



Electricity Distribution Redefined



Not just poles and wires

The traditional model of how electricity is generated and distributed to customers is now a distant memory. Much has been said about the shift from the historical one-way flow of energy sourced from a small number of very large generators and transported through our networks, to the two-way flow of electricity from thousands of smaller generators, most of them private homes with solar panels on their roofs.

But the transformation of our business does not end with energy flows.

As the owner and operator of electricity distribution networks, our role in supplying power to customers has also evolved. While providing reliable, safe and affordable electricity supplies is still a priority, how we do it involves significant innovation in managing the increasingly complex and sophisticated system behind it.

Under the Energy Security Board's *Post 2025 Electricity Market Design* (June 2021), which was accepted by the Energy National Cabinet Reform Committee (October 2021), our role has been expanded from solely providing network services to performing as a Distribution System Operator (DSO).

Our purpose is to ensure all forms of distributed energy resources – such as solar, batteries, smart appliances, electric vehicles and future innovations – are integrated efficiently and flexibly in a system that benefits all customers.

This is a natural evolution of our business but not without challenge. Demands on the system are rising rapidly with the penetration of residential solar increasing by around 15% annually and the abundance of renewable energy in the middle of the day rising. Climate change policies and strategies are driving greater electrification and renewable energy developments as our customers and communities act to reduce carbon emissions and as the Federal and State Government focus on decarbonisation measures.

In practice, it means our infrastructure now forms a crucial gateway to a clean energy future. By providing seamless access to our networks, we are generating new value for all customers.

A Distribution System Operator

Our role as a DSO expands on our traditional services and involves three main functions:

1. Enabling all forms of distributed energy resources to be connected and to export their excess power into our networks, while also encouraging a shift in when power is used to optimise renewables.
2. Facilitating participation in the electricity market by new trader services such as electricity aggregators. By signalling network conditions such as where there is capacity or constraint, we enable these third parties to trade and move electricity through our networks.
3. Maintaining system security and network stability in coordination with the Australian Energy Market Operator (AEMO).

We are already performing these functions as a DSO.

But as the local system and national market continue to develop, our teams are actively participating in their design.

We are investing in technology and innovation to expand our network capabilities and customer choices.

Dedicated teams are deployed in:

- **Enabling exports** - Developing and trialling solutions for accommodating a greater two-way flow of energy which includes undertaking network augmentation to support solar penetration and exports,, introducing new tariffs that motivate load shifting to utilise solar exports and taking action to address associated issues like minimum demand.
- **Developing new products and services** - Leading trials and projects to demonstrate the customer benefits of stand-alone power systems / microgrids, community energy, electric vehicle charging, and pole-mounted or community-based batteries as well as new demand response and demand management programs to promote energy efficiency.
- **Testing and implementing technical solutions** – Advanced technical studies in new ways to manage network capacity and voltage control that are critical for network stability, such as Dynamic Voltage Management Systems.
- **Enabling competition** – Identifying and publishing the data that is required for a competitive market for network capacity that is essential for third parties managing new services such as batteries and Virtual Power Plants.
- **Developing leading edge information technology and telecommunications** – Building Distributed Energy Resources Management Systems for both our high and low voltage networks so we can flexibly manage all energy flows, send control signals in real-time and interface with energy markets.

In collaboration with industry and regulators, our people have also been selected to participate in various working groups and committees that are responsible for developing the rules, regulations, standards and guidelines for the electricity market.

Through these forums, we advocate for both the efficient development of the electricity system and the most cost-effective solutions and outcomes for customers.

Action	Initiative
Participate in reform working groups	AEMO Reform Delivery Committee ESB Maturity Plan Stakeholder Forum ESB Customer Insights Collaboration
Build DSO capabilities	Annual network capacity tender process design High Voltage Distributed Energy Resource Management System (DERMS) Phase 1 of DSO DERMS under development Dynamic Voltage Management System deployed Wholistic network voltage control strategy further developed
Test new services	Two community batteries installed Develop solutions to help AEMO manage minimum demand Direct load control trials for hot water and air conditioner services New tariff trials related to distributed energy resource integration New demand response program trials Donald-Tarnagulla microgrid feasibility study underway Partner in electric vehicle fast-charging trial

All customers benefit

We believe all customers should have equal opportunity to benefit from the market changes and opportunities irrespective of their level of active participation.

As regulated businesses, our revenue allowance informs the network tariffs we are able to recover from customers. These form just one of the components of a typical electricity bill received by every customer. So with all our customers contributing, we have a responsibility to ensure there is fair and equal access to network services.

Those customers who remain passive users of electricity will see benefits in the reliability, quality and cost of power supplies. They will also be contributing to environmental outcomes.

Customers who choose to actively participate in the electricity market by investing in solar or other forms of distributed energy, or taking part in other ways, can receive additional benefits and value streams.

Importantly we support the need for all customers, including those investing in new technologies, to have access to a strong customer protections framework.

