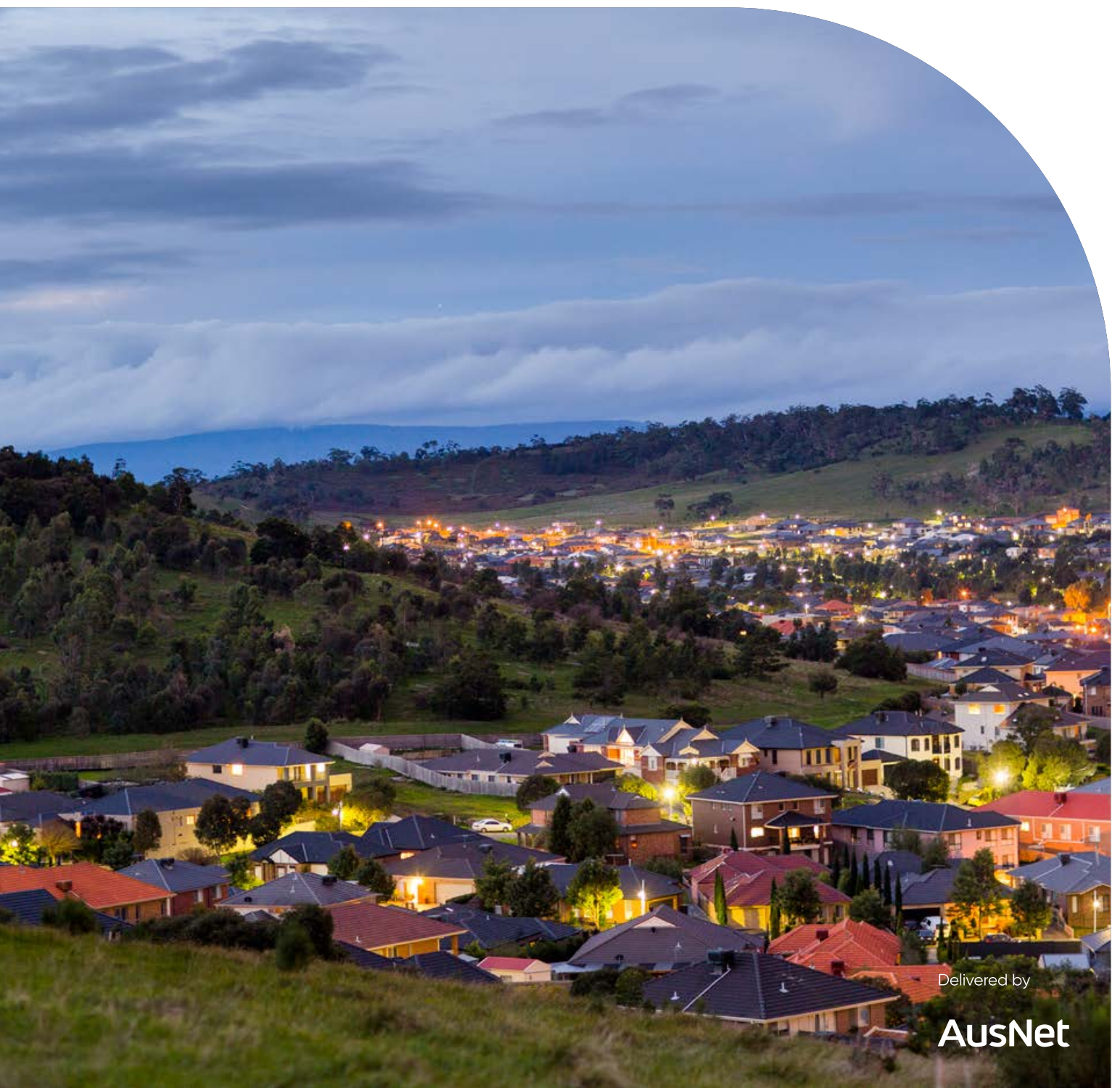


# The electricity network – transmission and distribution



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# Purpose

This fact sheet provides general information about electricity transmission and distribution.

## Electricity

Electricity is the transfer of energy through a conducting medium or material, for example, powerlines.

## Electricity network

The electricity network includes generators (such as wind farms, solar farms, gas-fired power stations and coal-fired power stations), the transmission network which carries and transforms bulk electricity (terminal stations, substations, high voltage transmission lines and towers) and the distribution network which delivers and transforms power for houses and businesses (poles and wires).

