

# Electric and magnetic fields



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Safety is essential every day for our landholders, the community and our people.

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## About this brochure

This brochure provides information about electric and magnetic fields (EMF), what they are and where they are found. It outlines existing guidelines and other important information which address specific questions on EMF.

We recognise the community concern about the potential health impacts of EMF. To appropriately manage EMF we rely on expert advice from government and health authorities in Australia and around the world to ensure that we practice prudent avoidance when designing and operating Queensland's transmission network.

## General safety information

EMF are found everywhere electricity or electrical equipment is used, including in the home, office, work sites and around transmission lines. The power industry in Australia has a proactive management program specific to EMF at power frequencies (50 Hz). In conjunction with this, the Federal Government's Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) also maintains continual oversight of emerging research into EMF exposure from powerlines and other electrical sources in order to provide accurate and up-to-date advice. This scientific evidence does not establish that exposure to EMF found around the home, the office or near powerlines and other electrical sources is a hazard to human health.

## Where are they found?

We are surrounded by electrical sources in our daily lives and are frequently exposed to some level of EMF. Electrical sources such as powerlines, electrical wiring and common appliances (e.g. fridges, toasters, televisions, hair dryers and computers) all produce extremely low frequency (50 Hz) EMF.

## Electric fields

Electric fields are present in any appliance plugged into a power point which is switched on or on stand-by. Electric fields are proportional to the voltage of the appliance and the distance the user is from it. They are strongest close to their source and their strength diminishes rapidly as you move away in much the same way as noise decreases as you move away from the source. Electric fields are also shielded by most objects including trees and buildings.

## Magnetic fields

Magnetic fields are present in any appliance plugged into a power point, switched on and operating. Magnetic fields are proportional to the amount of electrical current flowing in the device. When an appliance is completely turned off, there is no magnetic field. Like electric fields, these are strongest close to their source, and their strength diminishes rapidly as you move away.

For magnetic fields, our transmission network is designed and operated well below the general public exposure guideline limits of 200 micro-Tesla ( $\mu\text{T}$ ).

The examples overleaf highlight some commonly used electrical appliances and electricity infrastructure, and typical ranges of magnetic field levels. These measurements are recorded in micro-Tesla ( $\mu\text{T}$ ).

## Typical ranges of magnetic field levels



Oven  
0.2 – 3  $\mu\text{T}$



Fridge  
0.2 – 0.5  $\mu\text{T}$



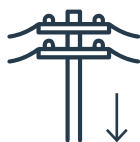
Toaster  
0.2 – 1  $\mu\text{T}$



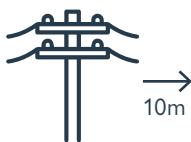
Hairdryer  
1 – 7  $\mu\text{T}$



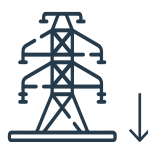
Laptop  
0.2 – 1  $\mu\text{T}$



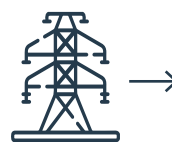
Directly underneath a  
distribution powerline  
0.2 – 3  $\mu\text{T}$



10 metres away from a  
distribution powerline  
0.05 – 1  $\mu\text{T}$



Directly underneath  
a high voltage  
transmission line  
1 – 20  $\mu\text{T}$



Edge of a high voltage  
transmission line  
easement  
0.2 – 5  $\mu\text{T}$



Directly above  
underground high  
voltage cables  
0.5 – 20  $\mu\text{T}$

## Transmission network safety

ARPANSA is the Australian Government agency responsible for research, policy and best practice regulation in regards to EMF. ARPANSA publishes guidelines for EMF exposure relating to all relevant situations to ensure community safety and the safety of electricity industry staff who work at much closer distances.

Our assets are designed in accordance with technical recommendations in the Energy Networks Australia (ENA) EMF Handbook regarding general public exposure to electric fields. We are committed to working closely with landholders, the community and other stakeholders with an interest in EMF by:

- Taking a prudent avoidance approach. Where possible, we locate proposed transmission infrastructure away from houses and habitable buildings so they do not materially add to EMF levels that already exist in a typical household environment
- Providing information to the public regarding the latest findings from independent and credible scientific research into potential health impacts
- Designing transmission lines to reduce EMF in accordance with best practice outlined in the ENA EMF Management Handbook (which can be viewed at [www.energynetworks.com.au/resources/fact-sheets/emf-management-handbook](http://www.energynetworks.com.au/resources/fact-sheets/emf-management-handbook))
- Providing the maximum EMF generated by proposed transmission lines as part of public consultation for planned projects.

## Living near transmission lines or other electrical sources

For homes near high voltage transmission lines, the magnetic field exposure will vary according to the amount of current carried and the distance from the transmission line. Generally magnetic fields in homes that are more than 50 metres from a high voltage transmission line are usually indistinguishable from typical background levels of appliances in the home which are illustrated in the diagram above. The same can be said for magnetic fields at distances of 5 to 10 metres away from substations and transformers. All magnetic field measurements from transmission lines are well below the exposure limit outlined in the relevant national and international guidelines of 200  $\mu\text{T}$ .

