

A CLEAR PLAN TO CONFIDENTLY EMBRACE AUSTRALIA'S ENERGY FUTURE

People are very clear about what they want from energy reform. It is reliable, affordable, lower emissions electricity. Australia has already jumped ahead of the rest of the world with more rooftop solar than anywhere. And massive penetration of low-cost, large-scale wind and solar farms has brought forward the use-by date for old thermal generators.

To get us safely to the future the Energy Security Board has recommended widespread action across four reform areas



Resource adequacy mechanisms to bring in the new resources needed to maintain reliability and avoid price spikes when coal generators exit the market.



Essential services changes to back up weather-driven generation, keeping the power system on an even keel technically and preventing expensive interventions which have been needed to keep the lights on in recent years.



Making the most of consumer investments in home-based energy like rooftop solar, batteries and smart appliances - using these distributed energy resources to take pressure off the grid and lower system costs for everyone.



Transmission and access reforms to cut the cost of transporting energy to consumers; planning for more generation to go into renewable energy zones; and a new model to manage congestion.

Change is already taking the market by storm. In the years ahead consumers will see...



High-tech change as the energy system moves to digital service delivery with more control over usage and bills than ever before.



The almost total rollover of generation to cheaper, cleaner, mainly renewable power.



Benefits for everyone from a modernised low emission power system that is working well, helping decarbonisation of the general economy and boosting Australia's global competitiveness.



Many millions more households and businesses with rooftop solar, batteries and electric vehicles.

More than **90 cents** in every dollar invested in generation since 2012 has been in wind and solar

Per capita, Australia is leading the world in installing renewable grid-scale generation – about 10 times the world average

The ESB reform roadmap takes a three-part approach:

There are great opportunities but also problems to solve as the old system reaches its technical limits and makes way for the new. In the process the risk of price shocks and blackouts are real and getting closer. Our recommendations are an integrated, progressive response to protect consumers and deliver on their expectations.



NOW
Fixing immediate problems, building strong foundations to handle fast-moving change.



NEXT
Getting ahead of the curve to implement what needs to happen next.



FUTURE
Orienting the national electricity market to its new path forward so everyone can plan with confidence.



BEING PREPARED FOR OLD COAL RETIREMENT

Over the next two decades Australia will replace most of its generation. Massive penetration of renewables in response to technology change, consumer choices and government policy has changed energy economics and old generators are bringing forward their retirement. We need orderly plans to exit old technologies and pave the way for new ones.

Energy Security Board recommendations to build reliability and confidence in supply



Insurance tools for governments to organise extra supply when they decide it's needed through a new strategic reserve or by triggering the current retailer reliability obligation (RRO); national investment principles.



In the medium term a **capacity mechanism** to incentivise the market to bring forward the right mix of firm, flexible and variable resources, including storage.



Generator requirements to increase transparency to the market including more information about early exit and power supply status.



ESB data strategy enabling tracking and forecasts of consumer choices, demand response, value of reliability, and better understanding of the wholesale market and changing contracting behaviours.

We're not debating the merits of coal, storage, renewables or gas. The job is to get firm and flexible supply. To achieve that we need improved information, harmonised jurisdictional schemes and orderly generator exit and entry.



We used to have about 100 generators. Quite rapidly we now have millions of units from large-scale to rooftop solar PV. We must maintain reliability, affordability and security during the transition to get maximum value out of renewables.



The long-term solution requires a stronger investment signal to lock in long-term revenue streams. Participants need sufficient incentives and confidence to invest in new capacity. Jurisdictions need assurance that participants will meet the power system's physical needs.



Principles for a common approach for all jurisdictional investment schemes will support competitive outcomes alongside current market frameworks.



A new opt-in, jurisdictional strategic reserve would give jurisdictions the option to procure any required reserves beyond the current market reliability standard if considered necessary for their region.



Extension of the existing South Australian ministerial 3 year ahead RRO trigger so it is available to all ministers if they wish to use it while further detailed design is done on a new capacity mechanism.

An additional 55 GW of projects is being proposed across Australia's east coast, almost as much generation capacity as exists today

National electricity market coal fleet will halve by 2030

Keeping lights on as the generation mix undergoes profound change

By restoring confidence that energy will be there when it is needed, we can reduce both the risks of extreme price volatility and the need for expensive government interventions.



NOW
Managing change right now: insurance tools for ministers; information; support for efficient operation of spot and contract markets.



