

Distributed Energy Resources Roadmap

Progress Report

April 2021



Chair's foreword

The Distributed Energy Resources Roadmap, released by Hon Bill Johnston MLA in April 2020, comprises 36 actions to fully harness small scale, low marginal cost and zero emission technologies. These new distributed energy facilities are rapidly transforming the energy mix away from traditional thermal baseload generation facilities on which our power system has been designed.

The Roadmap requires implementation of all 36 actions by 2024, to fully integrate distributed energy resources (DER) into the Wholesale Electricity Market (WEM) and operate in sync with the physical requirements of the power system.

Given the importance of the Roadmap as a cornerstone of the Government's Energy Transformation Strategy, the Energy Transformation Taskforce has prepared this one-year Progress Report, which shows implementation is on track.

My thanks go to our Strategy project partners Energy Policy WA, the Australian Energy Market Operator, Western Power, Synergy and Horizon Power, and all others who have contributed to this excellent progress.

Major activities over the next year include completing tariff pilots, further work on community storage, progressing the crucial DER orchestration project and furthering the design of the regulatory framework for DER participation in the new energy markets.

The Taskforce is confident that this rate of continued effort by the Roadmap implementation agencies will fully transform Western Australia's power systems by 2024. However, in the interim, risks to power system security and reliability remain.

Despite this period of pandemic upheaval, rooftop solar installations have continued at an accelerated rate. We are seeing new lows in daytime grid demand on sunny days, and record reductions in instantaneous solar PV output from cloud cover. Real-time fluctuations of this magnitude make the operation of the power system increasingly challenging.

Over the last year, Roadmap actions have focused on mitigating these risks – the implementation of the DER Roadmap needs to continue at pace and the transformation will require continuing vigilance.

Stephen Edwell

Chair

Energy Transformation Taskforce

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Distributed Energy Resources Roadmap

Implementation summary

Over the past 12 months, the Energy Transformation Taskforce, in cooperation with project partners, has overseen progress towards each of the urgent DER Roadmap actions.

Work to date has focused on mitigating the immediate risks presented by DER.

Highlights of the work implemented over the last 12 months include:

- **Improvements to the Australian Standard for inverters**, introducing improved autonomous inverter settings that help support the power system
- **Installation of community PowerBanks in 10 locations**, which is seeing batteries support the Western Power network and let customers access virtual storage
- **Release of a Distribution Storage Opportunities Plan** by Western Power, outlining 50MW of network need in 2021-22, and future opportunities for storage and other technology to support the network
- **Changes to the Electricity Networks Access Code 2004**, improving opportunities for providers of network solutions to Western Power
- **Launch of the first DER Register** for Western Australia, providing AEMO with information on installed devices to better manage the power system
- **Commencement of a time-of-use tariff pilot** and progress on a second tariff pilot model
- Progress of **reviews on customer protections and data rights**
- **Development of a DER orchestration pilot**, known as Project Symphony
- **Installation of strategic network investments**, including 25MVAR of reactive power support.

In addition to the core DER Roadmap actions, the Energy Transformation Taskforce oversaw the launch of the **Distributed Energy Buyback Scheme** in August 2020, which implements time-of-export prices for customer generation exports and makes battery storage exports eligible for payment.

The Challenge

On 4 April 2020, the McGowan Government released the DER Roadmap – an Australia-first plan outlining the actions we must take over the next five years to safely integrate DER and harness the potential for cleaner, more affordable energy.

Western Australians are continuing to embrace DER, including rooftop solar, which is presenting exciting opportunities for our energy system.

Increased adoption of DER will see greater levels of clean, inexpensive generation, and customers can benefit from avoided energy costs, lower prices and reduced carbon emissions.

But the speed and scale of solar uptake presents risks to our power system.

High levels of uncontrolled solar generation is making the power system harder to manage.

Without changes to policy, technical, market and regulatory arrangements, the AEMO identified a very high risk that increasing solar penetration will threaten the secure, safe and efficient operation of the South West Interconnected System (SWIS) as early as 2022.



