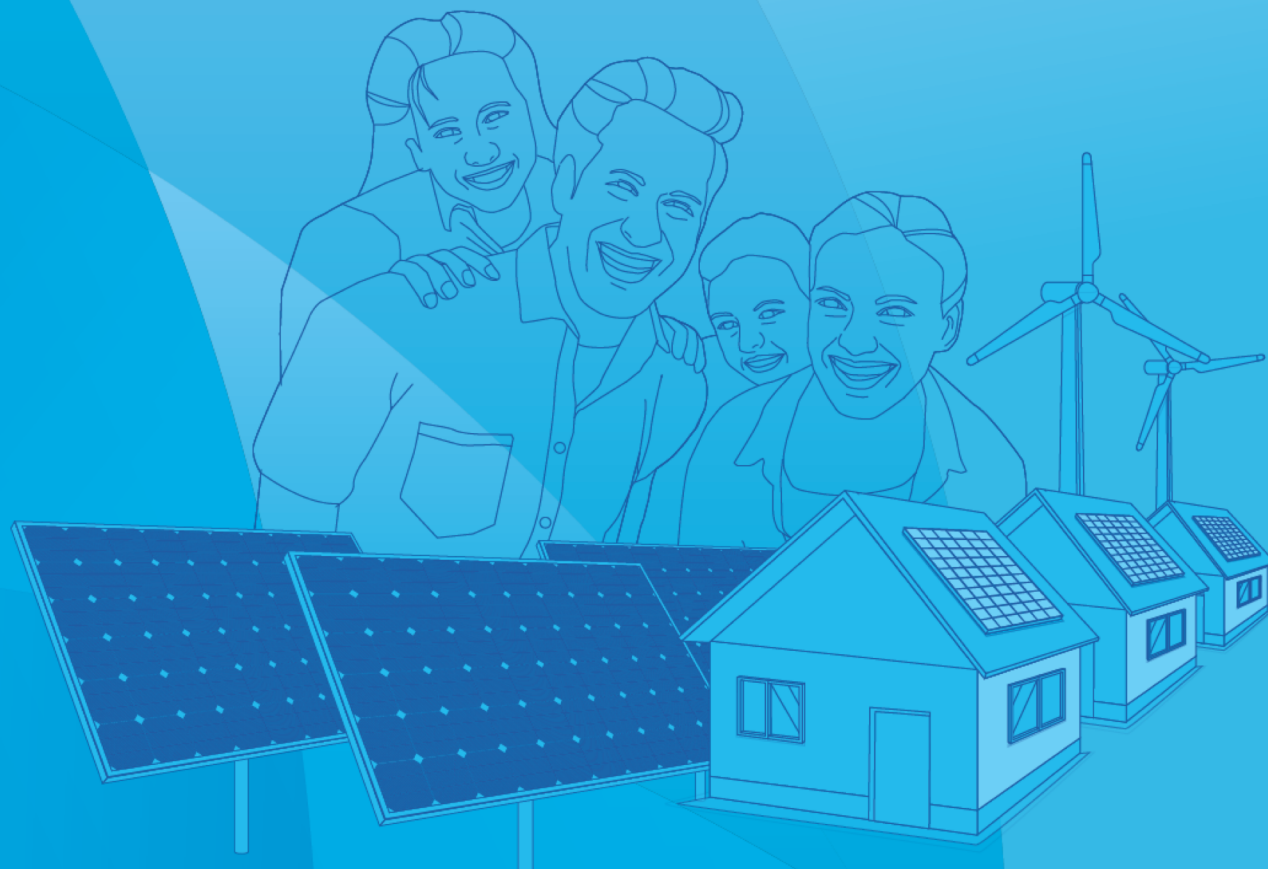


CLEAN AND SMART POWER IN THE NEW ENERGY SYSTEM

Unlocking benefits of change for consumers:
integration of distributed energy resources and
flexible demand