## Voltage and current

### Electricity network voltages

- 230 volts – Nominal voltage for Australian household electricity supply.
- 0.24kV to 66kV – Distribution network voltage range in Victoria.
- 132kV to 500kV – Transmission network voltage range in Victoria.



$$V = I \cdot R$$

Voltage (V) = Electrical pressure, like a pump that pushes water through a hose, measured in volts or kilovolts (1000 volts).

Current (I) = Flow of energy, like the rate of water flow coming from the end of the hose, measured in amps (A).

Resistance (R) = Limits the flow of current, like the diameter of a small hose limits the flow of water compared to larger hose, measured in ohms ( $\Omega$ ).



### Generation

Electricity is generated from traditional and renewable energy sources.



### Terminal station

Power transformer steps up voltage, for example 33kV to 220kV.



### Transmission

Transmission line carries high voltage electricity over long distances.



### Terminal station

Power transformer steps down voltage.



### Distribution

Distribution line carries electricity to houses.



### Consumers

Power transformer on pole steps down voltage before entering houses.

For illustrative purposes only

## National Electricity Network

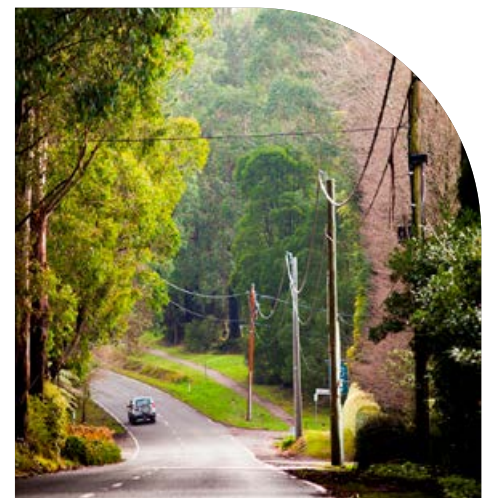
In Queensland, New South Wales, the Australian Capital Territory, Victoria, South Australia, and Tasmania, transmission networks are interconnected to form the National Electricity Market, also known as the NEM. The NEM transmission network carries power from electricity generators to large industrial energy users and local electricity distributors across the eastern states. It shares electricity through a wholesale commodity exchange, where supply and demand is matched instantaneously through a dispatch process. The NEM has a total electricity generating capacity of 65,252 MW (as at December 2021).

Read more – [www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem](http://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem).



$$\text{Power} = V \cdot I$$

Megawatts (MW) = The amount of power output, like the volume of water coming from the end of the hose. MW may refer to the amount of power generated, transmitted or required. A typical wind turbine has a capacity of between 1.5 to 3MW of electricity. The Western Renewables Link will unlock up to 900MW of renewable energy capacity, enough to power more than 500,000 homes.



## Transmission network

The transmission network transports high voltage electricity in bulk over long distances from large scale generators to terminal stations and substations. The transmission network is made up of terminal stations, substations, high voltage transmission towers and lines. AusNet owns, operates and maintains the transmission network in Victoria.

Electricity is transported by the transmission network at voltages ranging from 132kV up to 500kV. The voltage of the electricity is stepped up for transmission, for example from 33kV at the generator to 220kV for transmission, to make it more efficient to transfer over long distances.

By increasing the voltage for transmission, a lower current can be used which reduces the energy lost, such as heat, during transmission, making it more efficient. Using a higher voltage and lower current also allows more electricity to be transported with fewer transmission lines and using smaller conductors. The voltage of electricity from the transmission network is stepped down to a lower voltage before it is transferred to the distribution network.

Terminal stations are used to connect transmission lines and to step up voltage from generation for transmission, and step down voltage from transmission for distribution to consumers.