1. Secure and reliable supply

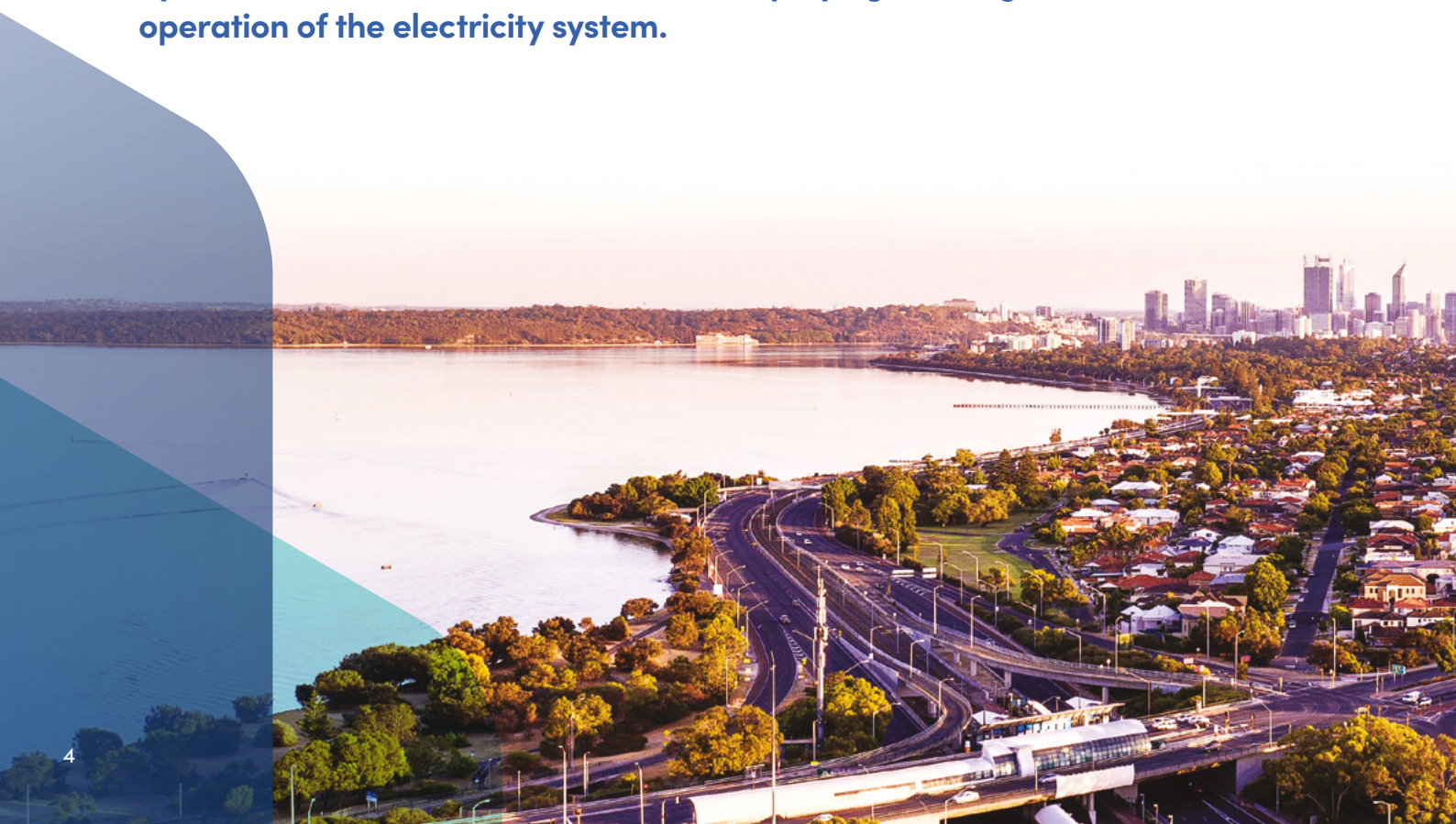


2. DER are active and delivering value



3. Customers are benefitting and protected

The DER Roadmap actions deliver a future where the challenges posed by DER have been resolved, and DER are playing an integral role in the operation of the electricity system.



DER Roadmap

Actions

The DER Roadmap outlines 36 urgent actions under four themes and 14 work packages:



Detail on the progress against each DER Roadmap action is provided on the following pages.



