

## FACT SHEET

# 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.





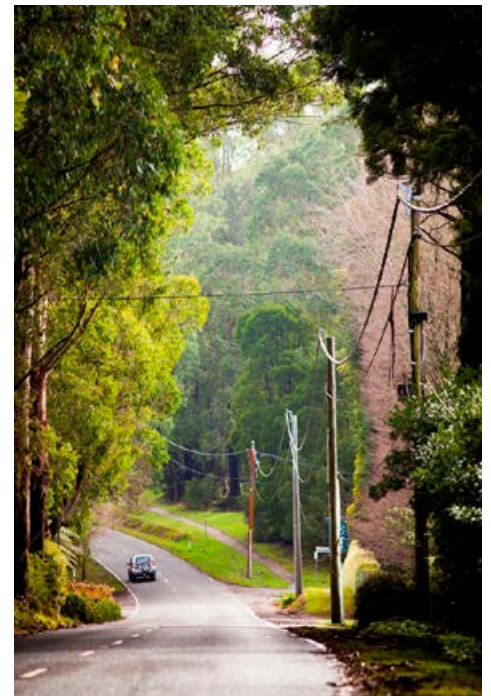
## Transmission network

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 Services 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

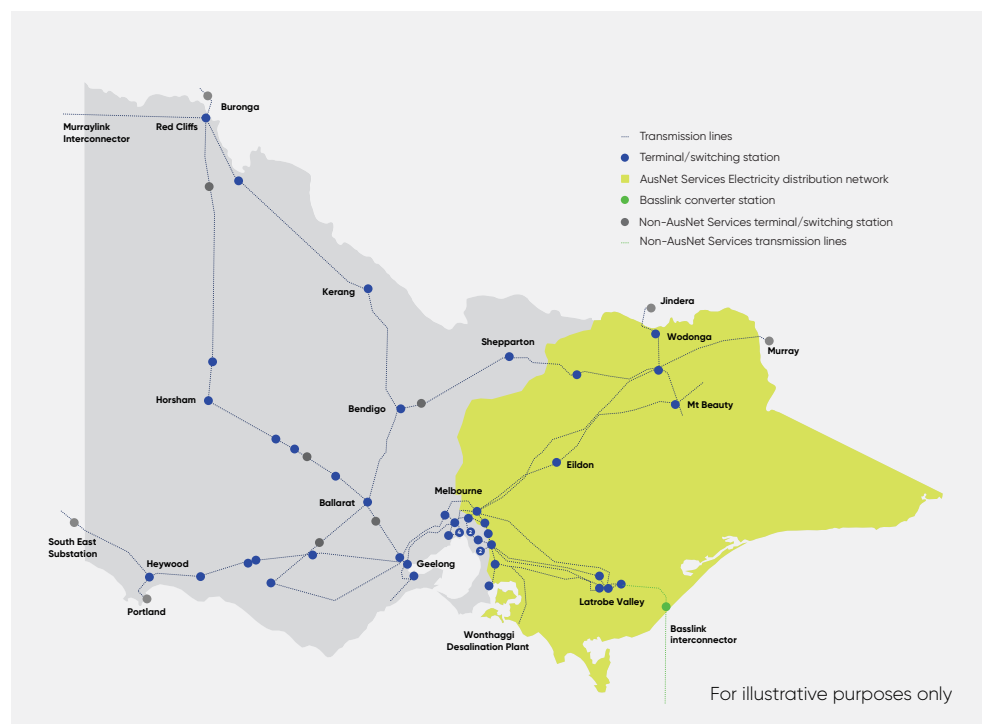
The distribution network transports electricity from substations to energy consumers for residential and commercial use. The distribution network is made up of shorter poles and wires than the transmission network. Electricity is transported by the distribution network at lower voltages ranging from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

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

## AusNet Services networks




- **AusNet Services Electricity Transmission Network** consists of approximately 13,000 high voltage towers and 6,850km of transmission lines.
- **AusNet Services Electricity Distribution Network** consists of approximately 50,000km of distribution lines that carry electricity to more than 700,000 customers, across eastern and north-eastern Victoria, and in Melbourne's north and east. (AusNet Services Annual Report 2021)

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 information

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 1300 360 795  
 [info@westernrenewableslink.com.au](mailto:info@westernrenewableslink.com.au)

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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).

## 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:

 1300 360 795  
 [info@westernrenewableslink.com.au](mailto:info@westernrenewableslink.com.au)  
 PO Box 638, Ballarat VIC 3353

## Feedback

You can provide feedback on this document via our website [www.westernrenewableslink.com.au](http://www.westernrenewableslink.com.au) or by calling 1300 360 795 or by emailing [info@westernrenewableslink.com.au](mailto:info@westernrenewableslink.com.au)

## Need an interpreter?



If English is not your first language or you need an interpreter, please call 13 14 50.

## 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 Victoria** ([www.esv.vic.gov.au](http://www.esv.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/environment-assessment/what-is-the-ees-process-in-victoria](http://www.planning.vic.gov.au/environment-assessment/what-is-the-ees-process-in-victoria)) including information about the environment assessment process managed by DELWP.

**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 Statement of Expectations.

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