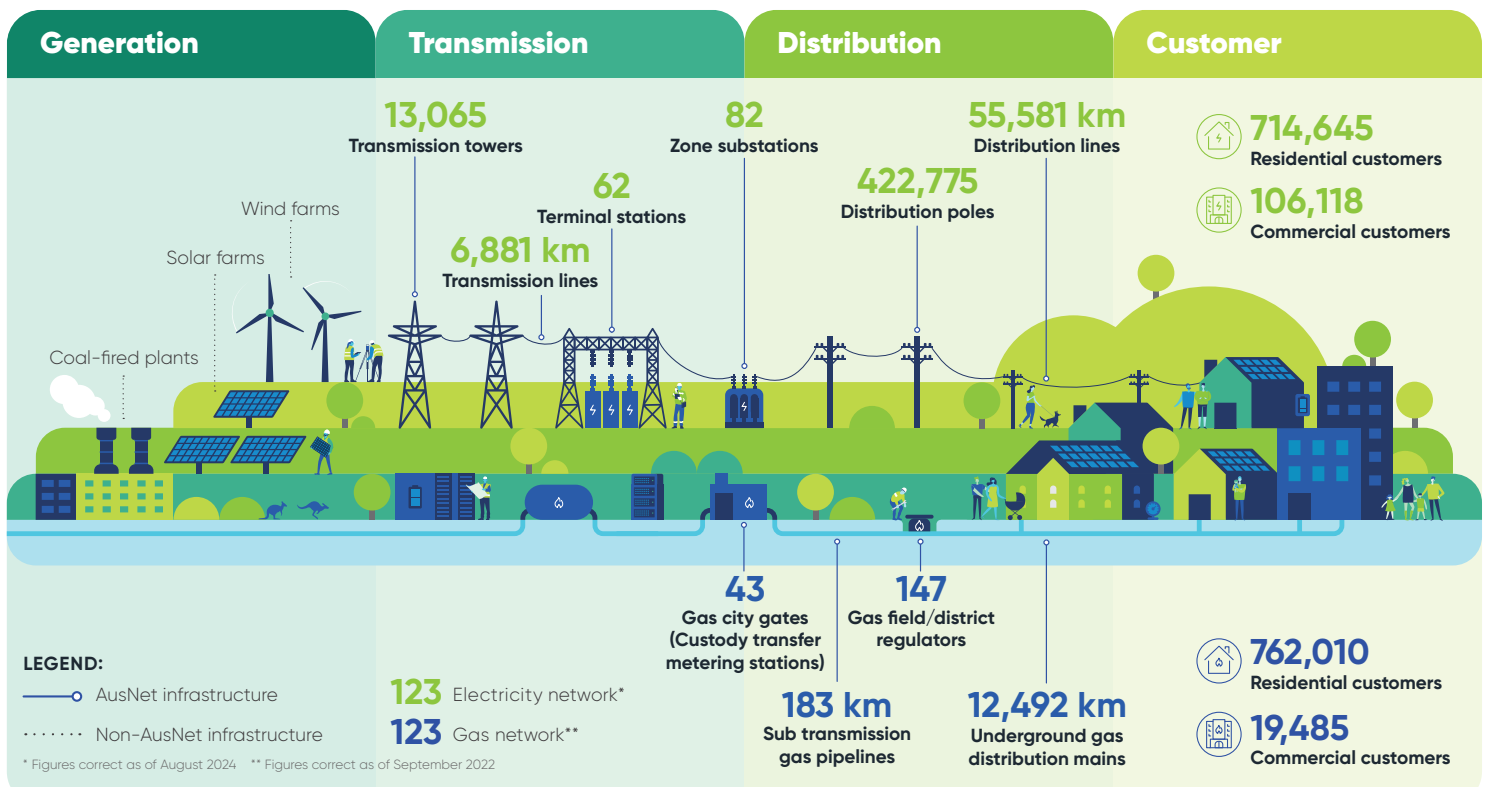
## Distribution network

The distribution network transports electricity from substations to energy consumers for residential and commercial use. The distribution network is made up of shorter poles and wires than the transmission network. Electricity is transported by the distribution network at lower voltages ranging from 0.24kV up to 66kV.

There are 5 electricity distribution businesses in Victoria, AusNet, Powercor, Jemena, CitiPower and United Energy, each responsible for a geographic region.

## AusNet networks

The transmission network and distribution networks are different types of infrastructure and require different design and management approaches. Each network has specific design standards and management plans that set out processes and procedures for easement management and activities, fire prevention and vegetation management. You can read more in the Managing Fire Risk fact sheet on the [Western Renewables Link website](#), Resources page.





## Western Renewables Link

[www.westernrenewableslink.com.au](http://www.westernrenewableslink.com.au)  
 1800 WRL WRL (975 975)  
[info@westernrenewableslink.com.au](mailto:info@westernrenewableslink.com.au)

Ballarat PO Box  
 PO Box 638, Ballarat VIC 3353

## Information straight to your inbox

Sign up for information straight to your inbox at the project website [www.westernrenewableslink.com.au](http://www.westernrenewableslink.com.au).

## Feedback

You can provide feedback on this document via our website [www.westernrenewableslink.com.au](http://www.westernrenewableslink.com.au) or by calling 1800 WRL WRL (975 975) or by emailing [info@westernrenewableslink.com.au](mailto:info@westernrenewableslink.com.au).

## Translation and interpretation services



If you need an interpreter, please call 13 14 50.



If you are deaf and/or find hearing or speaking with people on the phone difficult, please contact the National Relay Service on voice relay number 1300 555 727, TTY number 133 677 or SMS relay number 0423 677 767.

## Complaints

If you have a query, a compliment or a complaint, you can let us know by using the online enquiry form on [www.westernrenewableslink.com.au](http://www.westernrenewableslink.com.au).