Progress report

No	DER Roadmap Action	Status
Technology integration		
1	By October 2020, deliver improved inverter functions through the Standards Australia national review process for AS/NZS 4777.	Complete
2	By October 2020, assess the opportunity to deliver a program to incentivise the updating of latent capabilities in the existing inverter fleet.	Underway
3	By July 2022, introduce mandatory inverter communications functionality, including communications protocols, through AS/NZS 4777, to allow remote dynamic management of DER.	Planning commenced
4	By July 2022, develop a process to ensure inverters remain compliant with connection requirements and are upgraded to the latest settings over time.	Planning commenced
5a	By December 2020, deploy community PowerBanks to address network constraints in Canning Vale, Dunsborough, Ellenbrook, Kalgoorlie, Leda, Parmelia, Port Kennedy, Singleton, Two Rocks, and Wanneroo.	Complete
5b	By October 2020, develop a plan covering 2021-24 for Western Power to obtain additional distribution storage services (and installations where services do not emerge) across the SWIS to meet emerging network needs.	Complete
6	By December 2020, implement appropriate metering and settlement arrangements for distribution storage.	Complete
7	By December 2020, ensure the Electricity Networks Access Code 2004 allows Western Power to recover appropriate costs associated with efficient use of distribution storage under its regulated revenue.	Complete
8	By December 2021, update the Technical Rules to clarify the requirements for distribution battery storage beyond the current treatment as both a generator and a load.	Underway
9	By April 2020, install 25 MVar (five x 5 MVar units) of reactive power compensation, and continue the assessment and delivery of network technology solutions to provide grid support and maintain system stability on low-demand days.	Complete
10	By June 2020, review Under Frequency Load Shedding arrangements, and assess implications for AA5 investment program.	Underway
11	By December 2021, draft updates to the <i>Electricity Act 1945</i> to reflect a voltage standard that is more suitable for a high-DER environment.	Underway
12	Beginning in June 2020, revise system restart arrangements to consider DER.	Commenced
13	By March 2021, ensure the system operator's dynamic system modelling adequately incorporates DER, and arrangements adequately address power flows during system events.	Underway

Commenced: DER Roadmap requirement met, with work ongoing

Underway: Work in progress to meet DER Roadmap requirement

No	DER Roadmap Action	Status
14	By June 2020, undertake an assessment of distribution network visibility capability and develop an investment plan for deploying technology to improve that visibility, both static and dynamic, to support DSO and system/market operator requirements.	Underway
15	By September 2020, deliver a register of static DER data for the SWIS, with processes to support data collection and future DSO functionality.	Complete
16	By June 2020, commence work on planning to integrate electric vehicles in the grid, including for the deployment of charging points (household and fast charge) and trials to better understand the capabilities of vehicle to grid technology.	Commenced
Tariffs and investment signals		
17	By March 2020, develop tariff pilot programs to explore tariff structures that encourage system-efficient use of and investment in DER and help to share the benefits of DER with all customers. The scope of the pilots should include measures to assist and protect vulnerable customers.	Complete
18	Beginning in July 2020, commence implementation of the tariff pilots.	Commenced
19	From the end of 2020, commence reviewing the progress of and insights from the tariff pilots.	Commenced
20	By December 2021, deliver a program that reduces barriers to the installation of DER at commercial and residential rental properties.	Underway
DER participation		
21	By July 2020, deliver a range of updates to the Electricity Networks Access Code 2004 to facilitate better procurement of non-network solutions (using DER where appropriate) to address network issues by Western Power.	Complete
22	By July 2020, commence a comprehensive VPP technology pilot to demonstrate the end-to-end technical capability of DER in the SWIS, and its ability to respond in a coordinated manner under central dispatch instruction. The pilot would commence with a focus on technical performance of DER and transition to market participation testing (see action 23).	Commenced
23	By July 2022, complete a comprehensive VPP market participation pilot that tests the incorporation of aggregated DER into energy markets, including market dispatch and settlement arrangements from the market operator to individual customer.	Underway
24	By December 2020, develop a plan for the establishment of a DSO and DMO in the SWIS, including the identification of roles, functions, costs and practical operations. This plan should include an assessment of the costs and benefits to the system for the establishment of these functions.	Underway