FINAL REPORT JULY 2021



ENERGY
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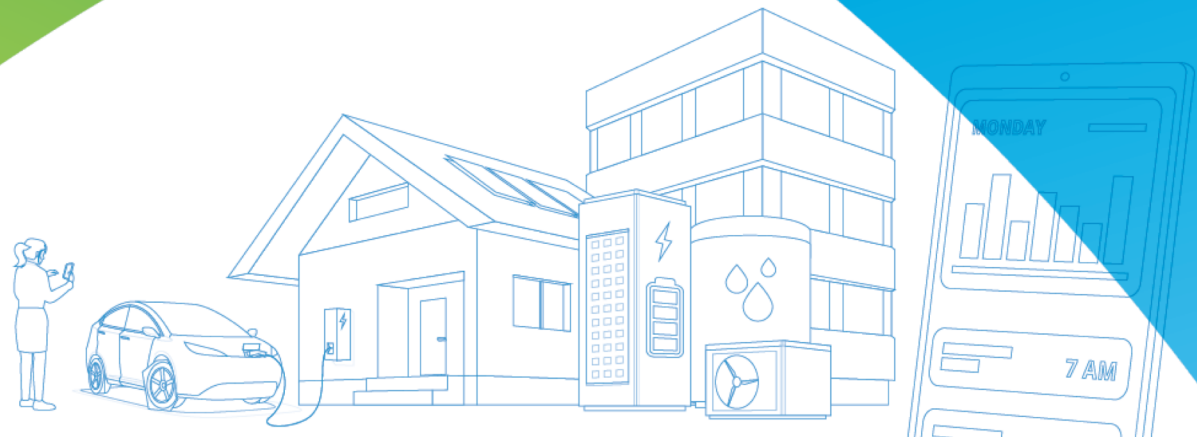
The Post 2025 market design supports the orderly transition to a modern energy system with rapid uptake of distributed energy resources. Consumer investments in things like rooftop solar, batteries and smart appliances . . .



... make it easy for families and businesses to benefit from being flexible with their energy use where they choose to do so



... maximise opportunities for consumers to benefit from lower system costs, seamlessly reduce their bills and lower emissions



New-look market built on consumer choices

Marvellous opportunities for consumers are emerging from Australia's transition to a decentralised, multi-flow electricity market.

Giving value back to customers

In the past, the national electricity market has been mostly a one way, supply based market. That means consumers just took the energy they needed off the grid – and it only came from one place - delivered by big generators.

Now more consumers are buying **and** producing their own power.

They might choose to produce to use; they might want to sell back to the grid. All this is made possible by renewables technology – with people putting solar PV on their rooftops, and turning on smarter home devices like air conditioning, hot water systems and pool pumps.

We are seeing the start of a two way market. With all the right technical and security settings under the hood, advances in technology digital technology can enable appliances and systems to talk to each other securely.

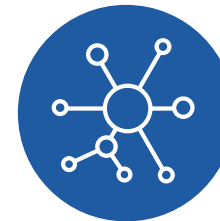
Consumers can be rewarded for their flexible demand; shifting it to when it is cheaper; cutting their bills by selling power back to the grid when it's needed; or by turning on their own panels and storage, and not buying grid power at all. And taking pressure off the grid is good for everyone – lowering the cost of running the whole system.

And, of course, if people don't want to sign up to any new deals, they don't have to. They can stay with service providers on much the same arrangements as they do now and enjoy the benefits of a more efficient system overall.

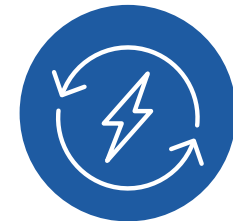
The clearest opportunity from the energy transition is the development of a two-sided market which will be a complete game-changer:



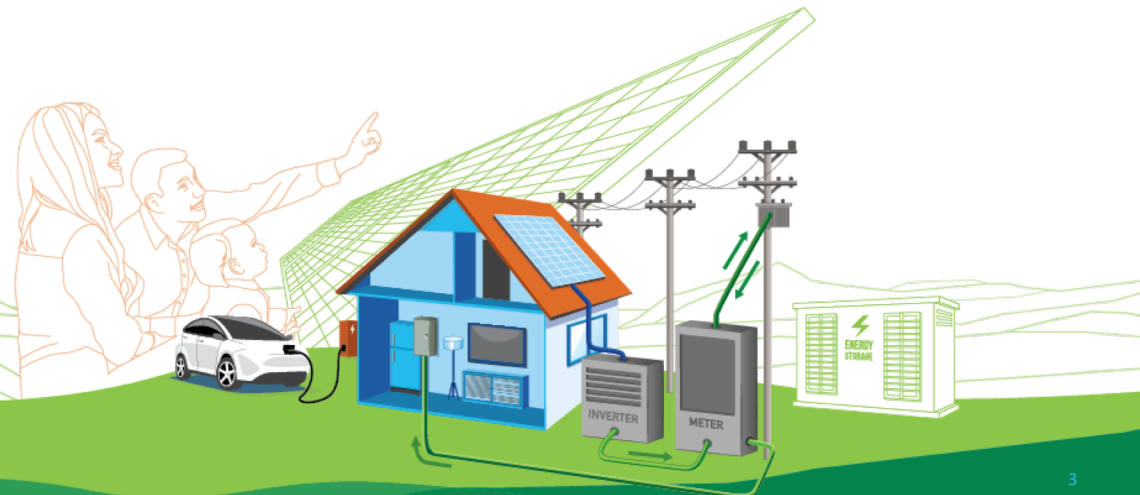
Lowering overall
system costs for
everyone



Increasing the
efficiency of our
existing network
assets



Making the most of
flexible loads, and zero
marginal cost variable
renewable energy



Unlocking benefits of change for families and businesses

Australians have the highest uptake of rooftop solar in the world.

And solar PV now makes up the biggest generator in the national electricity market. The market operator AEMO, says over the next 10 years this will double. Things are moving fast. In a decade we could see 50% of consumers using their home-grown renewable power and flexible appliances to not only cut their own bills but to lower system costs and emissions for everyone.

But we also have to make sure the right settings are in place to reduce risks created by the speed and scale of solar uptake. This includes, better information so consumers can shift their flexible demand to when it is valuable to do so, reducing solar wastage by more efficiently managing grid congestion, and having tools to keep the system secure when there is low demand on the system.

Work has already started on fixing the new market's growing pains and help develop modern, decentralised, two-way energy markets.

Turning power down, turning it off and shifting use to different times of the day and night is a smarter way to manage demand and an important substitute for more expensive infrastructure. Our recommendations are focussed on getting full value out of this latent flexible demand:



Affordability – giving homes and businesses new ways to manage consumption and control bills.



Emissions reduction – making the most of consumer investments in local renewables and electrification of transport through electric vehicles.



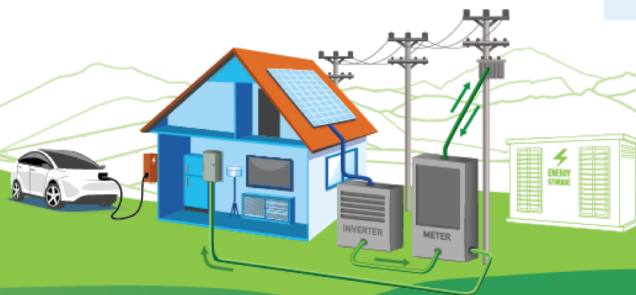
Keeping the lights on – flexible demand and the development of a two-sided market is important to help balance electricity supply and demand, minute by minute, keeping the power system stable every day.



Supporting jurisdictional reforms – by putting emergency backstops in place across all regions so tools are in place for the operator to keep the system secure while new two-way markets are developing at the same time.



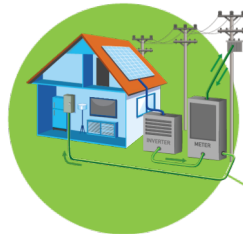
A simpler energy market transition for users – by setting directions so all parties across the energy system have clear roles and responsibilities as these evolve to support the increasing integration of distributed energy resources.



How it all works

Reforms will unlock choices and greater value for consumers in future

Flexible trading arrangements will separate out manageable generation and load from the uncontrollable energy supply to a home or business. This removes barriers and makes it easier for smaller players to engage with the market.



Trader services reform will cut red tape by creating a single universal registration category for all entities who want to do business in wholesale energy and services.



Scheduled lite reform will encourage smaller players like aggregators managing direct load control; or local community batteries; to voluntarily give information on decentralised generation size, availability and operation to AEMO so it can safely, efficiently ensure supply and demand is balanced.