Top 10 ways to access a clean energy future

The facing illustration depicts the main opportunities for customers to take part in the clean energy future by accessing our network to either consume, store, or share electricity.

- 1. Large-scale renewable energy connections:** The region serviced by Powercor has some of the most prospective areas in the state for large-scale solar and wind farms and includes four of the six Renewable Energy Zones in Victoria. We work with projects ranging from 1MW to 150MW to connect them to our network and supply renewable energy to customers.
- 2. Stand alone power systems/microgrid support:** While we're already involved in some trials, we expect more communities at the end of our network or in high bushfire risk areas will be interested in microgrids or similar projects which rely on community solar and batteries. While improving energy self-sufficiency, they still utilise our network to distribute power locally.
- 3. Electric vehicle public charging infrastructure:** The rollout of public charging services across the state is being supported with connections to our network for reliable power.
- 4. Rooftop solar capacity:** These popular systems allow homes, businesses and increasingly, apartment buildings, to generate and use their own renewable energy. We see around 15% growth each year in the number of customers choosing to install power.
- 5. Rooftop solar exports:** More than 90% of the households installing solar on their roof are able to export the excess energy not used in their home into our network. From there it can be shared with neighbours or stored in a battery for when it is needed to meet demand.
- 6. Local battery storage:** In the future, batteries will be common assets found on our network for energy storage. These could be ground-mounted community batteries supporting hundreds of customers or pole-top batteries servicing a couple of streets. They support reliability for these customers and help keep local solar in the community.
- 7. Electric vehicles as generators:** EVs are essentially batteries on wheels. In the future, there is a real opportunity for customers to utilise any power they don't use when driving to power their home. Technology is also developing to enable excess power from EVs to be exported into our network in the same way as a solar system. 'EV2G' stands for 'EV to Grid' and when the EV is charged by solar power, it is another way of sharing renewable energy through our network.
- 8. Household batteries as VPPs:** Having a private battery is a way of storing excess solar from a rooftop system. It also opens an opportunity to participate in a Virtual Power Plant (VPP). Power exported by batteries into our network can be aggregated by a trader service and sold into the National Electricity Market.
- 9. Manage energy demand:** Customers have an important role in helping us to maintain network security by managing their energy demand. This could be peak demand in summer when everyone is using air conditioning or minimum demand in the middle of the day when there is too much energy coming into our system for what is being used.
- 10. Optimise smart meters:** More than 97% of our customers have advanced meter technology owned and managed by our networks. These make it easy to get accurate information about how much energy is being used in homes or properties. Our online services providing this information enable customers to make informed choices about new energy technologies, new electricity tariffs and energy efficiency opportunities.

Supporting net zero emissions targets

We acknowledge local governments in our regions and the Victorian Government have committed to achieving net zero emissions by 2050. Many communities have also declared climate emergencies influencing efforts towards energy self-sufficiency and long-term resilience.

Consumer demand, new technologies and regulation are driving actions under strategies to achieve these objectives. For example, the Victorian Government's *Climate Change Strategy* (June 2021) sets out plans for:

- 50% of Victoria's electricity to come from renewable sources by 2030
- 50% of all new light vehicle sales to be zero emissions vehicles by 2030
- gas use to be decarbonised including switching to greater electrification
- supporting 778,500 households and 15,000 businesses to install solar and batteries
- assisting community investment in renewable energy.

Our place in the energy supply chain makes our networks necessary for fulfilling the needs of customers as they find new ways to consume, export or store power. Our role as a DSO is therefore a critical contributor to the success of emissions reduction strategies.

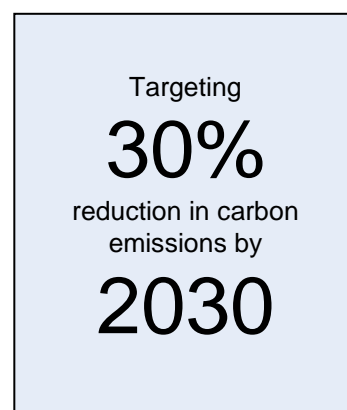
As at the end of December 2021, our networks featured:

- 188,881 residential customers (18.3% of our total) with rooftop solar installed
- 1,752 customers with batteries installed at their properties
- 1,870 MW of installed capacity of renewable energy generation (residential and large-scale) on our network
- 247 MW of additional large-scale renewable developments in the pipeline for connection.

Our target is to achieve a 30% reduction in carbon emissions by 2030 compared to 2019 levels.

Distribution line losses from our networks are the source of 89% of our carbon emissions. The key factors affecting distribution line losses include the volume of electricity being transported, air temperature, the generation source and the distance the electricity travels between that source and customers. While electricity consumption is rising, we expect these system losses will fall as the generation mix of the energy distributed changes in favour of more renewables.

By enabling greater penetration of residential rooftop solar as well as large-scale renewable connections, the CO₂ associated with each unit of electricity we distribute falls.



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