Commenced: DER Roadmap requirement met, with work ongoing

Underway: Work in progress to meet DER Roadmap requirement

No	DER Roadmap Action	Status
25	By December 2020, identify legislation and regulatory framework requirements including timeframes for development and implementation to establish DSO and DMO functions.	Underway
26	By September 2021, finalise communications protocols, data and technology requirements to accurately predict and publish operating constraints on the distribution network under a DSO, and requirements for coordination with the system operator.	Underway
27	By December 2021, introduce changes to wholesale market arrangements necessary to enable the participation of DER in the wholesale market via a DER aggregator.	Underway
28	By June 2022, introduce adapted network connection agreements that enable the DSO, once established, to interact with devices on the distribution network.	Underway
29	By December 2022, deliver a DSO/DMO legislative and regulatory framework, for transition to commencement by 1 July 2023.	Planning commenced
30	At 1 July 2023, DSO and DMO goes live in the SWIS, with DER able to respond to meet network needs as well as be dispatched into the WEM and be compensated appropriately.	Planning commenced
31	By July 2023, develop the initial design of the framework for a distribution services market with fit for purpose arrangements for dispatch and settlement. Include an assessment of the cost and benefits of market creation.	Planning commenced
32	By July 2024, commence the development of trials for a distribution services market for network support.	Planning commenced
Customer protection and engagement		
33	By September 2020, assess the applicability of the Consumer Data Right to Western Australian energy customers and commence assessment of an applicable customer data regulatory framework.	Complete
34	By June 2020, commence a process to ensure that new business models in the electricity sector, at a minimum, provide appropriate protections for consumers.	Commenced
35	By March 2022, establish a regulatory framework in the SWIS for new energy service business models to ensure access to the Energy Ombudsman, and that hardship schemes and exemptions are appropriately applied.	Underway
36	By July 2020 engage with energy customers and commence an education program to ensure that industry, government and the public are sufficiently informed about the need for changes being undertaken as a result of the Roadmap recommendations.	Ongoing

Commenced: DER Roadmap requirement met, with work ongoing

Underway: Work in progress to meet DER Roadmap requirement



DER Roadmap action status update

Technology integration

Inverter Standards (Actions 1-4)

The capabilities of inverters, through which DER devices interact with the power system, are critical to managing high levels of DER.

The DER Roadmap actions reflect the need to improve the minimum standard for technical and communication capabilities of new inverters under the relevant Australian Standard, AS/NZS 4777.2 (**Actions 1 and 3**). Further, there is a need to ensure existing inverters can be upgraded (**Actions 2 and 4**).

On 18 December 2020, Standards Australia implemented changes to AS/NZS 4777.2 which enhance the autonomous settings of inverters installed after December 2021, with specific provisions for power systems such as the SWIS, thereby achieving **Action 1**.

Implementation of **Actions 2, 3 and 4** is now underway with project partners, including trials by Western Power to test the costs and benefits of upgrading legacy inverters in Madeley and Port Kennedy.

Distribution Storage (Actions 5a-8)

Storage on the distribution network can provide a cost-effective solution for network and power system risks, while offering opportunities for customers to access storage products.

Recognising this, the DER Roadmap actions required the installation of community PowerBanks, the development of a distribution storage plan for 2021-24, and the implementation of a range of regulatory instrument changes to improve opportunities for the deployment of storage.

By July 2020, Western Power had installed and commissioned 10 community PowerBanks (meeting the requirement of **Action 5a**). On 10 February 2021, Synergy commenced recruitment for customers who wish to access the benefits of these PowerBanks through purchase of a 'virtual' storage product.

On 11 December 2020, Western Power released a *Distribution Storage Opportunities Information Plan* (achieving **Action 5b**), outlining the nature

of opportunities for storage to meet network requirements and providing an indicative storage opportunities map. This map identifies up to 50MW of network need in Byford, Henley Brook, Southern River and Waikiki by 2021-22, with ongoing distribution network requirements annually. Transmission-level constraints are also anticipated to occur in Busselton and Katanning by 2023-24.

PowerBanks and other distribution storage are now required to be metered (**Action 6**), and on 18 September 2020 Energy Policy WA implemented changes to the Electricity Networks Access Code 2004 (Access Code) improving arrangements for the efficient procurement of storage and storage services by Western Power (**Action 7**). Western Power is currently reviewing storage provisions in its Technical Rules for completion by December 2021 (**Action 8**).

Grid Response (Actions 9-11)

As DER levels increase, the Western Power distribution network faces localised challenges, particularly due to fluctuations in voltage and two-way power flows.