NEXT
Providing nation-wide tools to manage risk in a targeted manner including investment principles and 12-18 month development of a new capacity mechanism.




FUTURE
We must prepare for challenges beyond 2025. Having laid foundation reforms the market will be ready for a stronger capacity mechanism.


BACKING UP POWER SYSTEM SECURITY

Lack of essential system services has cost consumers a lot of money in recent years as a result of expensive interventions. New technical backups (frequency, inertia, system strength, operating reserves) are needed urgently now we have increasing wind and solar generation and falling levels of coal-fired power. New technologies like large-scale batteries and flexible demand will help make the system stronger.


Energy Security Board recommendations enabling the services you need to keep the lights on




Priority actions are progressing to support the availability, investment in, and scheduling of **four essential system services** frequency, operating reserve, inertia, and system strength.



New tools to help AEMO manage the complexity of scheduling these essential system services as the generation mix changes.



ESB monitoring and advice on market conditions and need for longer term reforms like the further bundling of system services and an integrated ahead market or development of an inertia spot market.

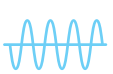


ESB data strategy to make sure data can be accessed for monitoring and forecasting of required services, and to help learning about the changing system especially variability of weather-driven generation and demand.

We must restore confidence in the system, avoid high running costs for consumers, and value the capabilities of batteries and other innovations.



We are moving to a future that will be increasingly reliant on flexible resources (like storage) to firm up the expanding volume of renewables and provide critical system security services.



AEMC has created **new markets** to financially reward ultra-fast energy technologies for stepping in at short notice to supply frequency control to avoid blackouts.

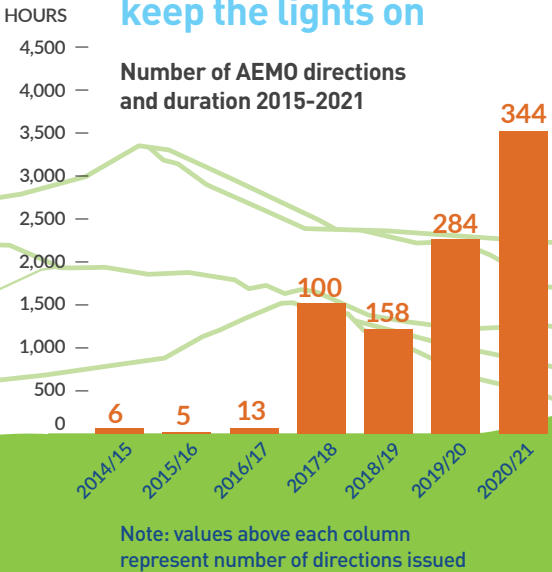


Australia is leading the world in operating a system with high levels of inverter-based resources and new technologies are being tested by AEMO, ARENA and industry trials and other demonstration projects.

Underway

- ▶ [Fast frequency response market ancillary service](#)
- ▶ [Primary frequency response incentives](#)
- ▶ [Operating reserve market](#)
- ▶ [Efficient management of system strength](#)
- ▶ [Investigation into system strength frameworks](#)
- ▶ [Synchronous services markets](#)
- ▶ [Introduction of ramping services](#)
- ▶ [Capacity commitment mechanism for security and reliability services](#)


Stepping in to keep the lights on




Security = all about the power system's ability to keep technical parameters like voltage, frequency, current flows; within safe limits and control.

Technical reforms cannot wait until 2025 so this work is already underway


The plan is focused on properly valuing all services necessary to maintain essential system capabilities and giving AEMO tools needed to efficiently schedule these services.



NOW
New AEMC rules and other rule change projects are underway to address these issues.



NEXT
Market bodies working with stakeholders on details so we can get the right scheduling tools in place for AEMO.



FUTURE
Market bodies to monitor system needs as changing generation pushes the limits of system security and operational experience.

UNLOCKING BENEFITS OF CHANGE FOR CONSUMERS

The largest generator in the national electricity market is now owned collectively by consumers – and sits on their rooftops. Digitalisation and the internet of things means people will manage energy very differently. There will be new ways to save for everyone. Properly harnessing latent demand side flexibility and solar PV, will make the grid more productive, cutting both costs and emissions.

Energy Security Board recommendations to bring forward user-friendly innovation



Detailed integration plan to resolve identified technical and market issues which are blocking effective integration of distributed energy resources. Implementation to make sure changes deliver what consumers need.