## Are EMF the same as electromagnetic radiation?

EMF can be commonly confused with electromagnetic radiation (EMR), but they are not the same – EMF around powerlines, electrical wiring and household appliances are not a form of radiation. EMF causes energy to be transferred along electric wires whereas EMR refers to the movement of electromagnetic energy through a wave (e.g. radio waves, microwaves, visible light, UV radiation and X-rays).

## Are EMF levels different for 500kV and 275kV transmission lines?

For people who work or live near 500kV and 275kV transmission lines, there is no significant difference in EMF levels. At the edge of an easement for both a 275kV and 500kV transmission line, EMF levels are similar to those present in a standard home – and significantly below the relevant national and international guidelines. At about 200 metres from a transmission line (either 275kV or 500kV), the EMF is so small it cannot be easily measured and differentiated from magnetic fields from other closer sources found in and around the home or workplace.

## What health research has been carried out in relation to EMF?

Electricity has been used in Australia for more than 100 years with extensive research carried out on EMF. Internationally, there have been around 3,000 studies carried out in relation to EMF, which has significantly enhanced our knowledge of this topic. Leading global health bodies including the World Health Organisation continue to evaluate research into health effects associated with exposure to EMF. The scientific evidence does not establish that exposure to EMF found around the home, the office or near powerlines and other electrical sources is a hazard to human health.

## Does undergrounding a transmission line eliminate EMF?

The ground and metallic sheath is integral to the design of the underground transmission line cable and provides shielding from electric fields, but do not shield magnetic fields. Underground transmission line cables are closer to ground level, so they can have similar or even greater magnetic fields in comparison to the same lines installed overhead on transmission towers. As you move away from underground transmission line cables, magnetic fields decrease very quickly. For people who work or live near underground transmission line cables, magnetic fields are significantly below national and international guidelines.

## What about EMF impacts on livestock and farming?

Powerlink's infrastructure effectively co-exists with many different land use types and farming methods across Queensland, including grazing. Information from a number of well-recognised scientific sources and studies indicate that no reason exists for concern about the effect of EMF on animals or plants, and that EMF has no adverse effect on livestock health.

Information on how to safely install, operate and maintain electric fencing can be found in Powerlink's brochure 'Fencing near Powerlink transmission lines', available on our website: [www.powerlink.com.au/reports/fencing-near-transmission-lines](http://www.powerlink.com.au/reports/fencing-near-transmission-lines).

### Additional resources

For additional information about EMF, please refer to the following resources:

- **Energy Networks Australia:** [www.energynetworks.com.au](http://www.energynetworks.com.au)  
> EMF Management Handbook: [www.energynetworks.com.au/resources/fact-sheets/emf-management-handbook](http://www.energynetworks.com.au/resources/fact-sheets/emf-management-handbook)
- **Australian Radiation Protection and Nuclear Safety Agency:** [www.arpana.gov.au](http://www.arpana.gov.au)  
> Exposure to Electrical Sources FAQs: [www.arpana.gov.au/understanding-radiation/radiation-sources/more-radiation-sources/electricity/frequently-asked-questions](http://www.arpana.gov.au/understanding-radiation/radiation-sources/more-radiation-sources/electricity/frequently-asked-questions)  
> Electricity and Health Fact Sheet: [www.arpana.gov.au/understanding-radiation/radiation-sources/more-radiation-sources/electricity/frequently-asked-questions](http://www.arpana.gov.au/understanding-radiation/radiation-sources/more-radiation-sources/electricity/frequently-asked-questions)  
> Measuring Magnetic Fields: [www.arpana.gov.au/understanding-radiation/radiation-sources/more-radiation-sources/measuring-magnetic-fields](http://www.arpana.gov.au/understanding-radiation/radiation-sources/more-radiation-sources/measuring-magnetic-fields)
- **World Health Organisation:** [www.who.int](http://www.who.int)  
> Electromagnetic fields brochure: [www.who.int/news-room/questions-and-answers/item/radiation-electromagnetic-fields](http://www.who.int/news-room/questions-and-answers/item/radiation-electromagnetic-fields)

## Contact Us

Further information about Powerlink and our projects can be downloaded from [www.powerlink.com.au](http://www.powerlink.com.au)

General Enquiries FREECALL 1800 635 369 (during business hours) and ask for Landholder Relations

In case of emergency FREECALL 1800 353 031 (24 hours, 7 days a week)

Email [LandholderRelations@powerlink.com.au](mailto:LandholderRelations@powerlink.com.au)

[www.powerlink.com.au](http://www.powerlink.com.au) |    



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Everyone. Everywhere. Everyday.