The DER Roadmap required Western Power to install reactive power compensation (to help manage rising voltages) and review its Under Frequency Load Shedding (UFLS) arrangements to ensure their ongoing suitability for a high-DER environment.

As of April 2020, Western Power had installed 25MVar of reactive power compensation (meeting **Action 9**), and has since installed additional reactive power support on its network. Western Power also reviewed its UFLS arrangements by June 2020 (**Action 10**), which has led to ongoing improvements and further collaboration with AEMO to ensure the arrangements adequately incorporate DER.

Energy Policy WA is progressing updates to the *Electricity Act 1945*, to reflect a more suitable voltage standard for a high-DER future (**Action 11**).

Power System Operations (Actions 12-13)

The increasing complexity of a distributed power system, with nearly 300,000 individual generators, presents new operational challenges to the system operator, including during contingency events and managing increasingly volatile power flows.

In response to these challenges, AEMO has met DER Roadmap requirements to begin revising system restart arrangements (**Action 12**), and enhance its dynamic system modelling to ensure it adequately incorporates DER (**Action 13**).

Through these processes, AEMO has identified scope for further actions using DER data to improve power system operation which will be implemented throughout 2021-22.

Distribution Network Visibility (Actions 14-15)

The DER Roadmap recognised the need for Western Power to have greater visibility of the distribution network, including mechanisms for recovering network visibility investments. The visibility of DER by the AEMO was also required to be improved through creation of a static register of DER devices.

Western Power is undertaking a comprehensive review of its Technical Rules, with proposed changes to network visibility requirements and future investments to be presented to the Economic Regulation Authority later in 2021 (**Action 14**).

AEMO, Energy Policy WA and Western Power have collaborated to establish a DER Register for the SWIS, which formally commenced on 1 March 2021 (**Action 15**). The establishment of the DER Register includes the regular transfer of DER device data from Western Power to AEMO to assist in system operation and forecasting.

Planning for Electric Vehicle Integration (Action 16)

The uptake of electric vehicles (EVs) remains slow in Western Australia. However, the risk from uncoordinated, widespread adoption of EVs will still present significant challenges for the power system. At the same time, the prevalence of large, mobile storage offers an opportunity to provide broader network and system benefits.

Western Power has commenced EV integration planning from a network management perspective (**Action 16**). Additionally, Energy Policy WA is undertaking a review of the State's readiness for EV integration from a whole-of-system and customer perspective, aligned with the State EV Strategy recommendations.

The prevalence of large, mobile storage offers an opportunity to provide **broader network and system benefits.**



Tariffs and investment signals

Tariff Pilots (Actions 17-19)

The DER Roadmap recognised that existing flat tariff structures are increasingly unsuitable as DER penetration increases, and tariff structures should be explored that encourage system-efficient behaviour by electricity users and alleviate equity issues.

To understand the impact of alternative tariff structures, the DER Roadmap identified the need for tariff pilots.

Synergy, Western Power, and Energy Policy WA have collaborated on the design of two retail tariff pilots based on a time-of-use and subscription model (**Action 17**), with the first “Midday Saver” tariff pilot commencing in November 2020 for more than 400 residential customers (**Action 18**). The Midday Saver features an 8 cents per kilowatt hour (c/kWh) for electricity consumed between 9am–3pm to encourage the use of plentiful solar energy. Customer recruitment surveys and ongoing interaction with participants are assisting in the review of the pilots (**Action 19**).

DER for Tenants (Action 20)

Residential and commercial tenants are often unable to enjoy the benefits of DER, as there are limited incentives for landlords to install such devices.

Synergy and Energy Policy WA are developing a program to help alleviate split incentives for tenants and landlords to make DER more widely available (**Action 20**). At present, Synergy is implementing the Government’s Smart Energy for Social Housing project, which is seeing rooftop solar and electric heat pump water heaters installed on public housing properties and helping tenants save on their energy bills.

Energy Policy WA is undertaking work to improve options for customers within embedded networks.

Distributed Energy Buyback Scheme

On 31 August 2020, the Distributed Energy Buyback Scheme (DEBS) was launched, introducing time of export payments for energy from eligible renewable energy systems, home batteries, and electric vehicles.

Electricity exported at peak times between 3pm and 9pm will earn 10c/kWh.

Electricity exported at all other times will earn 3c/kWh.