New ways for consumers with solar, batteries or smart appliances to be rewarded for responding to system needs, backed up by **jurisdictional emergency measures** to keep the grid stable.



Consumer risk assessment tool to be adopted immediately so emerging risks to customers can be assessed and fit for purpose consumer protections put in place.



ESB data strategy removing barriers so consumers can access the services they want from different providers and regulators can make sure consumer protections are fit for purpose.

Most customers won't even need to know that very complex, technical changes are happening in the background to create a two-sided market.



Trials to help consumers make the most of the new market like taking advantage of negative and low-price periods by shifting consumption to soak up excess solar generation.



Flexible trading arrangements will make it easier for consumers to be able to choose products from multiple service providers that meet their needs.



Increasing visibility of resources on the grid to make sure AEMO can balance our increasingly diverse and variable power system.



New trader services to open the market and cut red tape by creating a single registration category for all businesses in wholesale energy and services.



Customers will be rewarded by lower bills if they choose service providers that can use technology to turn off or turn down demand and appliances at different times to help balance overall system demand and supply.

South Australia is set to meet 85% of demand with domestic PV generation by 2025 with other states close to 50% or above.

Close to **3 million** Aussie homes now have solar systems

Our DER implementation plan is a three year program of actions:

Our engagement approach will gather stakeholders to work on consumer issues in a series of six monthly sprints so these insights can inform the direction of market reforms.



NOW

Fixing immediate problems now to keep the system safe and stable, valuing customer flexibility to smooth out demand peaks and troughs each day.



NEXT

Focused on what needs to happen to remove barriers for innovative services to enter the market and escalate DER integration.



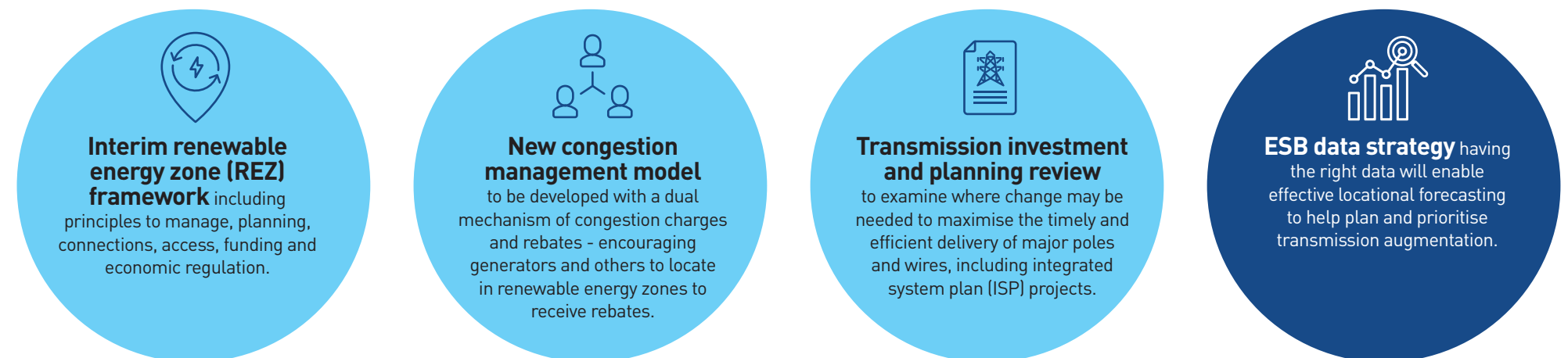
FUTURE

Work will be well underway with the right data sharing capabilities and standards in place for customers to switch DER providers and efficiently charge their electric vehicles.

OPENING THE GRID TO CHEAPER RENEWABLES

New generation, mainly renewables, is locating far and wide across the regions wherever sun and wind resources are best. These reforms are about cutting costs of getting that dispersed generation to consumers. We are already well progressed down this path through the actionable ISP. Now we're recommending better signals to encourage more generation into renewable energy zones where transmission costs can be shared and firm access secured.

Energy Security Board recommendations to locate generators and batteries where they are needed most



This ESB pathway is designed to complement and support the major reforms being undertaken by state governments.



The grid is congested, preventing more low emissions, cheaper renewables getting to market. We already see it in north-west Victoria. Without action congestion will get worse around the country long before 10 years is past.



New rules on dedicated connection assets lower connection costs by making it easier for generators to share assets like power lines.



The interim REZ framework together with state government schemes should allow a number of early renewable energy zones to proceed expeditiously.