A MODERN ENERGY SYSTEM

New
ways to
trade

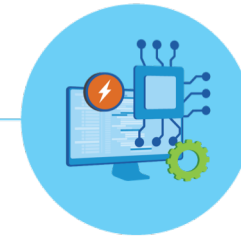
Under
the hood
changes



SMART, CLEAN, FLEXIBLE



Consumer protections will be fit for purpose. As new DER offers emerge consumers can safely try different products and switch between providers if they wish to do so.



Technical settings will change in the background out of sight, but when consumers decide to change the way they use energy they will be able to do so – simply, safely and securely.



Introduces evolved **roles and responsibilities** for traders (aggregators/retailers), distribution networks, and the system and market operator.

Reforms will unlock choices and greater value for consumers in future (continued)

Implementation plan – now

Most of the solar PV on rooftops today is passive, or uncontrollable – which makes it harder for AEMO to balance supply and demand minute by minute as it operates the system. AEMO must maintain system security, which is done by carefully managing all types of generation operating at any one time, so services are available to keep the lights on.

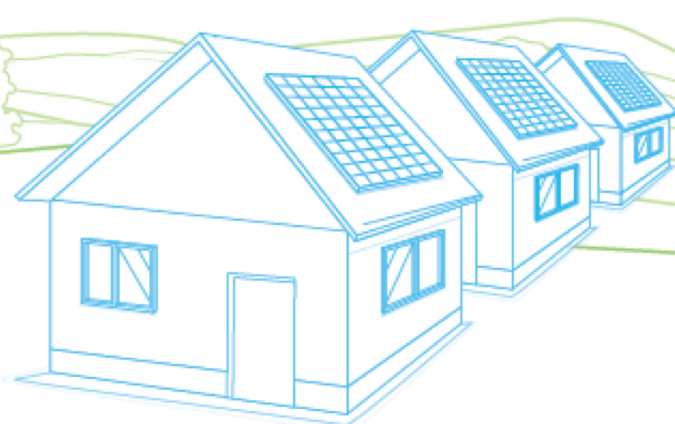
In the same way that emergency backstops are already in place to keep the system secure when there are low levels of supply reserves, we are now going to need different tools and arrangements to keep the system secure as it rapidly evolves to one with low system demand conditions.

Emergency backstops will likely be required in all mainland states in coming years to deal with the system security challenges associated with low demand conditions. These can occur when big numbers of customers have rooftop solar and are generating for their own energy needs during the day. Without flexible demand that can move to times of the day when this cheap solar energy is plentiful, such conditions can affect frequency and inertia and make the job of maintaining system security even harder.

Coordination or management of distributed energy resources is important to keep the system safe and stable so everyone can use energy as they wish to do so.

Most solar PV still being installed are unable to moderate output to respond to system needs, or changes to the spot price . Incoming appliances like batteries and electric vehicles don't have incentives to charge up at lowest cost times which runs the risk of adding to grid congestion.

A smart system better manages electricity flows and smooths out demand peaks and troughs each day, to get more out of the poles and wires we already have. And it takes advantage of low fuel cost generation to reduce overall energy costs. Immediate actions recommended for mid 2021 to mid 2022 to support those priorities include the following:



Reforms will unlock choices and greater value for consumers in future (continued)

Implementation plan – now

NOW

Several reforms are underway to address pressing needs:

Development of technical standards governance: AEMC will release a consultation paper in August 2021 on this rule change requested by the ESB.

Standards for new technologies/devices: providing functionality for ‘active’ DER devices will guide next stage of the Distributed Energy Integration Program (DEIP) work including further definition of DSO network responsibilities. This includes important work on interoperability, enabling devices to communicate with each other so customers can easily switch between providers. Other activities –

- ESB/market bodies to confirm policy on electric vehicle charging standards and timing for their introduction.
- ESB is developing policy advice (due to DEIP December 2021) on interoperability to provide direction on technical standards.
- Based on this advice support phased introduction of mandatory technical standards for new inverter based solar PV and battery storage.
- ESB and DEIP to identify related processes needed to enable DER interoperability alongside standards eg registration, telemetry data collection and management of identity and access control.
- **Development of DER cyber standards** with ESB/AEMO to provide scope and need ahead of the Commonwealth DISER standards; AEMO to maintain coordination with DISER and workplan oversight; risk identification via DEIP interoperability workstream.