Or you can let us know by:

1800 WRL WRL (975 975)  
[info@westernrenewableslink.com.au](mailto:info@westernrenewableslink.com.au)  
 PO Box 638, Ballarat VIC 3353

You can also lodge a complaint or provide feedback directly to your Land Liaison Officer.

Complaint handling steps:

1. You can lodge a complaint with AusNet as outlined above.
2. We will acknowledge receipt of a complaint in writing and will provide a unique complaint reference number within two working days.
3. We aim to resolve the complaint within ten working days.
4. Where we cannot reach a resolution within ten working days, we will keep you informed of the progress being made with handling the complaint by providing regular updates on the investigation and a revised timeframe for resolving the complaint.
5. At any time, you may request to have your complaint escalated to the senior management team by sending an email to [GeneralManager@westernrenewableslink.com.au](mailto:GeneralManager@westernrenewableslink.com.au)

If your complaint or question relates to the RIT-T process, you can raise it with AEMO by emailing [WestVicRITT@aemo.com.au](mailto:WestVicRITT@aemo.com.au).

If your complaint or question relates to the Environment Effects Statement process, you can raise it with the Department of Transport and Planning by emailing [environment.assessment@delwp.vic.gov.au](mailto:environment.assessment@delwp.vic.gov.au).

If you are not satisfied with the outcome after you have made a complaint to the project team, you may pursue dispute resolution through the Energy and Water Ombudsman Victoria if the complaint relates to access or proposed access to private land under section 93 (1) of the *Electricity Industry Act 2000 (Vic)*, and/or compliance with the Land Access Code of Practice.

## More information about this topic

### Australian Energy Market Operator Energy resources

[www.aemo.com.au/learn/energy-explained](http://www.aemo.com.au/learn/energy-explained)

### Energy Networks Australia resources

[www.energynetworks.com.au/resources/fact-sheets/](http://www.energynetworks.com.au/resources/fact-sheets/)

### Department of Environment, Land, Water and Planning information

[www.energy.vic.gov.au/electricity/about-the-electricity-sector](http://www.energy.vic.gov.au/electricity/about-the-electricity-sector)

## Other sources of information

### Australian Energy Infrastructure Commissioner

([www.aeic.gov.au](http://www.aeic.gov.au)) including information about how to make a complaint, best industry practice and resources for landholders.

### Australian Energy Market Operator

([www.aemo.com.au](http://www.aemo.com.au)) including information on the Regulatory Investment Test for Transmission (RIT-T) process for this project.

### Energy and Water Ombudsman Victoria

([www.ewov.com.au](http://www.ewov.com.au)) including information about complaints and dispute resolution.

### Energy Safe

([www.energysafe.vic.gov.au](http://www.energysafe.vic.gov.au)) including information about the safe design and operation of high voltage transmission networks in Victoria.

### Environment Effects Statement Process in Victoria

([www.planning.vic.gov.au/environmental-assessments/environmental-assessment-guides/environment-effects-statements-in-victoria](http://www.planning.vic.gov.au/environmental-assessments/environmental-assessment-guides/environment-effects-statements-in-victoria)) including information about the environment assessment process managed by the Department of Transport and Planning.

### Essential Services Commission

([www.esc.vic.gov.au](http://www.esc.vic.gov.au)) including information about the regulation of transmission licenses in Victoria and the Electricity Transmission Company Land Access Code of Practice.

### Valuer General of Victoria

([www.land.vic.gov.au/valuations/first-time-here/about-valuer-general-victoria](http://www.land.vic.gov.au/valuations/first-time-here/about-valuer-general-victoria)) including general information about how land is valued in Victoria.

The information in this document is for reference only – it is not designed to be, nor should it be regarded, as professional or legal advice. You should seek appropriate independent professional and/or legal advice where appropriate and before making any decisions based on material in this document. The information is an overview (in summary form) and does not purport to be complete. This document, and the information in this document, will not form the basis of any contract or commitment. AusNet does not guarantee or warrant the accuracy, completeness, or currency of the information provided and AusNet, its directors, officers, employees, agents and advisers disclaim all liability and responsibility (including for negligence) for any direct or indirect loss or damage which may be suffered by any recipient through use or reliance on anything contained in or omitted from this document.

## More information

Visit the project website [westernrenewableslink.com.au](http://westernrenewableslink.com.au) for the latest project information.

## Contact us

[westernrenewableslink.com.au](http://westernrenewableslink.com.au)  
 1800 WRL WRL (975 975)  
[info@westernrenewableslink.com.au](mailto:info@westernrenewableslink.com.au)

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