Congestion information resource (AEMO) and connections resource initiative (AEMO/Clean Energy Council) are being enhanced to provide better information on existing and forecast congestion.



Consumers are being asked to pay billions of dollars for expanding network so new infrastructure has to be planned in an orderly manner, efficiently built and effectively used.

121 new wind and solar projects connected to the grid in past 4 years

An additional 55 GW of projects are currently being proposed across Australia's east coast – almost as much generation capacity as exists today

Connecting the new generation and storage we need as efficiently as possible

This pathway is a two stage process initially encouraging new generation to connect in REZs while the longer-term congestion management model is developed.



NOW

Rules and guidelines the states can use to guide connections along with congestion management tools so each REZ can contribute to the overall future power system.



NEXT

Congestion management model to incentivise generators to bid more closely with true costs of generation based on location.



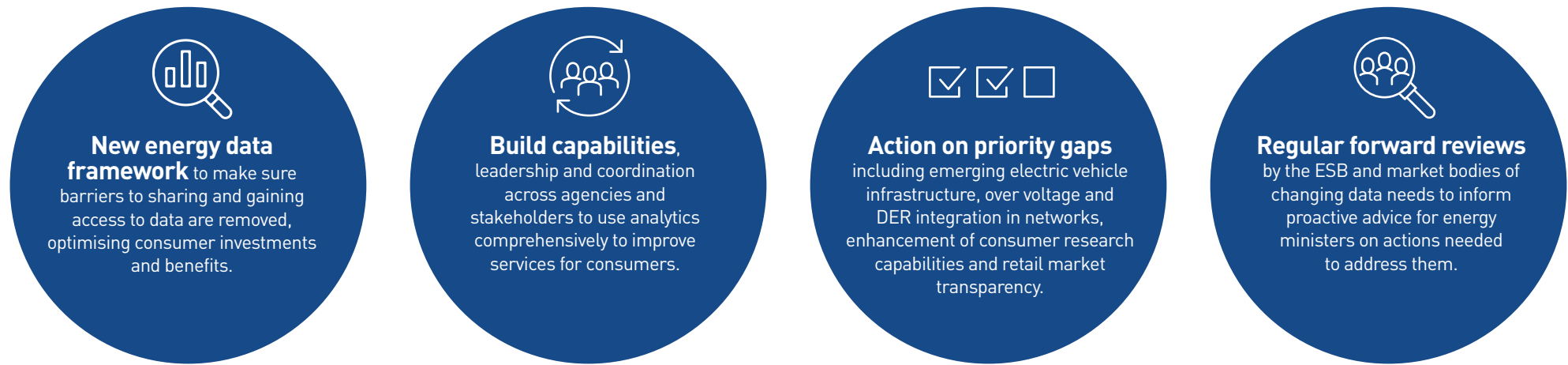
FUTURE

Conditions will continue to change on the grid. The ESB/market bodies will review and report on changes to make sure arrangements remain fit for purpose.

NEW ENERGY DATA STRATEGY

Digitalisation of the nation’s energy market is well underway. Energy market bodies are investing in advancing systems and capabilities to take advantage of developments. But there’s still a way to go before consumers, their service providers, policy makers and industry have all the data they need to make the best decisions in the face of change.

Modernisation of critical market systems and data frameworks are vital to enable the ESB’s reform pathways



Data and analytics will change the way we think about dynamic energy management, empowering individual consumers and developing smarter grids capable of handling both large-scale weather-driven power stations and locally produced generation.

Data and technology are critical foundations to unlocking benefits for customers and to support efficient future energy market operations and planning.

Data simply does not exist in some important areas. Transparency of DER (solar PV) and the low voltage network remain the system’s largest data gaps.

This is increasingly important in a future national electricity market with demand and customer owned devices increasingly responding to market and price signals automatically like batteries exporting in response to peak prices or electric vehicles charging off-peak.

Better data and advances in technology can help to reduce costs of operations and network planning. These depend on accurate forecasts of consumer demand and DER take-up. To date, such trends have been under-estimated and predicted outcomes fluctuate widely raising real planning risks.

Essential system services and DER measures require forward planning capabilities and also more visibility of real-time behaviours; and should involve tracking of how new energy services are impacting consumers to inform robust consumer protections.

Optimising long-term interests of consumers in a digitalised future

Reforms will overcome prevailing complexity and inconsistencies in data management and produce savings for consumers.