Dynamic operating envelope trials underway in South Australia and Victoria to help develop guidelines on metering configurations, connection agreements and capacity allocation rules for network capacity to maximise what we get out of the existing grid.

Distributed energy resources access and pricing rules are being developed by the AEMC to make room for more rooftop solar on the grid and embed batteries and other resources more effectively. Draft rules were released 25 March 2021 and final rules are due in August.

Wholesale demand response mechanism takes effect from October 2021 letting large users trade their energy use. It encourages large consumers to reduce their electricity consumption in response to wholesale market price signals. It works by scheduling this demand into the market in the same way generator supply is scheduled.

Addressing system security challenges emerging from low system load conditions:

- **Enhanced AEMO information** such as: new guidelines to improve knowledge sharing of conditions that contribute to minimum system demand; collaboration with industry to report to the market on minimum system demand conditions; new post-event reports to be associated with market notice mechanisms.
- **Turn up capability trials** run by AEMO and ARENA exploring ways to help more consumers take advantage of negative and low-price periods by shifting consumption to soak up excess solar generation.
- Introducing **emergency backstop measures** to curtail solar PV output, like those already working in South Australia, to give the operator the tools it needs to maintain system security when it is threatened.

Jurisdictional consideration of possible conditions for environmental scheme subsidies to help them work with the needs of the system as well as in the direction of jurisdictional environmental targets eg incentives for active inverters on solar PV; firmed solar PV (installed with batteries); for DER assets to be part of a virtual power plant or system load program; or EV subsidies to be conditional on managed charging.

Consumer protections:

- Introducing a new **risk assessment tool** to be used immediately by market bodies in carrying out their activities and keep consumer protections fit for purpose.
- **Existing retailer authorisation process** will be reviewed by AER and AEMC

Reforms will unlock choices and greater value for consumers in future (continued)

Implementation plan – next

We need to make it easier for consumers, both households and businesses, to benefit from being flexible with their energy use, and manage their consumption and bills if they want to. In addition to DER integration, flexible demand is going to be increasingly important to balance supply and demand, keeping the system stable every day.

These recommendations focus on what needs to happen next to remove barriers and build more foundations for the future. They set priorities for the market bodies to continue the work to intergrate and fully realise the potential of distributed energy resources.

NEXT

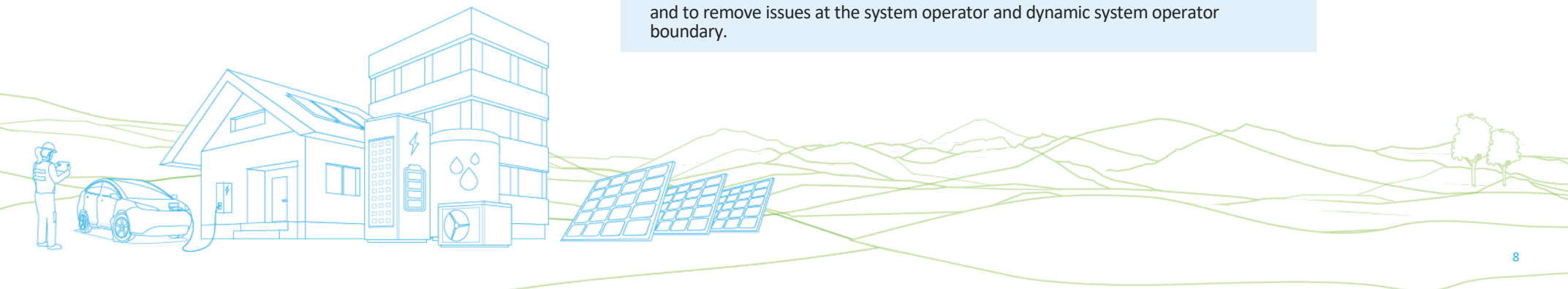
Trader services model cuts red tape by creating a streamlined universal registration category for all trading entities, making it easier for consumers to choose different providers for different services. The AEMC is consulting on this model as part of its integrating energy storage systems rule change project.

Flexible trading arrangements have been proposed by the ESB to support foreseeable developments so for eg consumers can choose to have EV charging managed by service providers separate to their household bill. We recommend AEMO submit a rule request to the AEMC.