These rates better reflect the cost of electricity at different times of day, with the 10c/kWh provided during the afternoon and evening, when electricity demand and the wholesale cost of electricity is higher.

DEBS encourages households to maximise use of solar energy when it is plentiful, which benefits those households and supports grid stability.



DER participation

Network Investment Process (Action 21)

Western Power is provided guidance, through the Access Code, on how it procures and makes network investments. The DER Roadmap recognised that as network challenges resulting from DER intensify, and as innovative DER solutions emerge, the Access Code and network investment process must evolve to leverage new opportunities.

On 18 September 2020, Energy Policy WA implemented a range of changes to the Access Code (meeting the requirement of **Action 21**), facilitating better procurement of non-network solutions to address network issues.

DER Orchestration Pilot (Actions 22–23)

The coordination of large quantities of individual DER devices is critical to realising the benefits of DER for the power system. Orchestrated DER, acting as a virtual power plant, will be able to participate in providing network and system services, and facilitate payment to customers for providing those services.

Western Power, Synergy, AEMO, and Energy Policy WA have collaborated to design a comprehensive DER orchestration pilot, known as Project Symphony. This pilot will test the technical ability of DER to be aggregated (**Action 22**), and the potential for aggregated DER to provide services in energy markets (**Action 23**).

Project Symphony has been under development since early-2020, with the pilot to commence in mid-2021.

Distribution System Operator (DSO) and Distribution Market Operator (DMO) Function Set (Actions 24–32)

Energy Policy WA released an issues paper, *DER Orchestration Roles and Responsibilities*, in August 2020 (**Action 24**) as part of consultation to inform ongoing policy development in this area.

The DSO and DMO actions are interrelated with progress on other DER Roadmap actions, including those relating to inverter standards and Project Symphony. Planning work on **Actions 25–32** is underway, and will be informed by the outcomes of Project Symphony.





Customer protection and engagement

Customer Data (Action 33)

Customer data and information flows will play an increasingly important role as DER and energy services markets evolve. Arrangements relating to the ownership, availability and protection of this data require consideration, including the application of the Consumer Data Right (CDR) being implemented elsewhere in Australia.

Energy Policy WA has undertaken a review of the CDR for energy consumers in the SWIS, and on 6 November 2020, released a paper on the applicability of the CDR to the Western Australian energy sector (completing **Action 33**). This paper found that customers already have rights to their data, but a long-term data governance framework should be assessed following the completion of the reforms implemented under the Energy Transformation Strategy.

New Business Models (Actions 34–35)

The proliferation and development of DER is creating opportunities to new business models providing energy services for customers. As these offerings emerge, it is essential that customer protections are retained, and the regulatory framework is kept up-to-date.

Energy Policy WA has undertaken a Retail Electricity Licensing and Exemptions Review of the existing regulatory framework. The review has led to development of a new alternative electricity services framework including Codes of Practice to ensure consistent customer protections (**Action 34**). This framework will also lead to obligations for new business models in relation to these protections (**Action 35**).

Customer Engagement (Action 36)

The DER Roadmap recognises that DER should provide benefits and value to all customers. Customer engagement is central to achieving the integration of DER, and should include education programs and ongoing interaction to improve customer understanding of the power system and their behaviour.

Energy Policy WA has commenced engagement with energy customers (**Action 36**) through various forums, publications and public consultation, and is coordinating public-facing engagement on the power system, in cooperation with AEMO, Horizon Power, Synergy and Western Power.

What's next?

The focus of the DER Roadmap implementation is now on delivering the outstanding actions, which broadly relate to the long-term participation of DER in the power system. In particular, this will see:

- **Progress on the landmark DER orchestration pilot (Project Symphony)** in Western Australia, which will test the ability for DER to provide services to Western Power, and participate in the Wholesale Electricity Market.
- **Development of regulatory arrangements for the future participation of DER**, including arrangements for the DSO and DMO, and the role of DER aggregators.
- **Completion of trials for network management solutions**, including for community storage, network visibility, and inverter upgrades.
- **Continuing customer engagement**, including through review of the existing licencing framework, and DER for tenants.
- **Completion of tariff pilots**, including the Midday Saver pilot and implementation of a second tariff pilot, followed by assessment of findings.

Our implementation partners

Working together for a brighter energy future



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