Scheduled lite reform encourages smaller generators (5-30MW) and demand side resources to opt in to the market, providing greater visibility to AEMO and to participate with lighter telemetry. Phased implementation to be managed by AEMO.

Modernised regulatory frameworks including network services tariff reform review from the AEMC, local use of system tariffs, and regulations around dynamic operating enveloped.

Network interface and data sharing protocols, for minimum system load events, and to remove issues at the system operator and dynamic system operator boundary.



Reforms will unlock choices and greater value for consumers in future (continued)

Implementation plan – future

By this stage work would be well underway to improve DER participation in markets, to respond to network congestion, make it easier for people to switch between providers and unlock benefits to consumers.

The ESB recommendation of a phased approach to implement DER interoperability and communications standards will progressively establish an enduring operational framework as the two-sided market emerges.

Given the unpredictability of consumer device development and uptake it is critical that this stage retains agility to focus and resolve issues as they become priorities.

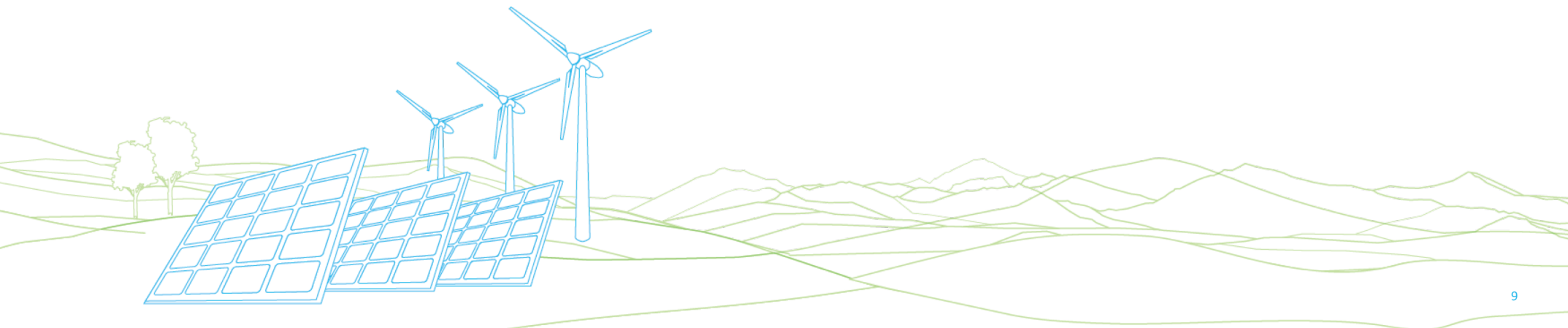
FUTURE

The maturity plan approach to steering the reforms with customer insights has already started and will extend across this three-year program and beyond.

The distributed energy resources (DER) implementation plan will work alongside the maturity plan to resolve the identified technical and regulatory issues creating barriers to full DER market integration. The issues slated for resolution in phase three include;

- developing share data capabilities between distribution networks and AEMO
- dynamic operating envelopes deployed through all networks
- interoperability standards adoption to allow ease of customer switching
- managed charging standards adopted for electric vehicles.

The culmination of this work is a **future system architecture** providing markets and services to effectively integrate and value DER and flexible demand



ESB recommendations to energy ministers

To enable the effective integration of high volumes of distributed energy resources (DER) and flexible demand onto the national electricity market

Support the DER implementation plan so

- a) consumers are rewarded for flexible demand and generation, have options for engaging with the market (including switching between service providers) and have protections.
- b) wholesale market supports innovation, integrates new business models and has a more efficient supply and demand balance.
- c) networks can accommodate continued update of DER and two-way flows and can manage network security cost effectively.
- d) AEMO has the visibility and tools it needs to continue to operate a safe, secure and reliable system including maintaining system security during minimum load conditions.

Adopt a jurisdictional ministerial lever for emergency backstop measures as an immediate reform. Enduring measures to address system security challenges associated with low minimum system load are being prepared as part of the implementation plan.

Note the ESB has developed a consumer risk assessment tool as an immediate reform. The tool will be used by the ESB and market bodies in work identified in the implementation plan.





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